1902.

INTERSTATE ROYAL COMMISSION

ON THE

RIVER MURRAY,

REPRESENTING THE

STATES OF NEW SOUTH WALES, VICTORIA, AND SOUTH AUSTRALIA.

Presented by B. O. Reynolds Esq. Inst. C.E. Esq.

REPORT

17-10-02

OF THE

COMMISSIONERS.

WITH MINUTES OF EVIDENCE, APPENDICES, AND PLANS.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND.

Ee II (c) 165

Melbourne:

SANDS & McDOUGALL LIMITED PRINTERS.

1902.

D2.56.PIM NO2
NO2

VICTORIA

(TO WIT).

EDWARD, by the Grace of God, of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India—

To our Trusty and Well-beloved—

JOSEPH DAVIS, Esquire, of the State of New South Wales;

STUART MURRAY, Esquire, of the State of Victoria;

FREDERICK NEWMAN BURCHELL, Esquire, of the State of South Australia.

Greeting:

KNOW you, That We, reposing great trust and confidence in your ability, zeal, industry, discretion, and integrity, do, by these presents, authorise and appoint you to make a diligent and full inquiry concerning the Conservation and Distribution of the waters of the river Murray and its Tributaries for the purposes of Irrigation, Navigation, and Water Supply, and to report as to the just allotment of the Waters of the Murray Basin to the use of each of the States of New South Wales, Victoria, and South Australia, and upon the best methods, joint or otherwise, for their conservation and distribution for the purposes aforesaid, and as to the practicability and cost of the necessary works for such objects: We also authorise you to make the fullest investigation in regard to any other matter concerning the utilisation of the waters of the said River and its Tributaries which may be brought before you during the course of your inquiry: And We do give you power, at your discretion, to procure such assistance as you may deem necessary for enabling you duly to execute this Our Commission: And Our further will and pleasure is that you do, within four months after the date of this Our Commission, certify to Us, in the Office of Our Chief Secretary, under your hand and seal, what you shall find touching the premises: And We hereby command all Government Officers, and other persons whomsoever within Our said State, that they be assistant to you in the execution of these presents: And We appoint you, the said JOSEPH DAVIS, President of this Our Commission: And We do hereby declare this Our Commission to be a Commission for all purposes of the Act 54 Victoria, No. 1,038, intituled *Evidence Act* 1890.

In testimony whereof, We have caused these Our Letters to be made Patent, and the Seal of Our said State of Victoria to be hereunto affixed.

Witness Our Trusty and Well-beloved Sir GEORGE SYDENHAM CLARKE, Knight Commander of the Most Distinguished Order of St. Michael and Saint George, Fellow of the Royal Society, Governor of the State of Victoria and its Dependencies, in the Commonwealth of Australia, &c., &c., &c., at Melbourne, this thirteenth day of May, one thousand nine hundred and two, and in the second year of Our Reign.

(L.S.) GEORGE SYDENHAM CLARKE.

By His Excellency's Command,

W. A. TRENWITH.

Entered on Record by me, in the REGISTER OF PATENTS, Book 24, page 258, this thirteenth day of May, one thousand nine hundred and two.

G. C. MORRISON.

31288

1902.

VICTORIA.

ROYAL COMMISSION—CONSERVATION AND DISTRIBUTION OF THE WATERS OF THE MURRAY RIVER BASIN.

REPORT OF THE COMMISSIONERS.

To His Excellency Sir George Sydenham Clarke, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George, Fellow of the Royal Society, Governor of the State of Victoria and its Dependencies, in the Commonwealth of Australia, etc., etc., etc.

MAY IT PLEASE YOUR EXCELLENCY:

We, your Commissioners, appointed on the thirteenth day of May, 1902, "to make a diligent and full enquiry concerning the Conservation and Distribution of the Waters of the River Murray and its Tributaries for the purposes of Irrigation, Navigation, and Water Supply, and to report as to the just allotment of the waters of the Murray basin to the use of each of the States of New South Wales, Victoria, and South Australia, and upon the best methods, joint or otherwise, for their conservation and distribution for the purposes aforesaid, and as to the practicability and cost of the necessary works for such objects," and other matters, have the honour to submit this our report:

Sixty-three meetings for taking evidence have been held at various places in the three States concerned in this enquiry, and two hundred and ninety-four witnesses have been examined; eighty meetings have also been held in Committee.

CAP. 1.—HISTORY OF THE RIVER QUESTION AND ENQUIRIES BY FORMER COMMISSIONS.

Importance of the Murray River to Australia.

THE River Murray, judged by its length of channel and area of catchment, should be one of the great streams of the world; and, although its volume of water is small, relatively to its immense gathering ground, it is yet the greatest waterway in Australia, and its utilisation is of the first importance to the inhabitants of the States through which it flows. It is, therefore, matter for surprise that the problems which it is the function of this Commission to investigate still remain unsettled.

The history of the rivers question for the past eighteen years is briefly as follows:—

South Wales Commission, 1884.

In 1884 a Royal Commission was appointed in New South Wales, under the Presidency of the Honourable W. J. (now Sir W. J.) Lyne, M.P., "to make a diligent and full enquiry 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."

Victorian Commission, 1885.

This Commission presented three reports, a prominent feature of which was the utilisation of the waters of the River Murray. Two conferences were also held, in 1886, with a Royal Commission on Water Supply appointed by the Governor of Victoria. The result was the adoption of the following resolutions :—

Conference between the N. S. Wales & Victorian Commissions and resolutions agreed on.

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. That 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 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, at 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 utilised, shall be equal.

4. 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 utilisation 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.

These resolutions were accordingly submitted to the Governments of the two colonies, but no Bill was prepared by either for the constitution of the proposed Trust.

South Australian Commission.

South Australia, being greatly interested in the navigation of the river, also appointed a Commission, and asked to be joined in conference with the Commissions of New South Wales and Victoria. Circumstances, which it would serve no good purpose to recapitulate here, prevented any conference taking place. Since that time the establishment of the Renmark Irrigation Trust, and of a number of smaller Irrigation Settlements, has given South Australia an added interest in the maintenance of the volume of water in the river. Considerable areas of land bordering the river in that State are regarded as suitable for irrigation; and, apart from the Settlements referred to, private irrigation is already carried on, on a moderate scale, with varying success.

South Australia's interest in the river question.

Organisation of water supply service in N. S. Wales.

One tangible result of the New South Wales Royal Commission of 1884 was the organisation of a Water Conservation Service, under the charge of Mr. H. G. McKinney, who had acted as engineer to the Commission. Mr. McKinney proposed the construction of a series of canals for irrigation, principally from the Murray and Murrumbidgee. In 1896 the New South Wales Government invited Col. Home, an Indian officer of large experience in irrigation works, to visit the colony, and report upon these various schemes, and generally upon the prospects of water conservation and irrigation. Col. Home, reporting in 1897, selected two projects as those most likely to prove successful. These were:—A canal leaving the left bank of the Murrumbidgee, below the off-take of the Yanko Creek; and:—A canal from the right bank of the Murray River, at Bungowannah, seven miles below Albury. He recommended an alteration of site of the off-take of the Murrumbidgee Canal; and in both projects the provision of storage to ensure the maintenance of a permanent supply.

Re-organisation of the Victorian Water Supply Department.

In Victoria, a Water Supply Department had been in existence for many years. Under its direction, various works had been carried out for the supply of country towns; but the report of the Victorian Royal Commission of 1886 created a new interest in irrigation, and led to greatly increased activity. The Department was re-organised; Mr. Stuart Murray, who had been associated with the Commission as Professional Assistant, was appointed Chief Engineer; and, under the Ministerial guidance of Mr. Alfred Deakin, who had been its President, attention was devoted to providing facilities for irrigation. A large number of the schemes then initiated have since been carried into effect.

Authority of the Commonwealth.

The birth of the Commonwealth has brought into existence a new authority vested with powers which, within certain limits, are supreme. The introduction of this new, and, to some extent, controlling factor, made it more than ever necessary that the States interested in the disposal of the waters of the Murray Basin should come to some conclusion as to their respective rights and interests in the river and in works for the utilisation of its waters. Several successive years of drought, too, had made the residents in the Riverina district of New South Wales keenly anxious for the realisation of some of the projects for the irrigation of their lands, already so long under discussion. This anxiety found public expression in March of this year, when an organisation, called the Murray River Main Canal League, invited the Federal Premier, the Premiers of New South Wales, Victoria, and South Australia, and other representative men, to a conference at Corowa. At the conference, several resolutions were passed, the principal of which are the following :—

The Corowa Conference of March, 1902.

1. That the Governments of the Commonwealth and the States concerned be urged to co-operate in preparing and carrying out a comprehensive scheme for the utilisation of the waters of the River Murray, which, while improving the

navigability of that river, will also provide for the imperative needs of the residents on both banks in the conservation and distribution of its waters.

2. That, owing to the urgent necessity for a scheme of water conservation for the Riverina, Northern Victoria, and South Australia, and as an instalment of a comprehensive scheme, the States of New South Wales, Victoria, and South Australia be asked to empower the Federal Government to provide storage reservoirs on the Upper Murray and a weir at Bungowannah, as proposed by Mr. McKinney and endorsed by Col. Home and Mr. McGregor; such head works to be National.

3. That, contingent upon the above resolution being adopted by the Governments concerned, this Conference recommends the public bodies interested to approach their respective Governments, and request that the distributing works, for utilising the Upper Murray storages and Bungowannah weir, be commenced at such time as will enable them to be completed concurrently with the head works named.

4. That, in the opinion of this Conference, the circumstances of Australia demand that all natural waters not already appropriated under legal sanction shall be declared public water, and made subject to a suitable system of law applicable to the whole of the Continent, and that the Commonwealth and State Governments be respectfully asked to consider such legislation as will provide for its regulation and disposal, in such manner as shall secure its fullest possible use in the interests of the whole of the people.

Appointment of this Commission.

These resolutions were considered by the Premiers present; and, before the delegates to the Conference separated, it was announced that a Royal Commission would be appointed by the three States concerned to investigate and report. This Commission is the result. The utilisation of the waters of the Murray Basin, and their appropriation to the service of the several States, being the chief subject for investigation, it will be convenient here to give a brief outline of the geography and physical conditions of the Basin.

Cap. 2.—GEOGRAPHY AND PHYSICAL CHARACTERISTICS OF THE MURRAY RIVER BASIN—ITS EXTENT AND IMPORTANCE.

Necessity for a clear idea of the geography of the basin.

Description of the river basin and its boundaries.

BEFORE devising schemes for the utilisation of the waters of a river, it is necessary to know their volume, the sources whence they are derived, and the losses to which they are subject in their progress to the sea. It is also very advisable to have a clear idea of the geography, and of the varying physical conditions, of the country forming the river basin, both from the point of view of its water-yielding capacity, as a source of supply, and from that of its agricultural value as a field for the utilisation of that supply in irrigation, or for other industrial purposes. The Murray is the great natural main drainage line of the South-eastern part of Australia, the basin of the river and its tributaries comprising 414,253 square miles—an area equal to double that of France—out of a total of 2,950,000 square miles in the whole Australian Continent. That is to say, this river basin includes within its limits nearly one-seventh of the entire mainland subject to the jurisdiction of the Commonwealth, being five-sixths of New South Wales, considerably more than half of Victoria, over one hundred thousand square miles of Queensland, and twenty-four thousand square miles of South Australia. Its boundaries are:—On the East, the coast Range, roughly parallel to, and at a distance of 30 to 130 miles from, the Eastern coast line of Queensland and New South Wales; on the South the Great Dividing Range following a Westerly direction, from sixty to a hundred miles distant from the coast, through the State of Victoria, and by an almost direct line, through South Australia,

to the River mouth; on the West the Mount Lofty and the Barrier Ranges, and badly defined low hills, through South Australia, New South Wales, and Queensland; and on the North, through the latter State, the Warrego and Carnarvon Ranges. The greatest height reached at any point on the boundary is in the South-east, where Kosciusko, the highest land in Australia, attains an altitude of 7,256 feet. It may be further worthy of note that, if to this vast catchment there be added the strip of coast land lying between it and the sea, from the Condamine River in the North-east to Lake Alexandrina in the South-west, the total would become one-fifth of the Australian Continent, containing at least three-fourths of its entire present population and much more than half of its agricultural and pastoral possibilities for the sustenance of human life. Of the whole 414,253 square miles within the Basin only 158,499 square miles make any effective contribution to the volume of the river. The remaining 255,754 square miles consist chiefly of delta lands, or other flat alluvial areas, that quickly absorb the rainfall on their surface; or that afford a scanty run off only during exceptional floods, when their contribution can serve no apparent useful purpose. The following tabular statement gives the details of the drainage areas, showing their extent within the several States, and the names of the tributaries through which their waters are discharged:—

Relation of basin to the whole of Australia.

Details of areas of catchment.

STATE OF QUEENSLAND.

Watershed of the	Effective Catchment in Square Miles.
MacIntyre and Dumaresq	3,062
Weir	2,693
Moonie	2,348
Condamine	16,274
Maranoa	7,126
Warrego	17,167
Paroo	13,567
Mungalalla, &c.	5,453
	67,690
Delta lands, &c.	36,835
	104,525

STATE OF NEW SOUTH WALES.

Watershed of the	Effective Catchment in Square Miles.
MacIntyre and Dumaresq	5,188
Gwydir	4,796
Namoi	9,462
Castlereagh	3,069
Macquarie	10,359
Bogan	4,930
Lachlan	20,159
Murrumbidgee	13,384
Billabong	1,779
Murray	2,373
	75,499
Delta lands, &c., East of the Darling	109,023
„ „ West of the „	49,840
	234,362

STATE OF VICTORIA.

Watershed of the	Effective Catchment in Square Miles.
Upper Murray	1,500
Mitta	2,400
Kiewa	700
Ovens	2,700
Goulburn	5,240
Campaspe	970
Loddon	1,800
	15,310
Delta lands, &c.	35,669
	50,979

STATE OF SOUTH AUSTRALIA.

	Square Miles.
Non-contributing area	24,387

TOTAL CONTRIBUTING AREAS IN THE SEVERAL STATES.

	Square Miles.
Queensland	67,690
New South Wales	75,499
Victoria	15,310
Total	158,499

TOTAL NON-CONTRIBUTING AREAS.

	Square Miles.
Queensland	36,835
New South Wales	158,863
Victoria	35,669
South Australia	24,387
Total	255,754
Grand Total	414,253

Low discharge from the catchment; reasons thereof.

When the rainfall over the whole area, low as it is, averaging only about 13 inches per annum, is compared with the flow of the river, a great disparity is seen to exist. Evidently the two chief reasons are:—The level character of most of the country; and the distribution of the rainfall, which, while of small amount, is so distributed in point of time that little water flows off from the surface. To these causes is to be attributed the fact that more than 255,000 square miles within the Murray Basin are to be regarded as non-contributing; while of the 159,000 square miles set down as contributing, a considerable portion is so in a small degree only. Part of the catchment, however, has a heavy rainfall; while some of the more rugged and mountainous portions, for example, the Jagungal, Bogong, and Dargal Ranges are covered with snow for several months in each year.

High discharge from the mountain areas.

On the Victorian side the contributing area above Albury is double that in New South Wales, but the volumes discharged are more nearly equal, the New South Wales tributaries being more largely fed by the heavy deposits of snow that melt in spring and early summer. The drainage area of the Upper Murray, with a mean

rainfall of more than 40 inches, constitutes the most reliable and effective part of the whole catchment. There is no other part of Australia, with the exception of portions of the catchments of the Murrumbidgee and Goulburn, where snow falls in sufficient quantities to have any marked influence upon the flow of the streams.

Fall of the river.

Above Albury the hills enclosing the river valley are generally about half-a-mile apart. Below that point they recede, and seven miles below Albury, the last spur of primary rock is seen at Bungowannah. Thence, throughout the whole of its course to the sea, the river flows through what may be termed level country, the fall being 9 inches per mile from Albury to Tocumwal, $7\frac{1}{4}$ inches from Tocumwal to Echuca, $4\frac{1}{2}$ inches thence to Euston, $3\frac{3}{4}$ inches to Wentworth, where it is joined by the Darling, and from Wentworth to Lake Alexandrina under 3 inches per mile.

The Murrumbidgee.

The Lachlan.

In regularity of flow and volume of discharge, the Murrumbidgee ranks next in importance to the Murray. Like it, its head waters are in high mountainous country, its sources being near Kiandra, whence it receives seasonable accessions of volume from the melting snows. The Lachlan, a tributary of the Murrumbidgee, rises on the Cullarin Range, a short distance from the town of Gunning, on the main railway line between Melbourne and Sydney. After a course of about eighty miles, it is joined by the Abercrombie, which comes from the Blue Mountains. It then flows North-westerly, through hill country, to Forbes. Below Forbes the country is flat, the run off contributing nothing to the volume of the river, except in times of extreme rainfall. Lower down the river becomes deltaic, till, finally, below the town of Oxley, it has no clearly defined channel, and loses itself in reed beds. It is only in times of high flood that the waters of the Lachlan actually reach the Murrumbidgee.

The Darling.

Of the Darling, the portion within the boundaries of New South Wales—that is, from Mungundi to its junction with the Murray at Wentworth—has a length of about 1,350 miles. It is the longest affluent of the Murray, and has its source in the Great Dividing Range in Queensland, where it is known as the MacIntyre. About 120 miles from its source the MacIntyre is joined by the Dumaresq, which forms portion of the northern boundary of New South Wales, and a little lower down, by a New South Wales stream which also bears the name MacIntyre. From the latter junction the river is known as the Barwon, and flows south-westerly to Walgett and thence westerly to Bourke, receiving by the way a number of tributaries from each side. From Bourke downwards it is known as the Darling; its course being south-westerly to Menindie, thence south to its junction with the Murray at Wentworth. The general fall of the Darling is about three inches per mile; the velocity, even in flood time, being only about three miles per hour.

The Goulburn.

The most important of the Victorian tributaries of the Murray is the Goulburn, to which the description of the Upper Murray is in many respects applicable. It rises in the Dividing Range, near Wood's Point, where the summits reach an elevation of about 5,000 feet, about 1,500 square miles of the catchment being in mountainous country of considerable elevation. About 5,240 square miles of the total drainage area are effective, the balance being non-contributing. Many of the sub-tributaries of the Goulburn are, in themselves, so large as to deserve to be ranked as important rivers.

Other Victorian tributaries.

The other important tributaries of the Murray, on the Victorian side, are:—The Mitta, Kiewa, Ovens, Campaspe, and Loddon. The Avoca rarely, and the Wimmera never, though both within the Murray Basin, make any contribution to the main stream.

Losses by evaporation.

In the beds of the rivers of the Murray Basin, many of which are wide, and often carry a small depth of water, the losses from evaporation are high. A further loss, the amount of which cannot be even approximately estimated, is due to their being dry during lengthened periods of drought, and to large quantities of water being absorbed on the occurrence of rain before a flow is again set up. Recorded observations appear to indicate that the maximum loss from evaporation may be taken as about 60 inches per annum. Large as this appears, it is not, after all, a

very considerable item when compared with the average annual flow of the rivers in fairly good years. Its effect is, however, felt severely in dry years, the rate of evaporation no doubt increasing as the depth of water decreases.

Volumes of the River and tributaries.

The following tabular statement shows the total natural discharges for a typical high year, for a typical low year, and for a mean year, of the River and its contributing streams, as well as the losses from overflow, soakage, evaporation, and other causes between the points of affluence. It gives, in fact, the natural volumes at leading points for each species of typical year, with the sources whence these volumes are derived :—

TOTAL NATURAL DISCHARGES OF THE RIVER MURRAY AND ITS CONTRIBUTING STREAMS.

All figures represent millions of cubic feet.

FOR A TYPICAL HIGH YEAR (1894).

ALBURY	New South Wales—Upper Murray			119,000
	Victoria—Upper Murray	34,000		
	Mitta	88,000		
	Kiewa	29,000		
			151,000	
	Total			270,000
	Discharge at Albury			264,000
	Losses, Overflow, etc.			6,000
ECHUCA	New South Wales—Upper Murray	119,000		
	Major's Creek (estimated)	5,000		
			124,000	
	Victoria—As before	151,000		
	Ovens	83,000		
	Goulburn	178,000		
			412,000	
	Total			536,000
	Discharge at Echuca			403,000
	Losses, Overflow, etc.			133,000
	Losses, Overflow, etc., between Albury and Echuca			127,000
TOOLEYBUC	New South Wales—As before			124,000
	Victoria—As before	412,000		
	Campaspe	15,000		
	Loddon	19,000		
			446,000	
	Total			570,000
	Discharge at Tooleybuc			295,000
	Losses, Overflow, etc			275,000
	Losses, Overflow, etc. between Echuca and Tooleybuc			142,000
MILDURA	New South Wales—As before	124,000		
	Murrumbidgee, Wakool, etc., estimated	528,000		
			652,000	
	Victoria—As before			446,000
	Total			1,098,000
	Discharge at Mildura			763,000
	Losses, Overflow, etc.			335,000
	Losses, Overflow, etc., between Tooleybuc and Mildura			60,000

MORGAN	New South Wales—As before	652,000		
	Darling	358,000		
			1,010,000	
	Victoria—As before			446,000
	Total			1,456,000
	Discharge at Morgan			971,000
	Losses, Overflow, etc.			485,000
	Losses, Overflow, etc., between Mildura and Morgan			150,000

FOR A TYPICAL LOW YEAR (1896).

ALBURY	New South Wales—Upper Murray			40,000
	Victoria—Upper Murray	12,000		
	Mitta	32,000		
	Kiewa	13,000		
			57,000	
	Total			97,000
	Discharge at Albury			91,000
	Losses, Overflow, etc.			6,000
ECHUCA	New South Wales—Upper Murray	40,000		
	Major's Creek (estimated)	1,000		
			41,000	
	Victoria—As before	57,000		
	Ovens	29,000		
	Goulburn	59,000		
			145,000	
	Total			186,000
	Discharge at Echuca			157,000
	Losses, Overflow, etc.			29,000
	Losses, Overflow, etc., between Albury & Echuca			23,000
TOOLEYBUC	New South Wales—As before			41,000
	Victoria—As before	145,000		
	Campaspe	4,000		
	Loddon	4,000		
			153,000	
	Total			194,000
	Discharge at Tooleybuc			140,000
	Losses, Overflow, etc.			54,000
	Losses, Overflow, etc., between Echuca and Tooleybuc			25,000
MILDURA	New South Wales—As before	41,000		
	Murrumbidgee, Wakool, etc. (estimated)	108,000		
			149,000	
	Victoria—As before			153,000
	Total			302,000
	Discharge at Mildura			218,000
	Losses, Overflow, etc.			84,000
	Losses, Overflow, etc., between Tooleybuc and Mildura			30,000
MORGAN	New South Wales—As before	149,000		
	Darling	144,000		
			293,000	
	Victoria, as before			153,000
	Total			446,000
	Discharge at Morgan			318,000
	Losses, Overflow, etc.			128,000
	Losses, Overflow, etc. between Mildura and Morgan			44,000

FOR A MEAN YEAR (1900).

ALBURY ...	NEW SOUTH WALES—Upper Murray			70,000
	VICTORIA	Upper Murray	20,000	
		Mitta	51,000	
		Kiewa	21,000	
				92,000
	Total			162,000
	Discharge at Albury			144,000
	Losses, Overflow, etc.			18,000
ECHUCA ...	NEW SOUTH WALES	Upper Murray	70,000	
		Major's Creek (estimated) ...	3,000	
				73,000
	VICTORIA	As before	92,000	
		Ovens	48,000	
		Goulburn	100,000	
				240,000
	Total			313,000
	Discharge at Echuca			254,000
	Losses, Overflow, etc.			59,000
	Losses, Overflow, etc., between Albury and Echuca ...			41,000
TOOLEYBUC ...	NEW SOUTH WALES—As before			73,000
	VICTORIA ...	As before	240,000	
		Campaspe	7,000	
		Loddon	8,000	
				255,000
	Total			328,000
	Discharge at Tooleybuc			208,000
	Losses, Overflow, etc.			120,000
	Losses, Overflow, etc., between Echuca and Tooleybuc ...			61,000
MILDURA ...	NEW SOUTH WALES	As before	73,000	
		Murrumbidgee, Wakool, etc. (estimated)	203,000	
				276,000
	VICTORIA ...	As before		255,000
	Total			531,000
	Discharge at Mildura			371,000
	Losses, Overflow, etc.			160,000
	Losses, Overflow, etc., between Tooleybuc and Mildura			40,000
MORGAN ...	NEW SOUTH WALES	As before	276,000	
		Darling	148,000	
				424,000
	VICTORIA ...	As before		255,000
	Total			679,000
	Discharge at Morgan			455,000
	Losses, Overflow, etc.			224,000
	Losses, Overflow, etc., between Mildura and Morgan ...			64,000

From the above figures it will be seen that the overflows between Albury and Tooleybuc are considerable, reaching to 200,000 millions of cubic feet in a high, and 40,000 millions in a mean year. A considerable proportion of the spill over is, however, returned by way of the Wakool.

CAP. 3.—GAUGINGS OF THE RIVER AND TRIBUTARIES, AND NECESSITY FOR CONTINUOUS RECORDS OF GAUGINGS.

THE following extract is from a recent publication by the Victorian Water Supply Department. It shows very clearly the need that exists for accurate observation and complete records of the discharge of rivers, especially in a country like Australia, where the available supply of water is small compared with the demand. It indicates briefly also the method of gauging now generally recognised as applicable to Australian rivers.

General necessity for proper gaugings and records thereof.

"A knowledge of the quantity of water that may be relied on, to be obtained from any proposed source of supply, is an essential preliminary to the discussion of any scheme of works for its diversion and utilisation. . . . . The quantity of water needed for irrigation is very great, compared with that demanded for most other industrial purposes. Indeed, it may be said that the fundamental question here is, not—how much water is required for the treatment of a given area of land? but how much water is available? and to how much of the land commanded can it be profitably applied? The area of irrigable land will always be in excess of the capabilities of the volume of available water. Hence it is most important to ascertain with precision what that volume really is, so that works of diversion and distribution may not be constructed in excess of the water that can be supplied by their means. . . . . To know what quantity of water a river or stream will discharge, it is only necessary to know what it has discharged. By this it is not meant to be asserted that the average discharge of a river is the same for every year, that the maximum and minimum for one year are the same as the maximum and minimum for every other year, or that the mean discharge for any season may be relied on as the volume always discharged at that season. But it is tolerably certain that the discharge from day to day and from month to month, recorded over a long period of time, will fairly represent the daily and monthly discharges over any similar period of time. The difficulty is to say what, in the case of any particular river, is the duration of the period or cycle.

"Of the rainfall precipitated on the drainage area, or basin, of a river, a portion is re-absorbed by evaporation into the atmosphere; a portion descends through the permeable upper strata, to reappear in the form of springs, perhaps in the basin of some other river; or finds its way to the sea through beds of deep-seated drift, or fissures and channels in the rock; the balance is discharged through the river channel. The proportion of the total rainfall on any drainage area that passes down its natural drainage line is extremely variable. It is greatest from those areas whose inclinations are steep, and in which the surface rocks are of compact and hard texture, and but thinly covered with soil. And it is greatest in those seasons when the rains are heavy and the temperature low; and least when the temperature is mild, and the rain discharge distributed over comparatively long periods of time. Of the rain water that does find its way to the river channels, a portion only is carried by them to the sea; much of it . . . . passes through drifts, and possibly rock fissures, in the river beds, to travel to its ultimate destination by underground channels. In the rivers of the Murray system a considerable proportion is dissipated by flowing off into ana-branches, effluent creeks, lakes, and lagoons, and being there evaporated. To determine fully the hydrographic conditions of a river it is necessary, therefore, that gaugings be made at more than one point of its course; and it is very desirable—where gaugings are made with a view to specific diversion and utilisation—that they be as near to the intended point of off-take as possible.

"The volume of water passing any point on the course of a stream, at a particular date, is obviously equal to its sectional area multiplied by its mean velocity. The cross sectional area in feet, multiplied by the mean velocity throughout the section, in feet per minute, is equal to the discharge in cubic feet per minute. Thus, if the breadth be 20 feet, the average depth 3 feet, and the

mean velocity 70 feet per minute, the discharge will be 4,200 cubic feet per minute. To ascertain the sectional area is usually a comparatively simple matter; to obtain the mean velocity, with any degree of certainty, is very much more difficult. The determination of the mean velocity of water flowing in open channels has been the subject of much careful investigation, and has been treated by numerous writers of repute in the field of hydraulic science. . . . . It is needless to say, however, that their formulæ are purely empirical—dependent on experiment alone. . . . . None of them are based on a sufficiently wide range of observations, or on experiments of a sufficiently conclusive character, to entirely satisfy the mind of their applicability to all classes of conditions. Even if we had a formula, conclusive and reliable as applied to channels of definite and uniform cross section and grade, it by no means follows that it would be applicable to the channels of rivers. Rivers are not canals; and in general it may be said . . . . that it would be impossible to include the whole of the conditions of a sufficient length . . . . in a clear and intelligible statement, far less to embody them as terms in a solvable equation. It becomes necessary, therefore, to determine the velocities by actual measurement; no other course seems possible in the circumstances. Even this is more difficult than might be expected. A great deal has been written on the subject of the ratio subsisting between the maximum velocity of current in any cross section of a channel, and the mean velocity throughout that section. But the results of experiments, made with a view to its determination, are even less conclusive and reliable than those bearing on the subject of the relation of velocity to hydraulic radius and hydraulic grade. The older writers generally affirm the proposition that the maximum velocity is at the surface, and in the centre of the stream. More recent authorities place it in that position for shallow water, but beneath the surface for deep water. No definition of the very vague terms 'shallow' and 'deep' seems to have been attempted. . . . . In these circumstances, it is necessary that the velocity measurements . . . . be made throughout the section. Nothing less could furnish results on which reliance could be placed."

Methods of gauging.

Recommendations of N. S. Wales Commission of 1884.

The importance of the question of river-gauging was recognised by the New South Wales Royal Commission on the Conservation of Water (1884), as will be seen by the following, which was one of the Commission's recommendations:—

"The gauging of the rivers initiated by us should be continued in a systematic manner, so that the discharge of all rivers likely to be tapped for Water Supply purposes may be known for all readings of the gauges. This information is particularly necessary in the cases of the Murrumbidgee, the Darling, and the Murray."

Victorian gaugings.

The most complete records of river-gaugings in Australia are those of the Water Supply Department of Victoria. They embrace the continuous gauging of thirty-one rivers and streams at 60 points, and the intermittent gauging of others, where partial information was required for certain special purposes. The Murray has been gauged at Mildura and Echuca since 1865, at Albury since 1877, and at Jingellic since 1890. Gaugings of the Mitta and Kiewa have been continuous since 1885, of the Ovens, King, and Broken Rivers since 1886, of the Goulburn and Loddon since 1881, the Campaspe since 1885, the Avoca since 1889, and the Wimmera since 1884. The Murray in South Australia has been gauged at Morgan since 1884, by the Government officers of that State, at depths varying from summer level up to 25 feet. Gaugings of the Murray, Murrumbidgee, and Darling have also been made by the New South Wales officers, but these records are not sufficiently complete for publication. Some of the evidence tendered by the officers of the latter State is, however, of a character to emphasise the need for reliable and complete records. Mr. McKinney, in his evidence, stated that during periods of low river the greater part of the discharge of the Murray at Jingellic comes from New South Wales, whilst at Albury, after it has received the waters of the Victorian tributaries Mitta and Kiewa, the proportions are nearly equal. Mr. Smail, who has investigated the discharges of the Upper Murray, supports this evidence, accounting for the fact by the circumstance that by far the greater area of snow land is within the State of New South Wales. Within the past few days, there has been a consultation and

N. S. Wales evidence on the subject.

examination of records by the officers charged with the work of river gauging, in New South Wales and Victoria respectively; with the object of reaching definite conclusions as to the relative volumes supplied to the Upper Murray from each of these States. This was called for by the considerable discrepancies between the evidence tendered by the two sets of officers. The result of the consultation is a common understanding and agreement as to the figures to be adopted. They are embodied in the tabular statement of discharges given in Cap 2—*ante*.

Variable volume of rivers.

In some river channels the total volume that flows down in certain winters is many times greater than in other winters. The discharge of the Wimmera at Glenorchy, for example, is found to have been in one year nearly twelve times what it was in another year. The Goulburn also has discharged in one year nearly four times as much as in another year, while the Murrumbidgee in one year discharged seven times as much as it did in another, and the Darling ten times as much in one year as in another. All this points to the necessity for storing largely of the winter flow to provide for dry years, and also to the need of accurate and complete records. To this end, the officers entrusted with the measurements and observations should be expert surveyors and trained to the work.

Necessity for storage of river waters.

Appliances used in the different States.

The method of gauging generally adopted by the New South Wales engineers has been that known as the "rod and float system." In Victoria and South Australia the more elaborate plan of combining cross sections with velocities obtained by current meter has been resorted to.

Need for uniformity of methods and of recording.

The value of stream gauging increases with the length of time over which it is extended; and it is important that, here in Australia, there should be some uniformity of system both of observing and recording. This can only be attained by entrusting the work to one authority, or by proper concert among the States. A complete compilation of results of the gaugings of all the important streams that contribute to the flow of the Murray should be published periodically, and made readily available to the section of the public specially interested.

Cap. 4.—Water Supply for Ordinary Stock and Domestic Use, &c., in Rural Districts; and for Irrigation —Experience in the Three States.

Rural water supply in Victoria.

In Victoria much has been done, both by the Government and by local bodies, either created for the express purpose or invested with special powers, in the way of carrying out works for the supply of rural districts, apart altogether from those on a scale necessary to provide the large volumes of water essential for irrigation. One of the most extensive of these schemes has, for its primary purpose, the promotion and support of the gold mining industry. Others provide water for drinking, and for domestic and sanitary use, for the rural population, as well as water for the cattle of the farmer and the grazier, during the dry season of the year and throughout years of drought. A very large proportion of the Northern districts of Victoria are served by such schemes. Others are in process of being carried out, or are under consideration by the Government with a view to being carried out. Several, both of those already in existence and of those in contemplation, among the latter the proposed service for the Mallee, involve the expenditure of very large sums of public money. From the essential point of view of service, though by no means uniformly successful, they have in general conferred immense benefits on the settlers. From the financial point of view they have been less so; chiefly, however, because Governments and Parliament have been forbearing and generous, rather than because those benefited have been unable to pay the rates demanded of them.

Rural supply in New South Wales and S. Australia.

In New South Wales, and to a less extent in South Australia, similar systems of works have been carried out in the Murray basin, with similar objects. In both of these States, however, the construction and administration of rural water supplies have been solely in the hands of the Government. The experience, from the point of view of service, has been similar to that of Victoria. Of the financial experience nothing can be said, because, for the most part, no direct financial return has been looked for, the schemes being carried into effect on the grounds of public advantage merely. But, even in New South Wales, there are no such extensive reticulations of channels, and no such provision of local storages, as are to be found in many parts of Victoria, though there is much agitation on the part of the settlers, and much pressure exerted on the State Government to have them carried out.

Irrigation in Victoria.

As there is more irrigation carried on in Victoria than in any other of the Australian States, it is to her likewise that those who wish to study irrigation here will naturally turn. There they will find much to interest, and something to criticise. The part played by the engineer is of course highly important; but even with the most skilful location, grading, and construction of works, nothing is more certain than that every individual cultivator, who uses water, has to learn the art; either through intelligent study of the experience of others, and careful observations and experiments of his own; or by the more painful, and in some cases ruinous, teaching of failure arising from his want of skill. The records of irrigation works in many countries seem strangely alike in one particular. Nearly all cultivators, to whom the practice is new, fall into the mistake of thinking that, because water is a good thing for the land, they can never do wrong in applying it. But the cultivator needs to be educated in the use of water:—Because he cannot otherwise obtain the best results, and may find failure where a very high degree of success is attainable; and, because, in a country like this, where the extent of irrigable land is far in excess of the possible supply of water, it is necessary in the interests of the community that the highest possible duty should be obtained from that used. This can never be the case while there is ignorance as to the best times of using and of the volumes to be applied.

Waste of water by irrigators.

In order to the most economical and effective use of water, it is obviously necessary that the users should know how much they are using; otherwise they cannot make intelligent deductions from their own experiences. In this respect Victorian practice is singularly deficient. Speaking generally, the Trust officials, and the individual users of water, have the vaguest notions of the quantities used. In some Trusts there are no steps whatever taken to measure the water received either by the Trust as a whole or by the individual farmers. The consequence is great waste, and an unobservant habit of cultivation. The successful cultivation of land is a business demanding both brains and energy. Irrigation is an added art which the cultivator must master before he can reckon on success; the experience of Victoria is on the whole, however, encouraging.

Financial results of the Trust System.

Certain main works, such as large dams and main supply channels, are constructed by the Water Supply Department, and are called "national works." Local government being much more highly developed than in New South Wales, the construction and management of minor works of distribution are placed in the hands of "trusts." Doubtless this system has many advantages, and is not likely to be changed. It has, however, certain disadvantages, and does not always lead to the greatest efficiency, nor perhaps to economy and consistency of policy: It has indeed the same advantages and the same defects that attend municipal government generally. Some are "irrigation trusts," and some, generally where the supply of water is insufficient for irrigation, are "waterworks trusts;" that is, they supply water only for domestic and stock use. The financial operations of the irrigation Trusts have not, so far, been attended by a very high degree of success. In no case have they fully met their engagements to the Government, so that in 1899 an Act was passed, under which large sums of principal and interest were writtten off. Out of a total indebtedness of about £1,300,000 about £1,000,000 was cancelled. The sums charged against the Trusts did not include the cost of the Goulburn and Laanecoorie weirs and Kow Swamp works, and it is the opinion of some experienced

officials that it is not at all likely the Trusts can ever carry more than the cost of the distributing channels, and that, if they pay interest and sinking fund upon these, no more can reasonably be expected of them.

Irrigation in the Goulburn Valley.

Apart from Mildura, which will be separately referred to, the most important irrigation works in Victoria are in the wide and fertile Goulburn Valley. A considerable part of this district is irrigated from a system of channels connected with the weir near Murchison; the Rodney Trust, comprising 277,545 acres, being one of the most prosperous agricultural areas within the Murray Basin. Evidence shows that the supply of water has practically doubled the price of land in the district. Within the Trust territory there is one large estate, containing about 24,000 acres. The remainder is occupied in comparatively small holdings; and there are instances where, by intense culture, a good living is obtained from areas as small as 25 acres. Such areas are generally devoted to fruit growing; peaches, pears, apples, Zante currants, and other fruits, being successfully grown. Wine grapes thrive in some parts of the Valley, table grapes in others. Wheat, oats, and lucerne are also profitably grown, while the irrigation of paddocks for fattening, enables some of the landowners to keep up an almost continuous output of fat stock. One witness, himself one of the most experienced irrigators in the Goulburn Valley, a fattener of stock, and who for that purpose irrigates chiefly lucerne, but has also successfully grown mangolds, amber cane, &c., says that, "upon the whole, the yield is just about doubled by irrigating." "Last year," he says, "I paid £14 for rates and £22 water charges, or about 1s. 6d. per acre for irrigation." But, though Rodney is cited as, on the whole, the most successful irrigation Trust in Victoria, there are others that afford ample proof of the benefits of irrigation. Wherever water has been made available it has improved land values, promoted denser settlement, and given a degree of certainty in the production of crops not previously possible.

Economy in the use of water.

Experience in other countries has everywhere in modern times led irrigators to economy in the use of water, so that the supply has year by year become effective for a larger area than at first served. Even on land that, to the eye, appears almost perfectly adapted for the application of water there is often a good deal of grading and other preparation necessary to secure a beneficial result. The rougher land must be divided into small lots, by temporary banks thrown up with the plough. When water is turned upon uneven land, the lower portions receive too much before the higher are even covered; a matter about which some agriculturists are very careless, with the result that, not only is water wasted, but sometimes the land is injured instead of being benefited. Mr. Hector, engineer to the Rodney Trust, said as to the grading of the land in his Trust district:—The Trust "try to encourage it, but it is difficult to get owners to do it; during the last few years, however, there has been a great improvement in this respect, people are beginning to see the necessity for grading. . . Those who have tried grading have found it of great benefit." Not only is less water used when land is properly graded, but Mr. Hector points out another great advantage, namely, the irrigation is carried through in less time. Some farmers, too, turn the water first on to the lowest parts of their land instead of the highest; with such carelessness as to suggest that something in the way of direct instruction might with profit be given systematically by the State Department of Agriculture. The total area at present under irrigated culture in Victoria is, as nearly as can be ascertained, 276,000 acres.

Irrigation in New South Wales.

Hay Irrigation Trust.

So far there has been little development of irrigation in New South Wales; although, at Hay and at Wentworth, irrigation schemes were started some years ago, under the authority of Acts of Parliament. Some of the land at Hay is not considered suitable for irrigation, the site, as a whole, not being so good as that at Mildura. But perhaps the chief reason the settlement has not been quite successful is that those who first took up the land lacked experience. Regarding this, one witness said:—"I consider the soil is adapted for irrigation, and I have confidence in the scheme if we only had practical men on the area, men who understood fruit culture and the growing of crops by applying water to the land. . . *We have found that land and water in themselves are not sufficient*, that there is a proper method of putting water on, and that method has to be learned by experience. A good

Wentworth Irrigation Trust.

many people who put in crops regardless of method found that they got no result simply from inexperience." The Wentworth Irrigation Trust is also largely a failure, only 130 acres being under cultivation. The land comprised in this Trust area is excessively saline and otherwise unsuitable. One witness, however, says:—"I think, not that the land would not pay well, but a prejudice has stopped settlement. There is a class of land at Mildura comparatively shallow, and the settlers only get water there at very long intervals; consequently, that class of ground dries up and the crops suffer. People think the land here is of the same class, but they forget that they can have water here every fortnight; that is, the land here is classed as the Mildura shallow land, and people do not take other circumstances into consideration."

Private irrigation schemes.

Hon. S. McCaughey's irrigation.

The most successful irrigation in New South Wales has been carried on by individual landowners, prominent among whom is the Hon. S. McCaughey, M.L.C. Mr. McCaughey has about 60 miles of channels on his North Yanko property, chiefly supplied by pumping. Last year he irrigated about 400 acres of crop; and, if gravitation water were available, he would irrigate 800 or 900 acres for sorghum and lucerne. "Sorghum is the best for summer fodder. In a year like this you get quicker results from Sorghum than anything else. . . . Lucerne would be the best to grow on a large scale; it does not require the annual expense of cultivation." Mr. McCaughey read a statement descriptive of his own experiences, from which the following is an extract:—

"The proposed Murrumbidgee weir below the Yanko junction would be of immense value to the inhabitants of the towns, and the owners of lands on the Yanko, Colombo, Billabong, and Forest Creeks. The estimated storage capacity of the proposed reservoir at Yass is about 18,000,000,000 cubic feet. This quantity of water would irrigate 275,482 acres to a depth of 18 inches, which would be sufficient to grow two crops of sorghum or four of lucerne. The former would carry fifty sheep to the acre for four months; the latter fifteen to the acre for six months; or a total of 13,774,100 sheep if fed on sorghum, and of 4,132,230 sheep if grazed on lucerne. . . . I estimate that it costs the owners of stock 6d. per head per month for renting grass, including other expenses, to save their sheep; this would be equal to 2s. per head on sheep fed on sorghum for four months, or £1,377,410, which is more than double the estimated cost of the proposed Murrumbidgee canal and Yass storage reservoir, and if the same acreage were in lucerne (275,482 acres), estimated to carry fifteen sheep to the acre for six months at 3s. per head, it would amount to the sum of £619,834—about the estimated cost of the proposed Murrumbidgee weir, canal, and Yass reservoir. These figures do not represent one-half the benefit annually that would be derived from saving the stock in such disastrous droughts as those experienced of late years; as, under present conditions, it will take several years to breed up to the full carrying capacity of the country; whereas, with the water supply mentioned, sufficient stock could always be available to take advantage of good seasons when they come. There is a deterioration in stock during seasons of drought that could be avoided if the higher method of stock farming were adopted by growing food as proposed. . . .

"Two-sevenths of the waste flow"—of the Murrumbidgee—"would irrigate 2,203,856 acres of wheat, oats, or barley to a depth of 4½ inches; which would, judging from my experience, give a return of 40 bushels of wheat or 60 bushels of oats to the acre, worth, say, 2s. for the former, and 1s. 4d. for the latter, or a gross return of £8,815,424 in either instance. The water would make a certainty of this return, whereas for the last five years the crops from Narrandera to Balranald have been almost total failures.

"The estimate of 50 sheep to the acre, fed on sorghum for the four Summer months, is only half the stock carried per acre on a small paddock on North Yanko last year. The average cost of growing sorghum would be about £1 per acre per annum, and of lucerne considerably less, as the sowing of the latter would only be required once in five years, whilst sorghum would require to be sown annually. The amount of labour required to cultivate and water the areas referred to would bring unprecedented prosperity to the towns in the districts benefited by this scheme, as well as the whole community. I know of no soil better suited for the

growth of sorghum than the immense polygonum areas below Hay. If supplied by gravitation with, say, 18 inches of water annually, it would increase its value tenfold. The estimate of 40 bushels of wheat and 60 bushels of oats to the acre is considerably less than some of the New Zealand yields; for there we often hear of 60 bushels of wheat and up to 100 bushels of oats to the acre, and, I believe, with irrigation equally good yields would be obtained here."

Mr. R. O. Blackwood's evidence.

Mr. R. O. Blackwood, of Hartwood Station, another leading pastoralist, thus emphasises some of the losses from drought that might be minimised by the provision of water for irrigation and for stock:—

"One feature connected with these losses must not, however, be overlooked, as I imagine the vast importance of it to the entire Commonwealth has not yet been fully realised. I refer to the loss, either by deaths or owing to lack of increase, there has been amongst the old-established stud flocks in the Deniliquin district, also to the loss there has been amongst what are known as the flock-breeding ewes in the same district. For the last fifty years or more these sheep have been most carefully handled, and . . . a higher class of sheep is now to be found in the district named than in any other part of the continent. This particular area is called upon to supply rams and high-class flock ewes to almost every part of the country. It stands to reason, therefore, that any serious diminution in the numbers of these sheep must not only be a very serious loss to the owners of them, but to all those also who depend upon them for the improvement of their own flocks; which, in the absence of the importation of high-class blood, must either advance but slowly by the process of selection, or else possibly go backwards. Such a state of things must be very prejudicial to the prosperity of a great number of those engaged in sheep raising, and the loss to the States owing to the non-improvement of the flocks . . . can only be looked upon as a national disaster."

"The fodder bill paid by Riverina to Victoria is a very material loss to New South Wales. Up to July last the Victorian Railways had carried fodder for Riverina to the value of about half a million pounds, and thousands of pounds' worth also must have entered this State without passing over the Victorian Railways. With irrigation facilities all this might readily have been produced on the North side of the Murray."

"A comprehensive scheme would enable a supply of water to be placed in every paddock, and so prevent losses of stock during droughts of moderate severity. . . To illustrate the vast saving there would be by growing our own fodder under a scheme of irrigation instead of purchasing it, I have prepared a short statement, by which it will be seen that, whereas it would cost at any place (say) 35 miles distant from Deniliquin, with fodder purchased at current rates, £717 10s. (or 7½d. per head of stock) per week to feed 22,400 sheep on only one pound of hay per day per head, it would only cost £73 10s. (or considerably under 1d. per head of stock) per week to feed the same number of sheep on two pounds of hay per day per head, if produced at home by irrigation."

Irrigation in S. Australia.

Apart from the Renmark Irrigation Colony and the Village Settlements along the banks of the Murray in South Australia, irrigation has not been practised to any great extent in that State. A few small pumping plants exist on the banks of the Torrens and the Murray. Mr. H. W. Morphett, of Wood's Point, stated that, in one year, he obtained 150 tons of onions from five acres of irrigated land on the Murray River, the net profit from the crop being no less than £600. The aridity of the soil and the low rainfall being such as to render the artificial application of water a matter of prime importance in South Australia, it is a little remarkable that irrigation has not been more generally practised. The one great illustration, in this State, of its advantages is to be seen at Renmark; where, in the midst of a typically dry Australian country, practically rainless in its natural condition, there exists a thriving settlement, carrying a population of about 1,000. The experience of the Village Settlements has, on the whole, been unfortunate; but this is explained by Mr. McIntosh, Inspector of Settlements in South Australia, as being due to the fact that the settlers were almost without practical experience.

S.A. Village Settlements.

Irrigable land in South Australia.

Mr. Jones, Secretary of the Public Works Department, states that there are 450 square miles of river flats suitable for the growth, under irrigation, of grass, cereals, onions, potatoes, etc., though not as a rule suitable for fruit culture, as the soil is chiefly composed of river mud. The remainder of the irrigable land along the banks of the Murray, in South Australia, he gives as 1,000,000 acres, 250,000 acres of which he considers could be utilised under existing conditions. The ground is well adapted for the cultivation of fruit, being good sandy soil of great depth, with a varying subsoil, clayey in some places, calcareous in others. The whole of this land is at such a level as to involve the use of pumping machinery, but the experience of Mildura and Renmark shows that this condition is not necessarily prohibitive.

Financial prospects of irrigation.

The development of a young country, by settling suitable people on the soil, and by aiding those who have undertaken the work of pioneering, is of prime importance to its Government. It is clear that, where the State has the predominant financial interest in irrigation works, the conditions are entirely different from those in countries where concessions are granted for the exploiting of water rights. Except in some rare instances, it is manifest that, in the latter, returns must be direct. State Governments, however, can afford to take a broader view, and to weigh the indirect as well as the direct benefits. Colonel Home, whose large experience in India entitles his opinion to respect, says:—"In connection with the financial prospects of irrigation projects, it may be mentioned that the development of irrigation is comparatively a slow process, and that it is not reasonable to expect that a canal should pay as soon as it is completed. This is fully recognised in India, where a canal is classed as remunerative, and carried out with borrowed money, if the forecast statements show that it will pay maintenance and interest charges within ten years after completion, and at the end of twenty years will pay the prescribed rate of interest on the sum at charge of the project, which is the capital cost, plus the balance, if any, of maintenance and interest charges over receipts from revenue."

Policy in regard to Trusts in Victoria.

In Victoria, the policy of the earlier legislation was to charge Trusts not only the cost of distributaries but also of the diversion and head works. But, if the experience of that State during the last ten years can be accepted as a guide, it would seem that in general such bodies are not likely, except under compulsion, to defray the maintenance and interest of the whole cost. The utmost that can be expected from their voluntary efforts is payment of interest and sinking fund on the cost of distributing channels and minor works. The financial relief recently given to Irrigation and Waterworks Trusts in Victoria, by Parliament, indicates that no more than this is to be looked for.

Trust finance.

It is questionable whether the method of trust finance is the best or only practicable one. It is usual to charge a rate on the annual value of land within the irrigated area of from 9d to 2s. 6d. in the £. The remainder of the revenue is from sales of water, the system universally followed being that of supplying on orders received from day to day. Anything like a reliable estimate of revenue is thus impossible, while actual receipts are subject to the greatest fluctuations. So long as water is believed to be available at twenty-four hours' notice, farmers will naturally delay their orders until the very last moment, in the hope that rain may fall. If charges were based on the system prevailing in cities, where every property owner within a fixed distance of the supply pays a rate charged on the assesssment, it would be possible to ascertain with a fair degree of exactness the revenue from any proposed work, whilst the use of water would also be greatly stimulated. Mr. George Gordon, President of the Eastern Goulburn Irrigation League, says, in advocacy of the extension of a canal for irrigation on the Eastern side of the Goulburn:—"My reasons for advocating irrigation are:—I came here some eleven years ago, and, after I had been out here for two or three years, I found that the people in Rodney" (probably the most successful Irrigation Trust in Victoria) "seemed to be making more money and doing better off the land than we were doing. To see what was the cause of this, I went over to Rodney, to get acquainted with the irrigated areas, and to see how it was they were turning off more fat stock and doing so much better than we were doing on this side. After spending a good deal

Trust management.

of time amongst the people of that part, I found that their better circumstances were due to the benefit they were deriving from the water. On this side of the river the land is practically lying idle from the middle of October until well on in April, generally up to the end of April. It is consequently lying idle six months in the year, and therefore giving us no return. In Rodney, where they put down the lucerne and irrigate it, they can make more money off 300 acres than we can here off 1,000 acres during those six months; so, that we are considerably handicapped in the way of production by not having irrigation." Questioned as to how it is the Rodney people do not appear to fully appreciate the advantages of irrigation, as is evidenced by the fact that only about 37,000 acres, or about 13 per cent. of the Trust area, is irrigated, Mr. Gordon replied, "I cannot understand how that is so, but I base my opinion on the 'figures' that a number of the men who are using the water are making. As to the people who are not using the water, their land is lying idle like ours."

Tragowel Plains Irrigation Trust.

The Tragowel Plains Trust, which derives its supply from the Loddon, is in times of drought without sufficient water to provide more than stock and domestic wants, so that irrigation cannot then be practised; while the Macorna North Trust, fed from the Murray, has generally sufficient water to provide for irrigation. As instancing the resulting gain to the latter Trust, Mr. Donald McIvor says:—"It has been impossible to carry on dairying profitably on the Tragowel Plains Trust since 1894, and cropping has been a comparative failure also; but in the Macorna North Trust you can nearly always depend on getting some returns, say, 2½ to 3 bags of wheat and from 7 to 8 bags of oats per acre. Then, in regard to dairying, I may say that the yield from my sixty cows in the Tragowel Plains dropped to 50 gallons per day; but when I shifted them to the Macorna North Trust, it rose in three days to 130 gallons, and in a fortnight to 160 gallons." Important evidence in this respect was also given by Mr. R. Richardson, of Kerang, who says:—"Before the water was brought along the Macorna Channel, I was obliged to mortgage my property. As soon as water was available, I applied it to the land, and gradually removed the mortgage, and have made a comfortable living since. Failing the water, I could not have remained in the district. I might state that I am a director of the Pyramid Butter Factory, and about two months ago the united cheque of twenty suppliers of cream from the south side of the Macorna Channel, where they have a very indifferent supply, only amounted to £18; whereas four suppliers from the North side, where they have an ample supply, drew from that factory £32. Owing to the want of water, my own revenue has gone down from £9 or £10 per week to about £2 10s."

Lessons of Victorian experience.

The Victorian experience is sufficient to show that irrigation works should not be commenced without due consideration of the financial prospects. The indirect benefit to those districts favourably situated for irrigation, by settling a large population on the land, may perhaps be considered to go far towards reimbursing the State, even where, as in Victoria, a large proportion has been written off the cost. At the same time, what has happened there may be taken as showing that other methods of finance, at least, demand a trial, not merely for ensuring a certainty of return, but also as an indirect means of inducing a more extensive and more profitable use of water when provided.

The extent of irrigable land in the Murray Basin, that is land commandable by water, and of character and quality suitable for wet culture, within the States of New South Wales, Victoria, and South Australia, is shown in the following tabular statement. It is not to be understood that the whole of this can be irrigated in any one year. It cannot be so; the available volume of water is wholly insufficient, even in years of high river discharge. It is the land that might be profitably irrigated, if water were available:—

IRRIGABLE AREAS.

			Acres.	
NEW SOUTH WALES—				
Darling and tributaries	...	Gravitation	22,587,200	
Lachlan	...	... ,,	9,539,200	
Murrumbidgee ...	...	... ,,	6,995,840	
Murray	...	... ,,	4,620,160	
				43,542,400
VICTORIA—				
Murray and tributaries	...	Gravitation	4,000,000	
				4,000,000
SOUTH AUSTRALIA—				
Murray		Pumping to 110 feet level	1,000,000	
,, ...		Pumping to 160 feet level	1,500,000	
				2,500,000
		Total Area in the three States		50,042,400

CAP. 5.—SPECIAL IRRIGATION SETTLEMENTS IN VICTORIA AND SOUTH AUSTRALIA.

Mildura.

THE Mildura Irrigation Colony is on the left bank of the Murray, about sixteen miles by direct route above the junction of the Darling. It was founded in 1887 under an agreement between the Government of Victoria and the Messrs. Chaffey Brothers, conveying certain rights of land purchase, with authority to divert water from the river. The agreement was subsequently embodied in a special Act of Parliament, and ratified by the Legislature. Messrs. Chaffey Brothers were authorised to divert from the Murray volumes varying with the season of the year, and limited in respect of the number of acres under irrigated culture. In the month of March, for instance, when the river is generally at its lowest, one cubic foot per minute was allowed for each twelve acres under cultivation; while, during September, October, and November, when the volume is usually greatest, it was increased to one cubic foot per minute for every four acres. The total area of the concession is 250,000 acres, the land in its virgin state being, practically, valueless red sandy loam, covered with mallee and blue bush, with an average rainfall of less than eleven inches. It has been subdivided into agricultural blocks of ten acres, suburban lots of two and a half, and township lots of one-eighth acre.

The Chaffey Concessions.

Failure of the Messrs. Chaffey.

In the early history of the settlement, considerable dissatisfaction arose from the inability of the Messrs. Chaffey to fulfil the covenants into which they had entered; till at length, in consequence of their financial difficulties, the Government took over the works, and constituted a trust, with jurisdiction over 45,070 acres of the original concession, whereof 15,127 were sold land. The settlers, profiting by the mistakes of the past, are now utilising the soil to advantage and obtaining excellent results. Water is pumped from the Murray into channels at various levels, commanding an irrigable area of about 35,000 acres, whereof between 9,000 and 10,000 are under intense culture. The crops raised include raisins, sultanas, currants, apricots, peaches, and citrus fruits, representing an annual value of about £114,000. A considerable loss of water, from soakage, occurred from the 169 miles of channels when first constructed. This has now been in great part remedied by lining at an expenditure of £29,000. The Engineer of the Trust says that a further expenditure will be needed to place the whole in good condition. Mildura at present contains a population of about 4,000, and is in a fairly prosperous condition. The railway from Melbourne will be completed to the town by the end of March, 1903, and will give command of the markets, not only of the metropolis, but of several large provincial towns. The capital value of the improved lands is given as £500,000; which fact, seeing that they were practically valueless without irrigation, affords an excellent object lesson of what can be accomplished by skilful cultivation and judicious application of water. Mildura and Renmark are notable as the only settlements in Australia which, as a consequence of the concentration rendered practicable by irrigation, can afford the advantages of town life.

Constitution of Trust.

Difficulty from loss of water.

Present prosperity of settlement.

Other irrigation settlements on like lines.

Apart from these settlements, which depend wholly upon intense culture, there are some among the irrigated districts of the Goulburn Valley, such, for instance, as Ardmona, where pleasant homes set in attractive gardens afford proof of the prosperity that attends skilful cultivation, where water within reach renders the cultivators independent of the uncertain rainfall. The possibilities of extension of such settlements in Australia are not so great as in the United States. The conditions of water supply on the one hand, and of available markets on the other, are handicaps against us. Yet even these—the latter, at all events—are not as great as might be supposed. For, if we are not quite so well placed as to the European market, our situation with regard to the East is favourable, and the possibilities of development of trade in that direction are great. And, again, distance from a market, where there is ocean carriage, constitutes no serious disadvantage, except in the case of perishable products.

Possibilities of extension.

Renmark.

Much that has been said about Mildura applies equally to Renmark. Both colonies are on the red soil country of the Lower Murray, the conditions being similar in the two cases. The area of the Renmark concession is 250,000 acres; extending from the common boundary of New South Wales and South Australia, down the Murray, to the north bank of which it has a frontage of about 40 miles. In 1887 a beginning was made of the irrigation works, and the town of Renmark laid out, about 70 miles from Morgan, which is connected with Adelaide by rail. The license granted to the Messrs. Chaffey by the South Australian Government is identical with that granted by the Victorian Government in the case of Mildura. Here, also, owing to the failure of the promoters, the works were taken over, and a Trust formed, with an area of about 12,000 acres. The works are similar in character to those at Mildura.

Produce of Renmark.

The value of the citrus and dried fruits, and olive oil, shows a steady yearly increase. The export in 1901 was £29,474, being an increase of £8,542 over the previous year. As an evidence of the value of irrigation it may be pointed out that Chowilla Station, adjoining Renmark, and containing 250,000 acres, is, owing to the drought, carrying only 5,000 sheep, whereas Renmark, with 3,000 acres under irrigated culture, maintains a prosperous population of 1,000 persons, living under agreeable social conditions. "Chowilla" is by no means destitute of country which under irrigation might be as productive as Renmark. The contrast simply emphasises the revolution wrought by irrigation.

Water used at Mildura and Renmark.

Neither at Mildura nor at Renmark does the Trust limit its constituents to the volumes of water conceded to the original licensees. The depth actually applied to the orchard lands of both settlements is 28 inches per annum, representing a volume so great as to inspire apprehensions of serious waste. If this volume really is required for fruit culture, in the climate and soil of the Murray Valley, no time should be lost in amending the grants to the Trusts; while the fact should be borne in mind in any future concessions proposed under like circumstances.

Lessons of Mildura and Renmark.

Notwithstanding the criticisms to which untoward circumstances have exposed them, the Mildura and Renmark settlements show the possibilities of the lands in the River Valley, under a proper system of culture, in the production of nutritious, palatable, and wholesome food, in the support of a large industrial population, and in contributing to the trade and commerce of the States. Their experiences, however, have already begun to prove that the area of land suitable for the higher class of intense culture is limited by conditions not at first apparent. It is also showing that continuously cropping even the most suitable lands with any succession of the same kinds of crop—fruit, for example—must lead to the impoverishment of the soil, and to its reduction to an unfavourable condition of tilth. It is as necessary in fruit growing as in any other kind of agriculture that there should be a rotation of crops. This is pointed out by Dr. Jules Guyot in his well-known work on the cultivation of the vine, and is very apparent in the experiences of the Mildura and Renmark settlers.

South Australian Village Settlements.

In 1894 the Government of South Australia set apart several areas on the banks of the Murray for the establishment of Village Settlements. Several methods

of providing for the unemployed had been tried, with little result. The establishment of these settlements was regarded as an experiment; in the first place, to supply healthy employment, in the second to utilise, by irrigation, the waste lands on the river banks. They were started on communistic principles; but, owing to the lack of practical knowledge, and disagreements among the settlers, they have been by no means successful. Some have been entirely abandoned, while, in others, the original plan has been departed from. One was worked on the lines of the "New Australia" movement; this also proved a failure, and was closed in 1899. It is evident that here human nature is among the elements to be reckoned with, no less than quality of soil, suitable climate, and available water supply; and human nature as stubbornly resists amelioration as does the flintiest soil or the most arid climate.

Murtho. The Murtho Settlement is three miles above the Renmark pumping station, on the opposite bank of the river. It was originally formed by the settlers contributing £60 each, and being assisted by the South Australian Government with a loan of 50 per cent. on the value of all improvements. It was closed in 1894, and is now let on lease. The area is 2,998 acres, 250 of which are under cultivation.

Lyrup. Lyrup, about 24 miles lower down on the same side of the river, originally embraced 14,049 acres, 7,000 of which have been resumed. Of the remaining area, 500 acres are under cultivation, supporting a population of 105. This is the most successful of the river Village Settlements, a fact largely attributable to its proximity to Renmark, of whose experience the settlers took advantage.

Pyap. About 40 miles further down, is Pyap, with an area of 9,132 acres and a population of 69. Two hundred and ten acres are under cultivation, served by a pumping plant delivering 32,000 gallons per hour.

New residence. About four miles below Pyap, is the settlement of "New Residence." Meeting with little success, it has been abandoned, and is now the subject of a lease.

Moorook, Kingston, and Holder. Moorook, about eight miles below New Residence, embraces 3,200 acres, 160 of which are under cultivation; the population is 52. Kingston contains 3,901 acres, of which 180 are irrigated; the population is 56. The area of the Holder Settlement is 7,560 acres, 220 of which are irrigated; the population is 74.

Waikerie. Waikerie was originally established on communistic principles. There are 3,300 acres of land in the settlement, 290 being under irrigation. It contains a population of 64.

Ramco. The area of the Ramco settlement is 3,680 acres, about 150 of which are under irrigation and watered by a pumping plant capable of lifting 36,000 gallons per hour. The population numbers 38.

Gillen and New Era. Gillen and New Era are the last two village settlements on the river; Gillen being twelve miles below Ramco, and New Era eighteen miles further, or five miles above Morgan. Both, after an unsuccessful struggle of two years, were abandoned. They are now let on lease.

CAP. 6.—IRRIGATION IN OTHER COUNTRIES. ITS LESSONS FOR AUSTRALIA.

Diversity of conditions. A BRIEF glance at what has been done in other countries, in the application of water to the soil to produce food for the people, will be useful; even where the conditions differ widely from ours, there may still be much to learn. In Egypt, the oldest field of irrigation in the world, and where without its aid life would be impossible, the circumstances of the cultivator are as diverse from those aspired to on the part of our settlers as it is possible to conceive. In Egypt, the entire

agriculture of the country—practically the entire productive labor of the country—is performed by some two and a half millions of felaheen. This handful of people, *in fact, sunk in a condition* bordering on slavery, carries on its shoulders the seven or eight millions that constitute the population of the country. In the United States of America, on the other hand, in the arid western regions especially, irrigation has brought profitable employment, provided abundance of nutritious food, comfort, and luxury for the masses; while it has also found a profitable field for the investment of capital and for the operations of the merchant and financier. There is much to be learned from each of these cases, as well as from others where the circumstances do not reach either of the extremes; perhaps no less from the country whose conditions differ widely from our own than from that in which they are more nearly identical.

Irrigation in Egypt. Few areas on the world's surface support so dense a population as the narrow strip of land lying along the banks of the Nile. On both sides of that river, for hundreds of miles above Cairo, the fringe of fertility is hemmed in by the desert, which in many places extends down to the river itself. For many centuries it has supported a total population of nearly five persons to each acre of cultivation; a density which, if it could be extended to countries like Australia, where there are millions of acres of irrigable land, would bring about a social revolution of unimaginable magnitude. It is obvious that the conditions of perennial productiveness must exist in Egypt in phenomenal perfection. What, then, are these conditions? Virtually it is a rainless region; it is one which, with almost, though not absolutely quite, unbroken regularity, is inundated year after year by the waters of the Nile; finally, the river brings down at each annual flood a rich charge of fertilising silt, which, by the basin system adopted by the cultivators retaining the water upon each field for some weeks, ensures the deposit of a thin layer of soil. Are these, then, the ideal conditions of productiveness—absence of rain, and the annual flooding of the fields with water charged with rich soil or other manurial substance? Wonderful effects are ascribed to the fertilising properties of the silt, which is chiefly brought into the Nile by the Atbara or Black River. Prof. Hilgard, Director of the Agricultural Department of the University of California, shows that the layer of new soil so deposited is only of the thickness of common cardboard, about one twenty-fifth of an inch, equal to two good waggon loads per acre; observing that farmers would gladly haul and spread such fertilisers upon their land, if assured that they could thereby produce the like results. He also shows "that the neighbouring province of Fayoum, in Libya, shares the perpetual fertility of the Nile Valley, though irrigated only with the clear water of Lake Mœoris; that the regur lands of the Deccan, in South Central India, have been phenomenally productive for thousands of years; and that the region of China drained by the head waters of the Yellow River has been the granary of China for ages." From such facts Prof. Hilgard concludes that the extraordinary fertility of the valley of the Nile and other perennially fertile though arid lands is due to a quality inherent in aridity itself.

Professor Hilgard on the effects of aridity. Prof. Hilgard found, as the result of more than one thousand analyses of the soils of the arid Western regions of the United States, and of the well-watered Eastern regions, that the soils of the arid West contain, on an average, three times as much potash, six times as much magnesia, and fourteen times as much lime as the others. This high percentage of fertilising elements explains its superior productiveness. The Professor has even ventured on the following generalisation—"Arid countries are always rich countries when irrigated." This is the reasoning by which he supports his maxim:—"Soils are formed from rocks by the physical and chemical agencies commonly comprehended in the term weathering, which includes both their pulverisation and chemical decomposition by atmospheric action. Both actions, but more especially the chemical one, continue in the soil itself, the last named in an accelerated measure, so as to give rise to the farmer's practice of fallowing, that is leaving the land exposed to the action of the air, in a well-tilled but unplanted condition, with the view of increasing the succeeding year's crops by the additional amount of plant-food rendered available, during the fallow, from the soil itself. This weathering process is accompanied by the formation of new compounds out of

the minerals originally composing the rock. Some of these, such as zeolites, and clay, are insoluble in water, and therefore remain in the soil, forming a reserve of plant food that may be drawn upon gradually by plants; while another portion, containing especially the compounds of alkaline potash and soda, are easily soluble in water. Where the rainfall is abundant, these soluble substances are currently carried into the country drainage, and through the rivers into the ocean. Among these are potash, lime, magnesia, sulphuric and a trifle of phosphoric acids. Where, on the contrary, the rainfall is insufficient to carry the soluble compound formed in the weathering of the soil mass into the country drainage, these compounds must of necessity remain and accumulate in the soil." But the great advantage of aridity cannot be fully availed of without an adequate supply of water for irrigation. There is no doubt about the high quality of much of the plain country on both sides of the Murray; the character of the land in the Goulburn Valley in Victoria is almost identical with a good deal of the Riverina Country in New South Wales; and, in both, not only is much of the soil rich, but there are immense areas where the levels are entirely suitable for irrigation, and where the cost of preparing the land would approach a minimum. It is in these districts, if anywhere in the Murray basin, that the financial and social advantages that may result from irrigation will be possible.

Willcocks on Egyptian irrigation.

The political events of 1882, which led to the British occupation of Egypt, had as one result the transferring from India to Egypt of a number of highly-trained irrigation engineers. Sir Colin Scott Moncrieff, regarded as one of the ablest, was placed in charge of the Egyptian Public Works, and assigned the services of several Anglo-Indian engineers to assist him. One of these, Mr. W. Willcocks, has published a work called "Egyptian Irrigation," in which very interesting information is given as to the results obtained. For the system of "basin" irrigation, which has been developed and perfected in Egypt during the past five thousand years, Mr. Willcocks has nothing but admiration. The valley of the Nile, from Assouan to the Mediterranean, having been formed by the gradual deposit of alluvial matter from the river when in a state of flood, the high land is always next the bank and the low land near the desert. This conformation, which is similar to that of our Riverina country, explains the ease with which the lands between the river and the desert can be irrigated when the Nile rises. The following extract from Mr. Willcocks' book will explain the "basin" system :—

"Upper Egypt, with the exception of the Ibrahimia Canal system and the Fayoum, is divided into basins by earthen dykes running transversely to the direction of the river, starting from its bank, and reaching the desert. A dyke running parallel with the river, along its bank, encloses the basins on the river side, while the desert generally forms the fourth side. Some basins are still further divided, by one or more dykes parallel to the direction of the river, in order to divide the low lands near the desert from the higher lands near the river's edge. Large communities have made further sub-divisions, surrounded their properties by dykes, and made private basins, which they can irrigate at will, and of which they control the water supply independently of the main basins. Almost all these basins have special canals to lead directly into them the flood waters charged with alluvium. The beds of the canals are almost midway between the low Nile and ground-level; *i.e.*, about three or four metres below the level of country, or the same depth below ordinary flood; the canals are consequently dry during winter and summer. Many of the feeder canals have no regulating heads, but only a mass of loose stone at the take-off from the river. The heads of the canals taking off from the Nile are annually closed with earthen banks, which are cut about the 10th or 12th of August, when the millet crops in the basins have been removed; and the Assouan gauge being ordinarily at 14½ pics, the muddy flood water can flow freely into the canals. Each system of basins depends on one or more canals for its irrigation; some of the canals are insignificant, and feed only a few basins; while some, like the Sohagia, discharging 30,000,000 cubic metres per twenty-four hours (735,000 cubic feet per minute), are veritable rivers, and irrigate a very extended system. As the feeder canal passes each transverse dyke, it is provided ordinarily with a masonry regulator, to control the amount of water entering the basins. Each system of

basins possesses an escape, which allows the water, after it has deposited the alluvium, and stood some forty days on the land, to flow back into the river. Wherever the desert impinges on the river bank, there is a break in the system of basins. This happens very frequently on the right bank, but seldom on the left, where nearly all the cultivated land lies. The filling of the basins begins ordinarily about the 12th of August, and in the southernmost basins is completed by the 1st October, when the escapes are opened and the water discharged back into the Nile, ordinarily by the 15th October."

The works by which the English engineers have specially placed their mark upon Egypt are the restoration, and practical rebuilding, of the great barrages or dams below Cairo, which regulate the flow at the point where the Nile bifurcates and the delta of Lower Egypt begins; and the great regulating dam at Assouan, which was opened this year. They have also done much to improve the condition of the canals, particularly by works for reducing the excessive deposit of silt.

Irrigation in the United States.

In those regions of the United States that approach most nearly in physicall conditions to the Riverina and Goulburn Valley country, irrigation, as described by Smythe in "The Conquest of Arid America," elsewhere quoted from in this report, has had a most marvellous social influence, and made it possible for cultivators of the soil to live together in large villages, where they can enjoy many of the advantages of town life. The writer insists on the fact that irrigation not only makes possible, but to a great extent compels, the adoption of small farm units. His description of Riverside, an orange-growing colony in Southern California, discloses astonishing results. This settlement, originally consisting of 2,000 acres of pastoral land, bought at 10s. per acre, has been gradually extended until it now embraces 10,000 acres. The "farms" are from 5 to 10 acres in extent. When irrigation facilities were supplied, the land sold readily at £5 an acre. A few years later the unimproved lands sold for prices ranging from £60 to £100 an acre. The improved irrigated orchards, evolved from the sheep pasture, were valued, and actually sold at, from £200 to £400 per acre. There have been years when the best of them earned a profit of 50 per cent. on the higher figure. Perhaps there are few places where the financial results are so striking; but, judged by this test alone, irrigation in the United States seems everywhere to have been a success, so far at least as the cultivators of the soil are concerned. Although the net gains from irrigation in the United States have been enormous, there have been many difficulties and some heavy losses. It would be easy to select examples from the records of American irrigation to show that under the operation of unrestricted private competition, litigation has been frequent. In some cases works have been constructed with a haste that did not permit of stability; rates for water have been unduly high; and there has often been comparative scarcity where, with more careful preliminary investigation, there might have been abundance. Some companies holding valuable concessions have, after spending all their capital, been obliged to leave their schemes unfinished. Very serious difficulties also have arisen from the unsuitability of the English Common law to the conditions of the Western States. Some reference to the dealing with these difficulties, by the State legislatures and the State courts, will be found in that part of this report dealing with the legal aspects of the Murray River question.

Mr. J. D. Schuyler, in a work on American irrigation published in 1901, says :—"Capital has been slow to undertake the largest and most important works because of the difficulty of realising immediate returns from the investment. The development of a new section upon which water is but recently introduced, the construction of distributing canals, ditches, and pipes, the cultivation of the land and the planting of orchards, in fact, the conversion of the desert to a condition of profitable productiveness, is a work of time, which cannot be begun until the irrigation works are actually completed, and when begun is slow to fully develop. Meantime, however, the interest account accumulates, and often is so far in excess of possible revenues as to bring discouragement, and sometimes actual bankruptcy,

Necessity for storage.

before a paying basis is reached. That storage reservoirs are a necessity, and indispensable adjunct to irrigation development, no less than to the utilisation of power, requires no argument to prove. That they will become more and more necessary to our western civilisation is equally sure, and certain signs of the times seem to point to the inevitable necessity of Governmental control in their construction, ownership, and administration."

This is not merely the isolated opinion of an individual. The responsible leaders of the United States Government recognise that, in the arid regions, without irrigation, homes can neither be created nor maintained. The Secretary of the Interior, in his report to the President, of November, 1901, said:—"In my report for 1900, attention was drawn to the importance of providing, through wise administration, for the creation of homes for millions of people upon the arid but fertile public lands. . . . There is no function within the power of the Government higher than that of making possible the creation of prosperous homes." In his speech at Minneapolis, Mr. Roosevelt said:—"Throughout our country the success of the home-maker has been but another name for the upbuilding of the nation." President Roosevelt, in his message to Congress, delivered 3rd December, 1901, made some statements that well deserve quoting. He said:—"In the arid region it is water and not land which measures production. The western half of the United States would sustain a population greater than that of our whole country to-day if the waters that now run to waste were saved and used for irrigation. . . .

Storage of water properly a function of Government.

Great storage works are necessary to equalise the flow of streams and to save the flood waters. Their construction has been shown to be an undertaking too vast for private effort. Nor can it be best accomplished by the individual States acting alone. Far-reaching interstate problems are involved, and the resources of single States would often be inadequate. It is properly a national function, at least in some of its features. It is as right for the national Government to make the streams and rivers of the arid region useful by engineering works of water storage as to make useful the rivers and harbours of the humid region by engineering of another kind. The reclamation and settlement of the arid lands will enrich every portion of our country. . . . It would be unwise to begin by doing too much, for a great deal will doubtless be learned, both as to what can and what cannot be safely attempted, by the early efforts, which must of necessity be partly experimental in character. No reservoir or canal should ever be built to satisfy selfish personal or local interests, but only in accordance with the advice of trained experts, after long investigation has shown the locality where all the conditions combine to make the work most needed and fraught with the greatest usefulness to the community as a whole. There should be no extravagance, and the believers in the need of irrigation will most benefit their cause by seeing to it that it is free from the least taint of excessive or reckless expenditure of the public moneys."

Irrigation in the countries bordering the Mediterranean.

Irrigation has probably been practised, in parts of the European countries adjoining the Mediterranean littoral, from times as remote as in the lands of the East. The principal irrigation countries in Europe to-day are France, Spain, and Italy. Almost throughout France, irrigation is practised to some extent for the production of hay; but it is in the South, where the mean temperature is highest, and the rainfall most scanty, that the system is fully developed. All through the South, lucerne, beans, and lentils, vegetables of all kinds, and occasionally wheat and vines, are grown by the aid of irrigation. Lucerne does extremely well when irrigated, yielding five or six crops a year. The ground is first liberally manured, about five cubic yards of stable dung being allowed per acre. It is then sown with wheat, and, when this has brairded, lucerne seed is sown over it. In April of the year following the lucerne begins to yield its first crop. An acre of lucerne, on highly manured land, and irrigated, often produces as much in value as £18 10s per annum. One of the most valuable products of Southern France was the madder, which is specially adapted for irrigated lands; but its cultivation has been almost entirely extinguished by the substitution of aniline dyes for the rich purple formerly produced from the roots of the plant. Some costly irrigation works, notably in the Department of the *Bouches du Rhône*, were rendered valueless by this change in the process of dyeing. But the inventive powers and scientific skill of the

France.

French people were equal to the emergency. The water formerly used for the irrigation of madder was applied to other plants, chiefly certain varieties of wine grapes, theretofore believed to be unadapted for wet cultivation, with the result that the total value of the products of the country, as well as that of the irrigation works, remained undiminished. Irrigation canals in the South of France are the property of voluntary associations or Trusts. Designs for the works must be submitted to the Government engineers, whose approval is necessary, and who sometimes superintend the construction of new works or of extensive repairs. France is pre-eminently the land of small holdings; it is the small proprietor, whose little property can be tilled by his own hands, that fully appreciates the value of irrigation. Without men of this class, perhaps few, if any, of the irrigation canals would be constructed; at the same time their lack of capital often prevents the formation of associations capable of undertaking the work.

Irrigation in Spain.

Spain, with a high mean temperature, has in most parts a moderate or even scanty rainfall. At Madrid, for instance, where the mean temperature is 60 degrees Fahr., the annual rainfall is only 14.4 inches, of which 8 inches fall during the seven hottest months. Some of the rivers, capable of irrigating considerable tracts of country, and which have irrigable lands on their banks, are almost unused; but, in Southern Spain, especially in the province of Valencia, irrigation is very highly developed. Subdivision of land and peasant proprietorship have, in Spain, been carried far beyond the limits within which they might produce results socially beneficial. From this cause it is often difficult or impossible to obtain capital for useful works. It is estimated that there are, in Valencia, considerably over 100,000 acres of irrigated land; the necessity of irrigation in this region being apparent from the fact that, during the six hottest months, the average rainfall is only 4.6 inches. Fortunately, however, the hills to the north of the Huerta are of sufficient magnitude to constitute the sources of three considerable rivers, and of many smaller streams, which have been utilised with such skill and economy that the plains, even while scorching under the heat of the summer sun, are unsurpassed in beauty and in productiveness. The waste of water, throughout Spain, is nevertheless enormous, while the methods of measurement, if they can properly be at all so designated, are worthy of the Dark Ages. This country possesses one of the most perfect codes of law, on the subject of water and water rights, but it is one of the worst administered. The result is that half of its natural resources are absolutely wasted.

Irrigation in Italy.

In Northern Italy, Piedmont and Lombardy are amongst the most highly irrigated tracts. Lombardy seems to combine, within itself, all the circumstances that favour irrigation. The soil is of exceptional fertility, the regular slope of the land makes the application of water particularly easy, abundant supplies from streams that have their rise in the Alps prevent any anxiety as to shortage, in even the driest summers, while the peasantry is industrious and highly skilled in the arts of agriculture. Although the density of population is not so great here as in some other places that have been mentioned, the conditions in general are of the most favourable character. About one-third of the whole productive area is irrigated, but it has to be noted that the rainfall is, for certain crops, generally sufficient.

Probably the largest, and in some respects the finest, irrigation work in Europe is the Cavour Canal, in Piedmont, which was originally designed to draw its supply from the Po. Like many other large works, this one was started on an unsound financial basis, besides which an extraordinary error was made as to the minimum discharge to be relied on from the river. This, it was stated, had never been known to carry less than 4,677 cubic feet per second; but after the canal had been built, it was found that during the months of July and August the supply fell to no more than 1,600 or 1,800 feet per second. Fortunately, other sources proved available and at moderate cost. But for this circumstance the Cavour Canal project would have resulted largely in failure.

In Lombardy, it would appear, the administration of the canals has no monetary interest in the question whether the cultivator does or does not make an

economic use of the water supplied to him. The Piedmont cultivator, on the other hand, generally pays according to the area he waters; so that the question of use or waste is of prime interest to the owners of the works. The staple products of the irrigated lands of Northern Italy are butter and cheese, the water being employed chiefly for raising fodder for dairy cattle.

In Southern Italy there is a total irrigated area of about 600,000 acres, chiefly for the growth of oranges and other citrus fruits, which are largely exported. None of the works in the south are on a scale of great magnitude; they consist chiefly of diversions from the streams that flow from the Appenines to the sea on either coast.

Irrigation in India.

The experience of India is specially interesting to us, because it was there that English engineers first came into contact with a system of irrigation—a system that had, for uncounted centuries, been an important factor in enabling a dense population to maintain the struggle for existence, in face of conditions often extremely adverse. In many respects the physical conditions are not dissimilar from those with which we are familiar in Australia. One immense advantage for the Indian engineers is, that the most important of the rivers have their sources in the greatest mountains of the world, and are fed by their heavy rains and melting snows. Some, however, like our own, pass through hundreds of miles of plain country, and become sluggish streams. The like great differences of level and volume that we find here, are characteristic, though on a much more gigantic scale, of these Indian rivers. Indian irrigation covers districts of high temperature and low rainfall, so low indeed in parts of Northern India that even the scanty figures of the Western country of New South Wales seem large by comparison. There are in India districts where the rainfall does not exceed three to four inches per annum. On the other hand, it also extends to tracts, in which the rainfall is excessive at certain seasons, while at others the prevailing condition is arid heat.

Up to 1891 a little over £33,000,000 (taking the rupee at its face value) had been spent on irrigation works generally in India, yielding a net return of 4.2 per cent. Of this sum nearly £30,000,000 had been expended in what are known as productive works, that is works intended to be directly remunerative. Before being sanctioned, seeing that they are to be constructed with borrowed money, and it being held as essential that borrowed money should only be expended on works likely to be remunerative, the projects are severely criticised, not only from the engineering but also from the commercial point of view; yet some have not fulfilled expectations; though, taken collectively, they have covered the interest charges, with a gross surplus to the credit of the Government of nearly £4,000,000, and the profit is increasing year by year. Among the most satisfactory returns are those from the Eastern Jumna, Western Jumna, Godaveri and Cauvery Canals. All of these schemes were initiated by the native governments that preceded British rule, but since being taken over they have been extended, improved, and developed. Considerable sums have also been spent in protective works, that is works not expected to pay directly, but to operate as an insurance against famine; these date only from 1884. The gross area irrigated in India in 1891 was 13,405,195 acres. As illustrative of the vast scale of the profits derived from the irrigated lands of India, it was stated, in the report of the Indian Famine Commission in 1880, that:—"The ordinary rental of land is doubled by irrigation, while in eleven districts in Madras the average rental rises from 1.4 to 5.4 rupees per acre when supplied with water. In Tinnevelly the increase is nearly tenfold. In the 8 years preceding 1875-76, the average selling price of irrigated lands in the Cauvery Valley of Mysore was £35 an acre; while the best 'dry' land, at the same time, did not fetch more than £2 or £2 10s."

These are typical examples, covering a very wide range of conditions, of what irrigation has done and of what it may do for the tillers of the soil, dwelling in the more arid regions of the earth. Not one of the cases quoted is so exactly parallel to ours as to be capable, without modification, of being used as a model here. Yet, from one and all of them there is much to be learned that would prove of use to the settlers in the basin of the Murray, if only properly applied.

CAP. 7.— NAVIGATION — ITS EXTENT AND THE VESTED INTERESTS IN AND ASSOCIATED WITH IT. COMPARISON OF ITS CLAIMS WITH THOSE OF GENERAL SUPPLY AND IRRIGATION.

Extent and annual duration of navigation.

THE navigation of the Murray is, and always has been, largely in the hands of South Australia. The evidence shows that in most years the river is navigable to Wentworth for about seven months. For the last three, however, it has been navigable only about six months in each year. These years have also been unfavourable to navigation of the Darling; which, with the exception of a short distance near the Murray junction, has been practically non-navigable for the whole of that time. The Murrumbidgee may be regarded as navigable to Hay during certain months. A report of the New South Wales Public Works Committee, of 31st July, 1896, states with regard to the Darling that, for the fourteen years preceding, that river had been navigable for, on an average, half the year. Captain King, who has been engaged in the river trade for forty years, said that the Murray is navigable "generally, from May to December, from Blanchetown through to Albury, sometimes from end of July to December. The average is about six months navigation per year." At the time this Commission took evidence in South Australia (May, 1902), there was no navigation above Morgan. Its discontinuance is doubtless a grave inconvenience and often serious loss to the settlers along the river, who are dependent on water carriage for their supplies and for transit of their products. To many the river is practically the sole highway of trade, the cost of land carriage being prohibitive.

Capital invested in the river trade.

There are about 90 registered steamers plying on the river, and about the same number of barges; the largest barges having a capacity of about 300 tons. The capital value of this fleet cannot be stated with exactness; but, upon the basis of the evidence of Mr. Tetlow, Manager for Messrs. Permewan, Wright and Co., at Echuca, it may perhaps be taken as about £250,000.

Effect of diversions on the navigable volume of the river.

It seems unlikely that the navigability of the river has been appreciably affected by anything done in the way of irrigation, either in New South Wales or Victoria. The volume diverted from the Murray in New South Wales, for this purpose, is at present practically nil; and although some is diverted from the tributaries, as well as from the main stream, in Victoria, the total would have no sensible influence on the level of the river, or the duration of the period of navigation. An important factor affecting the duration of navigation has been the natural storage in certain lakes; a great part of which flowed out as the river sank, so maintaining its volume, sometimes for one to two months beyond that at which navigation would otherwise have ceased. Some of these natural storages are capable of improvement and regulation, their beneficial effect upon the navigability of the river being thereby extended.

Extent of the inconvenience and loss caused by closure of river.

Although the witnesses generally are agreed that it would be a convenience to have the river open for navigation all the year round, there is evidence to show that the periods of actual navigability are sufficient, both for the volume of trade and for the needs of the settlers. One exception, however, should be mentioned. At the Renmark Irrigation Settlement the fruitgrowers suffer considerable annual loss owing to the river being closed at the time their perishable fruits are ripe. A grower, who was offered £150 for his pears when on the point of ripening, had absolutely to lose the whole because he could not get them to market. The like has happened two or three times with regard to this particular crop. One of the principal settlers at Renmark said that, if the river had been navigable in June, which it was not, about 500 cases of oranges per week would have been sent away. It was also stated that at the same time there were from 250 to 300 tons of fruit river-bound at Renmark. Although it was admitted that

railway carriage is less damaging to fruit, and that the element of time is often a consideration, the Renmark witnesses expressed a desire for the locking of the river rather than the extension of the railway from Morgan. The inconvenience and loss arising from non-navigability of the river has perhaps been felt more acutely at Mildura than even at Renmark, navigation being maintained for some weeks longer at the latter than the former place. To Mildura, however, a railway is now in course of construction, and will probably be completed in March, 1903. This will give direct communication with Melbourne, and incidentally will command several of the large inland towns of Victoria. Opinion at Mildura therefore differs from that at Renmark. The local Shire secretary in his evidence stated that, the railway being assured, the people of Mildura feel little interest in the navigation of the river; their chief interest is now in the conservation of the water for irrigation. It appears, too, that the Mildura Railway Act embodies a Shire guarantee of a rate of 1s. in the £ on the value of property; it is, therefore, the interest of the settlers to send their produce by rail rather than by river, in order to minimise liability under the guarantee. Spite of this, however, there was one of the witnesses at Mildura, Mr. W. B. Chaffey, who expressed the opinion that, as the quantity of fruit produced increases, the river will be valuable as a means of carriage for export.

Value of the river trade.

It is not easy to arrive at the value of the trade maintained by navigation. How it is regarded by a representative of South Australian interests may be gathered from the evidence of the Honorable Alfred Catt, Chairman of Committees in the House of Assembly. When asked his opinion as to whether the volume of river-borne trade would be sufficient to warrant an expenditure of £350,000 in the construction of locks between Mannum and Wentworth, this gentleman said he was very doubtful whether it is so at present, but the question is whether the locking of the river would not cause an increase in the river traffic. Another view of the value once placed upon the river trade by South Australia appears from the fact that, for several years from 1878, the South Australian Government paid to that of New South Wales £40,000 per annum for the privilege of free trade with the latter colony. This may also be compared with the evidence of the Secretary to the Commissioner for Public Works, who, after stating that in his opinion the Murray should be locked as far as Echuca, the Darling to Wilcannia, and the Murrumbidgee probably to Balranald, said:—"I would like to add that if locking is carried out I maintain strongly that it must be on a basis which would not require the steamers or trade saddled with the expense of interest and maintenance. I do not say there should be no charge, but that it should be a comparatively small one. The effect of saddling the trade with interest and working expenses would be to largely prevent trade going on the river at all." Owners of river boats are of course concerned in the maintenance of navigation, and if it were permanent instead of intermittent, it would no doubt be greatly to their advantage. As it is, the boats are laid up for some months every year, and capital is consequently idle. The Darling is affected in this way to a much greater extent than the Murray.

South Australia the outlet for river traffic.

River trade decreasing.

South Australia is the natural outlet for a large proportion of the river-borne traffic, and, as before pointed out, it is largely in the hands of South Australians. The volume of this trade, however, far from increasing, has been seriously decreasing of late years. During the last two or three the condition of drought, prevailing throughout a large part of the country that furnishes the trade, may have had an important effect upon its reaching South Australia. A witness at Bourke stated that, in one year, the wool forwarded by his firm amounted to 67,558 bales, whereas during last year it was only 5,500 bales. The Bourke preferential railway rates have, no doubt, had a good deal to do with diminishing the river traffic at that port, but the drought is the chief cause.

Influence of railway rates.

The extension of Victorian railways and differential rates to various points on the Murray has had still more to do with the decrease in the quantity of wool and other produce carried to Morgan, Murray Bridge, and Victor Harbour, and to a certain extent also the extension of the New South Wales railways to Hay, Bourke, and Brewarrina. It has been urged, in evidence, that it is not the mere construction of railways, but the preferences accorded by them, that have largely affected the direction of trade. A South Australian witness, master of a river

boat, said:—"One time we were sole possessors of the Darling, but of late years Victoria wanted to have a slice in it, and imposed preferential rates, and gave us masters a bonus of 6d. per bale for bringing the Darling wool on to Echuca." It was also stated that the rate for wool from Echuca to Melbourne (156 miles) is fixed to compete with the South Australian rate from Murray Bridge to Port Adelaide (69 miles).

Effect of river trade on sea traffic with South Australia.

Some figures supplied by the Collector of Customs at Port Adelaide, giving the value of imports and exports *via* the Murray, show conclusively how the trade has decreased of late years. For instance, the imports for the ten years 1882-1891 were of the average value of £544,259, while for the succeeding ten years the average was £298,875; the average for each of the last five years being £199,516. The exports *via* the river for the same periods show a similar decrease; the figures being for the years 1882-1891, £185,584; and for the ten years ending 1901, average £77,016 per annum. A portion of the river trade diverted from South Australia has gone to Swan Hill and Echuca, both of which ports have experienced considerable improvement. The inward shipping to the former has increased from 25,784 tons in 1896, to 42,447 tons in 1901; while the outward shipping during the same period increased from 26,367 to 43,171 tons. At Echuca, in 1890, the inward shipping was 25,428 tons, while in 1901 it was 28,801 tons, an increase of 3,373 tons during the period. The total of vessels outward at that port in 1890 was 23,865 tons; while in 1901 it was 28,769, or an increase of 4,904 tons.

South Australian railway policy adverse to river trade.

So far as the lower Murray ports are concerned, as well as Goolwa and Victor Harbour, the railway policy of South Australia itself bids fair to complete what New South Wales and Victorian railway competition had begun. At Victor Harbour, for instance, figures supplied show that for the four years up to 1901 the average number of bales of wool annually exported was 3,473; whereas the average for the preceding ten years was 10,499. Most of it came from the Darling, and a witness expressed the opinion that, although the drought has a great deal to do with the falling off, the diversion of trade by means of the railways to Murray Bridge and Morgan had also contributed. Murray Bridge is 61 miles from Adelaide and Morgan 105, but the rates for river-borne goods are the same from both.

Schemes to provide a sea port for the Murray trade.

Those interested in the trade of the lower river are much concerned to see a scheme carried out that will have the effect of restoring the trade to what they regard as its natural outlet; a scheme by which the river boats will be able to tranship cargo to ocean-going steamers. Two have been proposed; one to render the Murray mouth navigable for ocean-going vessels, the other to cut a canal for river boats from Goolwa to Victor Harbour. The Murray mouth greatly resembles the entrances of the bar-bound coastal rivers of New South Wales, but its similarity to the Gippsland Lakes entrance, in Victoria, is still more striking. Many proposals have been made for rendering it navigable. Mr. Hickson, in 1876,

The direct outlet channel.

recommended a piled work at the sea entrance, sheltered by a breakwater 8,260 feet long, without deepening, and the establishment of a transhipping place inside the bar, at an estimated cost of one and a half millions sterling. Sir John Coode, in 1879, questioned whether the result would warrant such an expenditure, and was of opinion that the action of the east winds would shoal up the channel. He considered that the only reasonable prospect of success lay in the construction of two breakwaters running out from the shore, one on either side of the entrance so as to cover it, and terminating in not less than six fathoms at low-water spring tides. The cost of these works, including the breakwaters each over a mile long, he thought would not be less than two millions, and reluctantly concluded that the Murray mouth works involved too large an expenditure, with very doubtful prospects of success. In heavy gales, the waves break through the entrance from 15 to 20 feet high, and the sand bar is constantly shifting its position. One

Saltness of the Murray Lakes and its causes.

effect of a deep entrance channel would be to increase the saltness of the lakes, which, after a strong north-west or westerly gale, are brackish; the salt water being forced up the channels as far as Wellington. When the wind shifts to the south-east it is again blown out of the lake, a greater quantity running out under

these circumstances than during any river flood. The following, according to the report of Lieutenant Goalen, is the discharge at low water on the bar:—

Goolwa Channel	... ...	3,767,000 cubic feet per minute
Coorong „	... ...	980,000 „ „
Mundoo „	... ...	255,000 „ „

Canal to Victor Harbour.

The second project, that of constructing a canal from Goolwa, either to the sea direct or to Victor Harbour, is not new; as far back as 1874 a sum of £150,000 was actually set down on the estimates by Mr. Boucaut for a canal to Victor Harbour. Mr. Lindon Bates, who reported on it in 1901, advocates the construction of this canal in preference to a short cut from Goolwa to the sea. He estimates the cost at £571,000. Upon a former project, to bring the sea-going ships to Goolwa, there have been several reports since the year 1874; but Mr. Bates prefers the smaller canal, to bring the river craft to the ocean-going ships. Mr. Monerieff, the Engineer-in-Chief for South Australia, although he estimates that the canal could probably be carried out for £473,000, or £100,000 less than Mr. Bates' estimate, does not think that, under present circumstances, it would be a justifiable work. If carried out, this scheme would entail a cost of over £20,000 per annum for interest and working expenses. And, assuming the export of wool as 40,000 bales, an increase of over 20 per cent. on the highest record, the cost per bale would be not less than 10s. for these charges alone.

Several very positive statements were made in evidence by residents in the neighborhood of Lake Alexandrina of the increasing saltness of the lakes at the Murray mouth; the witnesses generally attributing it to the depletion of the river by diversions higher up, especially in Victoria. One gentleman, a station manager, however, attributed the increased saltness observable of late years to the continued drought. Another, master of a trading-boat, also attributed it to the low river. This gentleman said he had known the water of the lakes as salt in past years. Apart from verbal statements, the evidence of facts is against the hypothesis that there has been any increase of saltness in the Murray Lakes by reason of diversions of water from the river channel. We are of opinion that the proper course to maintain a supply of fresh water is the construction of a work at the outlet to exclude the sea, so designed as to discharge river floods over its crest. An estimate of the cost of such a weir was, some years ago, given by the Engineer-in-Chief of South Australia as £51,600. In the apportionment of water recommended in this report, provision has been made of a sufficient volume to make good the losses by evaporation in the Lakes.

Agricultural and pastoral lands demand water supply.

The occupation, except for pastoral purposes, of vast areas in the three States is only possible with a water supply. These arid portions must remain practically desert, unless the available water is economically distributed. It has been conclusively shown that it is only possible to supply a small proportion of the irrigable land, owing to the limited volume of the river. The employment of its water for navigation, great as may be the advantage in reducing cost of carriage, will therefore have to be a minimum. The irrigable area of 50,042,000 acres, already shown to exist in the three States, consists chiefly of fertile alluvial plains, timbered with myall, wilga, needle bush, and clumps of box and pine. The river frontages and country subject to periodical inundation are timbered with red gum and box. A portion of the land near the junction of the Murray and Murrumbidgee, and a considerable area in Victoria and South Australia, consists of reddish sandy soil, underlain in many places by nodular limestone and covered with mallee. The whole of these are, with a sufficient water supply, capable of profitable agricultural and pastoral settlement. Without it they must remain uninhabited wastes.

The Darling and Lachlan country.

The levels of the country near the Darling and the Lachlan do not admit of irrigation by gravitation. And, although the cost of pumping, as is proved at Mildura and Renmark, is not an absolute bar to its success, there appear to be few places on these rivers where conditions of soil, proximity to market, &c., make the establishment of irrigation settlements probable. The plain country adjacent to the Murray and Murrumbidgee, on the other hand, is, for the most part, readily commandable by gravitation.

The Murray and Murrumbidgee country.

Irrigable land in Riverina.

It is estimated by Mr. Allen, fruit expert to the New South Wales Government, that, between Corowa and Finley, there is an area of 600,000 acres of splendid irrigable land adapted to growing fruit, cereals, and lucerne. There are also 10,000 acres of suitable land near Deniliquin, 100,000 acres near the junction of the Murray and Murrumbidgee, 20,000 acres near Euston, and 20,000 acres near Gol Gol. The latter he considered equal to the best Mildura land, and suitable for olives, raisins, sultanas, etc. Much of the country west of Moulamein is of a heavy clayey nature, and not suitable for irrigation; and there is also a large belt of polygonum country, entirely unsuitable for cropping.

Lands in the Wagga district.

Mr. Coberoft, District Surveyor, estimates that the area within the Wagga Wagga district that will be affected by the proposed Murray and Murrumbidgee canals is 3,401,380 acres. A very large extent of this is agricultural land, mostly a strong reddish loam. Of the remainder the soil is of a clayey nature, with belts and patches of loam suitable for cultivation. Under existing conditions, on the timbered agricultural lands, an average area of 700 or 800 acres would be necessary for the maintenance of a settler; but, given a permanent water supply and opportunity for irrigating, half this area would suffice. Of the clayey plains, about 2,000 acres would be necessary to maintain a settler, but, with a permanent water supply, this might be reduced to 1,200 acres.

Existing water supply insufficient.

Mr. Coberoft is of opinion that the present water supply is quite inadequate for the requirements of settlement, as the principal watercourse, the Billabong Creek, is generally a chain of waterholes.

Lands in the Hay district suitable for settlement.

Mr. Broughton, District Surveyor of Hay, states that 9,100,000 acres within his district will be affected by the proposed Murray and Murrumbidgee schemes; the whole of which is suitable for grazing. The best agricultural land is situated south of a line running westerly from Coree to Morago, and comprises an area of 300,000 acres.

Irrigable lands in Victoria.

As to Victoria, Mr. Kenyon, of the Water Supply Department, classifies the irrigable areas thus:—Irrigable river flats in the mountain districts, 24,500 acres; river flats liable to submergence and therefore to a certain extent naturally irrigated, 224,000 acres; land eminently suitable for irrigation, forming the "plains" of the various river valleys, 3,700,000 acres. The total of nearly four million acres is, however, in Mr. Kenyon's opinion, beyond the practicable limit of irrigation works; their cost would be prohibitive. But there would be no difficulty in providing, at reasonable cost, for 2,000,000 acres; and this, he thinks, is the limit of area in Victoria that can be profitably irrigated.

Irrigable lands in South Australia.

The irrigable area in South Australia is stated at 2,500,000 acres. Little or none of it is commanded by gravitation; while of that within a lift of 110 feet at low water of the river the evidence shows that, under present conditions, not more than 250,000 acres can be expected to be occupied for intense culture.

Effect of the weight of evidence.

On the whole, the weight of evidence is in favour of considering irrigation as superior in importance to navigation. The views of some of the witnesses are, however, evidently tinged by the interests of the districts in which they live, or by their trade or business connections. As to the Darling, one witness expressed the opinion that, if there were no navigation of that river, settlement would die out. No proposal, however, has yet been made that would have the effect of rendering the Darling non-navigable, or even sensibly less navigable than it is now in ordinary seasons.

Col. Home's report on the Darling.

Col. Home, R.E., who reported to the New South Wales Government on the prospects of irrigation in that colony in 1897, speaking of this river, says:—"The Darling has throughout a deep well-defined channel which only overflows during high floods, when a great deal of flat country is under water. Beyond this flat area the ground rises on either side, in some places rapidly. The channel is very tortuous, the distance by river from Walgett to the confluence of the Murray at Wentworth being nearly 1,200 miles, and the fall in flood surface averaging little over 3 inches per mile; at Bourke the floods rise over 40 feet. The supply in the river is not to be depended upon, there being no regular rainy season in the catchment area, and the flow in it has even been known to cease altogether. In these circumstances it is impossible to look for irrigation on the Darling by gravitation or from reservoirs filled by the river when it is in flood. The former

plan might be resorted to in places where a good water-hole exists, and where suitable land can be found on the margin of the river; but most of the flooded land is not suited to irrigation, and this class of irrigation could hardly be practised on a large scale. The latter plan would have greater advantages, but the difficulty in this case is to store a sufficient depth of water to cover the loss by evaporation, etc., during the period between floods."

Navigation must be held subservient to water supply and irrigation.

The conclusion is unavoidable that, although existing vested interests demand certain substantial concessions in favour of maintaining the navigable condition of the rivers, the extension of navigation, except by the construction of locks, is not to be looked for. It is further evident that, in the event of circumstances at any time causing a conflict of interests, the demands of navigation must yield to those of general supply to settlers and for the irrigation of land.

CAP. 8.—EXISTING AND PROPOSED WORKS IN THE STATES OF NEW SOUTH WALES, VICTORIA, AND SOUTH AUSTRALIA, AND DIVERSIONS OF WATER FROM THE MURRAY AND TRIBUTARIES.

THE following is a brief summary of the principal works in New South Wales:—

Tuppal Creek Cutting.

Tuppal Creek Cutting takes off from the Murray 1½ miles below Tocumwal; it has a length of 4½ miles. The diverted water is used for stock and domestic purposes; the surplus returning to the Murray through the Edwards River.

Eagle Creek Cutting.

Eagle Creek Cutting takes off immediately above the village of Barmah. The water is used for stock and domestic supply. The cutting is about 3 miles in length, and cost, including head regulator, about £6,000.

Wakool Cutting.

The Wakool Cutting leaves the Edwards 5 miles below Deniliquin. It was completed in 1902 at a cost of £3,000.

Yanko Creek.

The only work carried out in the Murrumbidgee district is the improvement of the Yanko Creek; paid for in part by private subscription, in part by the Government.

Lake Cudgellico.

The Lake Cudgellico works are about 9 miles in a direct line south-westerly from Euabalong. A cutting of 2¾ miles leads from the Lachlan towards the lake. There is a regulator at its head, so that the water diverted is under control. It is intended to conserve flood waters and draw off when the river is low. The volume that can be stored is about 1,185,000,000 cubic feet. The cost of these works has been £22,000.

Booberoi Creek.

The Booberoi Creek works are about 11 miles north-easterly from Euabalong. They consist of a concrete weir on the Lachlan, and cutting to Booberoi Creek, about a mile in length. There is a controlling regulator at the head. Water is backed by the weir for a distance of about 20 miles, with a maximum depth of about 17 feet. The cost has been about £7,500.

Willandra Billabong.

The Willandra Billabong Creek head works are about 23 miles north-easterly from Hillston. They comprise a timber crib weir, a dam in the river, and a cutting to the creek. Water is backed in the river about 12½ miles, with a depth of 14 feet. Willandra Creek itself has been improved for a distance of about 10 miles. There is at present a drop board regulator at the head of the creek, but it is proposed to build a permanent structure to command the flow down the cutting. The cost so far has been about £10,000.

Middle Billabong Creek.

The head of the Middle Billabong Creek is about 15 miles north-easterly from Hillston. There is a timber weir in the river, and cutting leading to the creek. Water is backed for a distance of 15 miles, with a depth of 15 feet. There is a low regulator at the head of the cutting; but, as in the case of the Willandra Creek, it is proposed to eventually provide a work that will properly command the diversions. The cost to date has been £8,200.

Gin Gin Weir.

The Gin Gin Weir, on the Macquarie River, is 25 miles in a direct line upstream from Warren. It is of solid concrete, and diverts water down Ewenmar Creek, *via* Crooked Creek. The weir, which is about 28 feet high, backs water for a distance of about 21½ miles. The Crooked Creek Cutting has a length of about 1 mile. The cost of the works was £26,000.

Belaringar Cutting.

The Belaringar Cutting is 7 miles, in a direct line, upstream from Warren, and has a length of about 1¼ miles to Belaringar Creek. The cost has been £4,100.

Warren Weir.

Warren Weir, 3 miles upstream from Warren, is a timber crib work, and raises water to Gunningbar Cutting. It holds back a supply for a distance of about 15 miles. By its means water is diverted to Cookamurra Creek and Crooked Creek, and from the last named, by a cutting, to Duck Creek. Total cost about £10,000.

Works in the Gwydir River District.

There are three cuttings in connection with schemes for diverting water in the Gwydir River District. No. 1, 1½ miles in length, takes off from the great ana-branch of the Gwydir about 2½ miles in a direct line north-westerly from the town of Moree; No. 2, from the Meehi River, about 1¾ miles below the junction of Wee Waa Creek, is about 2¼ miles. No. 3, from the Moomin Creek, in the Parish of Millibee, is about 5 miles. There is a weir at the head of each of these cuttings. The total cost has been £22,500.

The whole of the foregoing works are for stock and ordinary supply only.

Hay and Wentworth Irrigation Trusts.

The Hay and the Wentworth Irrigation Trusts have been already referred to. Their works call for no special reference or further description here.

Works do not materially affect river.

No works carried out in New South Wales materially affect either the Murray or its tributaries. Diversions are merely along the course of natural channels, which have been improved, and which eventually return the balance of diverted water, after a portion has been used for stock and general purposes, to the main stream. The Lachlan contributes so little that it may almost be classed as non-effective. The enlarged supply obtained from some of its effluents, by improving their beds, etc., amounts to no more than the utilisation of that which would otherwise be lost by soakage and evaporation in swamps.

Bourke Lock and Weir.

With a view of providing permanent navigation on the Darling, several investigations were made. At length it was decided to construct an experimental lock and weir two miles below the town of Bourke. The site does not appear to have been judiciously selected, as a large sandbank has formed and blocks the approach. The type of weir adopted is the Chanoine, which has been successfully tried, both in France, where it was invented, and in America. On the Seine, several of this type have been in use for a number of years. The lock is of concrete, on the right bank of the river, and is 200 feet long by 37 feet wide. The weir consists of a series of timber shutters, which, in time of flood, lie flat on the river bed; but, when the river falls below navigation level, are lifted in succession. At the back of each shutter there is a vertical trestle with a sloping strut. The total cost of the work, the first of its kind constructed in Australia, has been £23,000. Neither the lock nor the weir can be said to have been a success, though doubtless something may be learned from their failure.

Irrigation for the Riverina country.

From Narrandera downwards on the Murrumbidgee, and from Bungowannah on the Murray, the natural conditions are very favourable for irrigation. The levels are exactly suited to the construction of canals, and a large percentage of the soil is admirably fitted for irrigation. The rainfall decreases rapidly towards the western end of the tract of country between the Murray and Billabong. West of Deniliquin

the average is about 15 inches, while to the east it is nearly 20. This consideration led Colonel Home to suggest investigating a scheme for a canal from the Murray at Tocumwal that would serve to irrigate the drier country to a point beyond Maude on the Murrumbidgee. Mr. Wade, Principal Engineer for Water Supply and Sewerage, has shown in his evidence that a canal from Tocumwal could be carried across the Murrumbidgee at Pevensey, below Hay, terminating at about 140 miles further on, at a cost less than that of the Bungowannah scheme.

Tocumwal Canal.

Bungowannah Canal.

The proposed canal from Bungowannah, of which surveys have been made, would provide for the irrigation of the tract between the off-take and the Edwards River, north of Deniliquin. Branches would be taken to Jerilderie, Conargo, Mulwala, and Deniliquin. The main canal, as originally proposed, would have a capacity of 78,000 cubic feet per minute. It would be 129 miles in length, with branches totalling 175 miles. The estimated cost, including one-half of the weir and head works, would be £732,000. In the apportionment of the waters of the Upper Murray, however, it has been found that only 60,000 cubic feet per minute will be available for New South Wales from that source, and, as a portion of this volume will be required for the country west of Tocumwal, it would not be prudent to make provision for more than 50,000 cubic feet per minute to be diverted at Bungowannah. The estimated cost of the weir and canals for the smaller supply will be £550,000. It is concluded that about 300,000 acres could be irrigated each year from this work. Assuming that one-seventh of each holding would be irrigated annually, the canals might be said to command 2,000,000 acres for irrigation. The evidence is emphatic that the Bungowannah canal would traverse some of the best irrigable land in New South Wales, and, although the rainfall is greater than in the country west of Tocumwal, it would be better to take off at Bungowannah. Another argument in favour of the Bungowannah scheme is that it would serve an area on which there is already settled a population of practical farmers prepared to utilise the water, while the Tocumwal scheme would benefit only a few large landholders.

Victorian Works.

In the State of Victoria, works for the conservation, diversion, and distribution of the waters of the Murray basin are much more extensive than in New South Wales.

The Goulburn National Works.

The Goulburn National Works comprise a weir on the Goulburn River, eight miles above Murchison, and nineteen and three-quarter miles of Main Channel, with regulators, off-takes, etc. The weir raises the summer level of the river about 45 feet, and provides an available storage of 670,000,000 cubic feet for the channel. Its length, over abutments, is 695 feet, exclusive of the head-gates, a further 230 feet. The waterway of the weir is occupied by 21 flood-gates, each 20 feet horizontally by 10 feet vertically in the clear. Each gate weighs 7 tons, and is worked by screw gearing, the motive power being obtained from the river itself. An electric lighting plant is provided for convenience of night work during floods. The Western Channel has a bed-width of 110 feet, normal side-slopes 1½ to 1, full supply-carrying depth 7 feet, and capacity, according to Kutter's formula, 103,000 cubic feet per minute. The proposed Eastern Channel has not yet been constructed. The Rodney Irrigation, and the Echuca and Waranga Waterworks, Trusts are supplied from the Western Channel. The total cost of the works, so far, has been £465,000, of which £144,000 was paid for land compensation.

Broken River National Works.

The Broken River National Works comprise two weirs of cement-concrete masonry on the Broken River, one about six miles below Benalla, known as Casey's Weir, the other at Gowangardie, about fifteen miles lower down. They were constructed by the Tungamah, Numurkah, and Shepparton Shire Waterworks, Trusts, and made National Works by Act of Parliament in 1900.

Loddon National Works.

The Loddon National Works comprise a regulating reservoir on that river, about half a mile above Laanecoorie, and two weirs for diversion, at Bridgewater and at the effluence of the Kinypanial Creek. The Laanecoorie Storage is a compound structure, the portion in the river bed being an overshot weir of concrete masonry, with a row of wrought iron automatic gates (of the type invented by Chaubart) along the crest. The remainder is in the form of an earthen embankment. The length of

the masonry weir is 320 feet, and of the earthen extension 700 feet. There are four thirty-six inch outlets, controlled by valves. The impounded water extends some five and a half miles up the river valley, the depth to the inverts being thirty-two feet, and the available contents, 610,000,000 cubic feet. The total cost of the work has been £133,000, of which £47,000 was for land compensation.

The Bridgewater Weir is of concrete masonry, and forms a kind of cap to a natural barrier of basalt rock crossing the river at this point. Its function is to divert water into the Bridgewater Channel, which supplies the Bullock Creek.

The Kinypanial Weir is of timber. Its purpose is to regulate and control the diversions into a cutting to the Kinypanial Creek, and for the North and East Boort Irrigation, and the Loddon United Waterworks, Trusts.

Kerang Lakes National Works.

The Kerang Lakes National Works consist of a weir on the Loddon River, just below the town of Kerang, constructed by the Swan Hill Shire Waterworks Trust, and taken over by the Board of Land and Works; regulating weirs on the Sheepwash and Washpen Creeks, which are supplied from the Kerang Weir; channels thence to Reedy, Middle, and Third Lakes, Lake Charm, Racecourse, Cullen's, and Kangaroo Lakes, and Lake Tutchewop; and an overflow channel from Lake Tutchewop to the Little Murray at Fish Point. The supply is obtained from the River Loddon in times of flood; or, failing this, from the River Murray, *via* the Kow Swamp National Works and the Pyramid Creek, which enters the Loddon just above the Kerang Weir. The cost to date is about £9,000.

Wimmera River National Works.

The Wimmera River National Works consist of a storage reservoir at Lake Lonsdale, distributing channels to the Mallee country, and storage weirs on the Lower Wimmera.

Lake Lonsdale.

The Lake Lonsdale Storage Dam is of earth, with an inner core wall of clay, extending northward 7,695 feet, from the high ground on the northern slopes of Mount Dryden to the Little Wimmera River. The channel is crossed by a masonry weir, 310 feet long, with bywash excavated out of the rock on the right bank. The reservoir has a maximum depth of 16 feet, and an available storage capacity of 1,981,000,000 cubic feet. This work is in course of construction, and will be completed early in next year. The cost, including land purchase and all charges, will not exceed £50,000.

Distributory Works.

The distributory works comprise a channel from the Donald weir, on the Richardson River, of a length of 22 miles; with branches to Birchip West, Sea Lake, Tyrrell West, Boigbeat and Nine-mile, and Kaneira, totalling about 200 miles. The cost will be £38,000.

Lower Wimmera Weirs.

There are also four weirs to be constructed on the Wimmera; near Dooen, at Dimboola, at Antwerp, and at Jeparit. With the exception of the last, which will be a compound structure, they will be timber weirs, with movable crests to provide for the passage of floods. The depths impounded vary from 8 to 10 feet, and the length backed up from 2 to 8 miles. The total cost of the four is estimated at £7,500.

Kow Swamp National Works.

The Kow Swamp National Works are for the supply of water for irrigation to the Lower Loddon District. They comprise an in-take and regulator, at the effluence of Gunbower Creek from the Murray River, for diversion into a natural lagoon, known as Kow Swamp. The Gunbower itself and Taylor's Creek are utilised, as far as possible, as part of the channel of conveyance. The Kow Swamp reservoir is capable of storing 1,780 millions of cubic feet, available for summer use. A channel is also carried round the Swamp, from Taylor's Creek, to join the Macorna Channel, which issues from the storage at its north-western point; supply being thus available both from the Murray direct and from the storage. The Macorna Channel reaches the Loddon at a point about 12 miles south of the town of Kerang, crosses the river by a wrought-iron siphon, and terminates at a total distance from the Gunbower in-take of 44½ miles. It has a carrying capacity of 10,000 cubic feet per minute. The inlet sill to the Gunbower Creek is at such a level that diversions take place only when the river is above full navigation level. The total cost of the works, including land compensation, has been £179,000.

Coliban Scheme.

The Coliban works supply water for domestic, manufacturing, and mining purposes to the City of Bendigo, the boroughs of Chewton, Castlemaine, Eaglehawk, and Raywood, and the townships of Taradale, Fryers, Maldon, Huntly, and Sebastian, and water for mining, irrigation, and general purposes to the interjacent districts. The scheme includes two principal storage reservoirs on the Coliban River, one at Malmsbury, the other about 10 miles higher up, with capacities of 3,337 millions and 4,093 millions of gallons respectively; a total of 7,430 million gallons, or nearly 1,190 millions of cubic feet. There are also 284 miles of main and branch channels, 25 subsidiary reservoirs and tanks with an aggregate storage capacity of 1,407 millions of gallons, 265 miles of main and reticulation pipes, together with flumes, bridges, and other works. Both reservoirs are of earth, the lower 1,727 feet in length by 60 in maximum height, the upper 883 feet long and impounding a depth of 63 feet. The total debit to capital account of the Coliban Scheme is, at present, £1,132,000.

Long Lake Pumping Scheme.

Long Lake Scheme includes a pumping plant of 3,000,000 gallons per twenty-four hours, seven miles of eighteen inch diameter wrought-iron pipe, and about eighty miles of main distributary channels, of four feet bed width, with ruling grade of one foot per mile. The supply is from Long Lake, about ten miles south-east of Swan Hill, fed by overflow from the Little Murray in times of high river. It will be for the supply of part of the Eastern Mallee, the construction being just entered on.

Trust Works in Victoria.

Besides the Mildura Trust, already referred to, there are in existence, within the Murray Basin, in Victoria, twenty Irrigation Trusts and seven Waterworks Trusts. The districts under their jurisdiction are shown on one of the plans accompanying this report. The works carried out by them comprise weirs, dams, storages, and off-takes, regulators, channels, etc., and supply for stock and ordinary use, and for irrigating a large area of country. These do not include the supplies to towns, of which there are a great number within the area, but whose demands are relatively so small as to be a negligible quantity in the present enquiry.

Proposed Works in Victoria.

There are certain works now proposed in Victoria, in fact decided on, though not in detail, and already in their initial stages. The principal of these are:—The Waranga Basin, to store 7,500 millions of cubic feet of the waters of the Goulburn; a Main Channel westward from this storage, to serve the country as far as the Yarriambiac Creek, in the Mallee, and to supplement the supply to the Mallee; the Eastern Goulburn Main Channel, to provide an irrigation supply to the country included in the Shepparton and Numurkah Trusts; and a Storage Basin on the Wimmera River, to supplement the supply from Lake Lonsdale.

Other proposals have been examined and entertained, but none of them are sufficiently definite to warrant their inclusion in the list of settled projects.

Proposed Works in South Australia.

Certain proposals for construction of works have been made in South Australia. The chief of these are the Lake Bonney, Morgan, and Burra Creek irrigation schemes. In 1894, the South Australian Parliament passed an Act providing for the establishment of an Irrigation Colony near Lake Bonney, between Morgan and Renmark. Preliminary surveys have been made in anticipation of a commencement of the work. The area of the proposed settlement is 100,000 acres, the land being similar to the Renmark Irrigation Colony.

Schemes are also under consideration at Morgan and Burra Creek, and detail surveys have been made of the sites. The area set apart at Morgan is about 2,000 acres, at Burra Creek about 2,500 acres, with provision for extension in both cases. Although the lift will be greater than at Renmark, it is anticipated that these projects will pay; as, owing to their proximity to the railway, they will command a ready market for perishable fruits.

The annual diversions authorised and unauthorised, in the three States are, as nearly as can be ascertained, as follows:—

		Mean annual diversion in cubic feet.
IN VICTORIA.		
Murray	1898–1901	6,986,000,000
Goulburn	1898–1901	4,135,000,000
Broken River	1898–1901	955,000,000
Campaspe	1898–1901	1,033,000,000
Loddon	1899–1901	4,885,000,000
		17,994,000,000
Unauthorised "pumping"		200,000,000
	Total	18,194,000,000
IN NEW SOUTH WALES.		
Murray, etc.		510,000,000
IN SOUTH AUSTRALIA.		
Murray		541,000,000

The Government of Victoria has entered into certain quasi obligations by giving authority to Trusts and persons to divert from the Murray and tributaries within her territory. So far as the tributaries are concerned, these are not of sufficient moment to affect navigation; there can be little doubt, therefore, that in these she is within her rights. So far as regards the Murray itself, there may be grave doubts as to the legality of these authorities; but, as they relate to a total volume—a mere fraction of that proposed to be conceded to Victoria by the recommendations of this Commission—it is unnecessary to further refer to them.

CAP. 9.—WORKS PROPOSED BY THE COMMISSION.

Proposed Upper Murray Reservoir.

INVESTIGATIONS have been instituted, on behalf of Victoria and New South Wales, by the officers of the latter State, and by Mr. Thos. Murray, an Engineer of the Victorian Water Supply Department, with a view of ascertaining the most suitable site for a reservoir on the Upper Murray. Surveys and borings have been made at Talmalmo, Thologolong, and, on the advice of Mr. T. Murray, at Cumberoona, respectively 55, 40, and 20 miles above Albury. Mr. Wade, the Engineer-in-Charge, states that he considers the Cumberoona site the most suitable, on the ground both of capacity and cost. A dam 70 feet high would impound 25,367,000,000 of cubic feet, and would be 8,000 feet long from the New South Wales to the Victorian side of the Valley. Its cost is estimated at £670,000, and the land resumptions at £117,500, or a total of £787,500. The total area submerged would be about 23 square miles.

Calculations, based on the gaugings of the past eleven years, show that a volume could have been drawn off sufficient to make, with the added discharges of the Mitta and Kiewa, a nearly continuous flow of 180,000 cubic feet per minute throughout the year. This it is proposed should be divided equally among the three States, in consideration of their bearing equal shares of the cost. In most years the basin would have been overflowing for several consecutive months; while in 1894 it would have been so for nine months. Although the total volume passing Bungowannah in the year 1901 was greater than in many previous years, yet, owing to the low winter discharge of the Mitta and Kiewa and the reduced flow of the Upper Murray, the volume of 180,000 cubic feet per minute could not have been maintained, during three months of that year. The mean discharge at Bungowannah for these three months would have been as follows:—

May	102,880 cubic feet per minute
June	150,700 „ „
July	101,450 „ „

Thus the deficiency, a comparatively small one, occurred during the months when a full supply would not have been required in the irrigation channels, whilst the reservoir, though empty at the end of July, would have been refilled and overflowing in the early part of September. A diagram attached to the report shows how the reservoir would have behaved during the eleven years 1891 to 1901.

Lake Victoria Reservoir.

Lake Victoria is near the Murray, below the town of Wentworth, and about 50 miles above the South Australian border. It covers an area of about 30,000 acres, and is connected with the main stream by the Rufus River, through which it is fed when the Murray is high. The level of water permanently impounded by the bar is R.L. 73.00, whereas flood marks show that the Lake has been filled to R.L. 90.00, the storage between the two levels being 17,000 millions of cubic feet. Mr. Sharman, the manager of Lake Victoria Station, states that he has seen the outflow from the Lake keep the river navigable to South Australia for four weeks after it had been closed above the Rufus. In order that full advantage might be taken of such floods, the Lake could be filled by raising the river level below Frenchman's Creek, and diverting through it to Lake Victoria. It is estimated that a weir on the river would cost £80,000, and the improvement of Frenchman's Creek and the erection of embankments and regulators £4,800, or a total of £84,800. These works would make possible the storage of 22,399 millions of cubic feet, a volume which, while allowing for evaporation at the rate of 60 inches per annum, would provide, in times of low river, 100,000 cubic feet per minute for a period of nearly four months. The cost of the Lake Victoria Storage, it is also proposed, should be borne in equal shares by the three riparian States.

Besides the works described in the foregoing, there are many other possible storages that cannot be particularised. On the Darling, Lachlan, Murray, and Murrumbidgee there are numerous lakes or natural reservoirs that receive large volumes of water in floods. When the river falls, the impounded water is released and flows back into the stream, contributing largely to its volume. On the Darling alone there are 70 lakes, the largest being Lake Cawndilla, which has a storage capacity of 7,196,000,000 cubic feet. Lake Menindie, it is estimated, will impound 16,700,000,000 cubic feet. The outflow from Lake Menindie alone, after having been filled by flood waters, has been observed to maintain navigation in the Lower Darling for many months after it had ceased higher up.

The importance of some of the lakes on the Darling may be understood from evidence given by Mr. A. F. Cudmore, of Avoca Station. This gentleman stated that the lessees of the station obtained an Act of Parliament authorising them to make a cutting from the Darling for 10 or 12 miles in order to take flood water from that river at a lower level. By means of this cutting, and by erecting dams across the ana-branch, the flood waters were backed up into lakes covering approximately 180 square miles. The depths vary from 6 to 14 feet, the average being about 10 feet. These lakes were filled to the brim in the 1890 flood, and even then an immense amount of water got away. The stored water remained in the best holding ground for about five years.

Locks and Weirs.

Some reference has already been made in this report to the subject of locks as means of promoting navigation. Estimates have been placed before the Commission of the cost of locks and weirs in the Murray, Murrumbidgee, and Darling. As to the South Australian portion of the Murray, Mr. Moncrieff, Engineer-in-Chief for that State, submitted plans for a typical lock and weir, which he estimates can be constructed for about £100,000; and he thinks that the cost of locking the river between Blanchetown and the New South Wales border will be, approximately, £600,000. The raising of the water level by these weirs would have the effect of submerging an area of over 85,000 acres of river flats.

From the South Australian boundary to Echuca, a distance of 666 miles, Mr. Wade estimates that twenty locks would be required at an estimated total cost of £730,000. The locks would be 200 feet long by 37 feet wide, and the lifts from 5 to 15 feet; the average length of each reach would be 31 miles. The surface area

of water in the length of river channel referred to would be 26,222 acres, and the water impounded 16,278,000,000 cubic feet. Assuming that there would be 400 lockings per annum, the quantity required, for this purpose, would be 38,640,000 cubic feet.

For locking the Murrumbidgee from its junction with the Murray to Hay, a distance of 240 miles, Mr. Wade estimates that nine locks would be required; the average distance between locks being 26½ miles, and the average lift 11 feet 3 inches. The volume impounded in the river would be 3,443,000,000 cubic feet. On the assumption of 400 lockings per annum, the quantity lost in this way would be 67,620,000 cubic feet. The estimated cost of the scheme is £321,750.

For the Darling, a scheme was prepared in 1890 by Mr. C. W. Darley, then Engineer-in-Chief for Public Works, New South Wales. He proposed the construction of forty locks and weirs between Wentworth and Walgett, at an estimated cost of £1,420,000. Mr. Darley proposed fixed weirs. Mr. Wade has substituted movable weirs, increasing the average lift from about 8 feet to about 13 feet; reducing the number of locks to twenty-four, and the cost to £920,000.

For providing locks and weirs for the navigation of the Murray, Murrumbidgee, and Darling, the total estimated cost is as follows:—

	No. of Locks.		Estimated Cost.
MURRAY—			
Blanchetown to State boundary of South Australia	6	...	£600,000
South Australian boundary to Echuca ...	20	...	730,000
			£1,330,000
DARLING—			
Wentworth to Walgett	24	...	920,000
MURRUMBIDGEE—			
Junction of Murray to Hay	9	...	321,750
Total			£2,571,750

Cap. 10.—LEGAL ASPECT OF STATE RIGHTS AND PRINCIPLES TO BE ADOPTED IN APPORTIONMENT OF WATERS.

In considering the just allotment of the waters of the Murray Basin to the use of each of the States of New South Wales, Victoria, and South Australia, the legal grounds of their several claims cannot be entirely ignored. But the uncertainty of the effect of decisions—Common law alone being applicable—on the various questions involved, renders it impossible, even were it advisable, to deal with them on this sole basis. Considerations of policy, of vested interests, and of the general welfare of the people must be accorded due weight in the settlement. It would be a public calamity that State rights should be left to be fought out in the courts; it would be hardly less calamitous to attempt to deal with them on what might be deemed strictly legal grounds, untempered by other considerations. Of the possible diversity of opinion as to these rights arising among trained lawyers, an idea may be gathered from a perusal of the evidence tendered in the course of the enquiry. What may, not improperly, be termed legal opinions were given by seven witnesses, of whom three are practising lawyers, as well as members of either the Federal or State legislatures; two are professors of law in Australian universities, and two are State officials.

Legal witnesses, diversity of opinion.

To fully appreciate the effect of their evidence, it is necessary to go back a little, and to look at the Imperial Act 18 *and* 19 *Vict., Cap.* 54. Section 5 of this Statute contains the following:—"Whereas by an Act of the fourteenth year of

Section 5 of Imperial Act 18 and 19 Vict., Cap. 54.

Her Majesty chapter fifty-nine it is amongst other things enacted that the territories therein described should be erected into a separate colony to be known and designated as the Colony of Victoria. And whereas doubts have been entertained as to the true meaning of the said description of the boundary of the said Colony it is hereby declared and enacted that the whole watercourse of the River Murray from its source therein described to the Eastern boundary of the Colony of South Australia is and shall be within the territory of New South Wales." The section goes on to provide that it shall, nevertheless, be lawful for the two colonies separated by the river to make regulations for the levying of customs duties on goods imported by way thereof, and for the regulation of navigation by their vessels trading thereon. It also makes it competent for them, by agreement, to define in any different manner the boundary line along the course of the river.

Effect of the Section as to jurisdiction over and rights in the Murray.

It does not appear that the legal effect of these words has ever been pronounced upon judicially. There has been one case, however, in which the Judicial Committee of the Privy Council gave an award in a matter in which the words of the section were necessarily involved. This was the case of the disputed ownership of Pental Island, near Swan Hill, which is bounded on the north by the Murray, and on the south by the Murrabit, an ana-branch of the Murray, but also contributed to by the Loddon, a purely Victorian river. In 1859, the island being at that time in occupation of a tenant, holding a lease from the Victorian Government, New South Wales raised the question whether it was not part of the territory comprised within the boundary declared by Section 5 of the Statute above quoted from. After protracted negotiation, it was resolved, in 1870, that the two colonies should each prepare its case, and that the question should then be remitted to the Judicial Committee of the Privy Council, the colonies undertaking to abide by the decision, as the Committee had no jurisdiction as a legal tribunal to entertain the matter. The proceedings assumed the form of an arbitration, and the award gave Pental Island to Victoria. Referring to this, one legal witness says:—"If that had been argued in the ordinary way, so as to be capable of being quoted in courts, that would be a very strong case, because it shows that, at all events, the Judicial Committee considered that Victoria had a riparian frontier." Another legal witness expressly concurs in this view, and refers to the Pental Island award as a very strong decision indeed. But the opposite view finds a supporter in a witness who holds that, since the waters of the Murray, from their source to the boundary of South Australia, pass wholly over New South Wales territory, they are the property of New South Wales. The contention is based on the well-known legal maxim that "*whosoever owns the land owns all that is thereon.*" This gentleman held that the grant to New South Wales was absolute and unqualified; besides which, there was no court having powers to restrain that colony in the use of the waters, and no executive with powers to enforce restraint. A less absolute view of the rights of New South Wales, conferred by Section 5 of *Act* 18 *and* 19 *Vic., Cap* 54, is that this colony is invested with exclusive rights of legislation in regard to the Murray; the term "watercourse" in the Statute being held to include the water in the channel as well as the bed and banks thereof. This view would, of course, imply that any Victorian legislation purporting to authorise or control diversion of the Murray waters would be in excess of her authority. It was further held that the conferring of exclusive powers of legislation over the Murray upon New South Wales did not destroy the riparian rights of Victoria as an adjacent owner, the right to the water being pertinent to the ownership of the banks, not the bed, and limited to such a use as does not diminish the customary flow. Again, it was asserted that the Imperial Parliament never intended to grant the whole of the waters of the Murray to New South Wales; the object of Section 5, already cited, was to confer criminal jurisdiction, which might otherwise be of doubtful residence in either colony. A practically identical view is that both the State of Victoria and its citizens, riparian owners within the State, are entitled to an easement, almost tantamount to a right of property, in the water of the river. It has to be borne in mind that, legally, there is a wide distinction between rights of property and rights of government. The majority of the witnesses admitted the

rights of Victoria as a riparian State to a certain easement in the river waters, a right that was absolutely denied by only one of them. A majority also held, subject to certain minor differences, that the sole jurisdiction over the river, and the exclusive right to legislate in regard to it, are vested in New South Wales.

Rights in and jurisdiction over the tributaries.

As to the tributaries of the Murray, the witnesses agreed that the rights of the States within their own boundaries have not been affected by federation; except that they have been restricted in respect of diversion, when this would impede the navigation of the main river. This restriction is, by some, held to be subject to the State rights of reasonable use, reserved by Section 100 of the *Commonwealth Constitution*. By others it is held that Section 100 does not abridge the right of the Commonwealth to see that the navigable depth is maintained. The balance of opinion was also that, before federation, each colony had full control over and power to use all the waters within its own territory, irrespective of the effect such use might have on the waters of the Murray itself. It was even held by some that the only limit to the right of New South Wales to the absolute use of the waters within her territory, including the Murray to the South Australian boundary, arose out of the obligations of comity towards the neighbouring States. Following this doctrine, Victoria would be within her powers in granting rights of diversion from the tributaries; she would exceed them in granting rights in the main stream. The opposite view was put forward in the form of a claim on behalf of South Australia, that she is entitled to a share in the waters of the Murray and of all the tributaries of that river. This appears equivalent to a declaration that riparian rights of States, within the Murray Basin, are subject to the ordinary rules of Common law affecting private proprietors. Riparian Common law, it was stated in this connexion, is applicable between the States as between individuals. Another view was that riparian law, as between the States, would be the same as between individuals, with the qualification that the State rights are territorial, the private rights pertinent to property. A third, the direct converse of the first, was that the Common law of riparian right, as between private proprietors, does not hold as between States.

Relative precedence of navigation and irrigation.

The precedence to be accorded to the respective claims of navigation and of irrigation hinges mainly on the interpretation of the trade and commerce sections of the *Commonwealth Constitution*. The opinions on the point given in evidence may be summarised thus:—Any interference with the natural flow of the Murray, that would render the river less navigable, would be unconstitutional. In this sense the tributaries are part of the main stream:—Legislation in regard to diversions must have respect to the maintenance of navigation. And on the other hand:—Any scheme interfering with the natural flow of the river, and constituting a complete or even serious obstruction to its navigability for the purposes of interstate trade, would be an infringement of Section 98 of the Constitution; subject, however, to the restrictions imposed by Section 100:—The establishment of federation does not affect the constitutionality of any State bringing about a diminution of the navigability of the Murray, save to the extent to which such enactment conflicts with some enactment of the Federal Legislature on the subject of navigation:—Water for irrigation may be held to be a natural right where cultivation is impossible without it. This application of Common law principles has grown up in America. It leads to the conclusion that the use of water for navigation must be subservient to irrigation. If the English Common law were admitted here, without modification, five-sixths of the Australian Continent would remain uninhabitable for all time. Neither in America nor Australia has irrigation yet become a factor in the life struggle of humanity; but, with the increase of population, it must so become in time. Natural rights of navigation extend only to tidal rivers. In non-tidal rivers they may be acquired by lengthened use, but extend only so far as that use. America has amended the Common Law to meet local conditions. In that country the Common law doctrine as to navigability of rivers has been set aside, and it has been held that a river navigable in fact is navigable in law. But, though navigability in fact gives rise to a legal right, that right is not paramount, and does not give navigation precedence over irrigation:—If a great and important industry demanded the diversion of the river water to an extent injurious to

navigation, the question of paramount right would be one for the High Court. Under the Federal Constitution, the test of navigability of a river would consist in its capacity for being used as a channel of trade and commerce.

Meaning of *reasonable use* in Sec. 100 of the Constitution.

As pertinent to the question of the precedence to be accorded to the respective claims of navigation and of irrigation, comes next to be considered that of reasonableness in the use of the river waters; in other words, the meaning to be attached to the expression "reasonable use," in Section 100 of the Constitution. On this three opinions were expressed:—The Federal Interstate Commission will probably be invested with powers to decide as to what is reasonable use. In that event no appeal would lie to the High Court on the question:—The interpretation of the words "reasonable use," under Section 100 of the Commonwealth Constitution, would be a matter for evidence, and is necessarily subject to doubt. This is a strong reason for its being made the subject of agreement. And finally:—Reasonable use (Section 100 of the Constitution) means such use as would not interfere with the rights of others.

Powers of the States to make an effective agreement, and mode of legalising the same.

As to the best method of making effective any agreement entered into among the States represented on the Commision for the utilisation of the water of the Murray and its tributaries, for conservation and irrigation, and as to the respective legislative powers of the Federal and State Parliaments in regard thereto, the balance of legal opinion was that advantage should be taken of the provisions of Subsection xxxvii of Section 51 of the Constitution, which confers upon the Federal Legislature power to deal with matters referred to it by the Parliaments of the States. The only way in which the Parliament of a State can speak to the Federal Parliament is by an enactment. There is no provision for exchange of messages. The necessary preliminary, therefore, would be the passing of a Statute by each of the three States concerned. Even with regard to this, one witness remarked that the Federal Parliament would not be bound to pass the measure in the identical form in which it was presented, nor afterwards to abstain from altering or repealing it without the consent of the States concerned. It seems clear, on the whole, that the legislative powers of the Commonwealth do not extend to conservation and irrigation. The Federal Parliament may legislate on these matters only on the motion of the States, and it further appears that such legislation can only be made applicable to the States at whose instance the law is passed. Another way of stating the position is:—The right to legislate in regard to conservation and irrigation pertains to the States. The riparian States may agree to legistate thereon. The Federal Parliament cannot do so, except on the motion, and with the concurrence and sanction, of the States:—Any agreement between the States as to rights in the river waters ought to be ratified by Federal legislation, under Section 51, Subsection xxxvii, of the Constitution, subject, however, to rights of reasonable use, as provided by Section 100, and also to rights of navigation.

Jurisdiction and powers of the High Court.

On the question of jurisdiction it is clear from the evidence that, prior to Federation, the enforcement of riparian rights as between colonies, or between the citizens of different colonies, was practically impossible, by reason of the absence of any common interstate law of riparian rights, and of any tribunal with powers to declare and enforce them. The establishment of the High Court, under the Commonwealth, will fill up this hiatus in our old constitutions. Jurisdiction, in matters arising under the constitution or laws of the Commonwealth, have passed to the Commonwealth. The judicial powers of the High Court, also, are held to extend to the enforcement of rights of conservation and irrigation, as well as of navigation; though the Federal Parliament is not entitled of itself to interfere in the first two of these matters:—One witness held, and he has not been contradicted, that rights accorded by a State, in excess of its powers, are valid only as between its own citizens. When they affect others they are, by that very fact, invalid. Again:—Prior to Federation, questions of riparian right, between citizens of different States, were within the jurisdiction of the courts of the State where an alleged wrong was done. They have now passed to the Federal High Court:—The Federal High Court, when created, may declare the law as

between States; it cannot make or amend the law. It may also declare the law as between citizens of different States, questions between citizens of one State are referable to the courts of that State:—If any State were injured by the act of another in respect of the river or its tributaries, an appeal for redress would lie to the Federal High Court.

Necessity for amendment of the Common law of riparian rights, or its supersession by Statute.

There was a consensus of opinion as to the need for amendment of the Common law in regard to riparian rights, or, perhaps, more correctly for its supersession by Statute; but there was some divergence of opinion in detail. The following is a brief summary of the several views:—Under the Roman Civil law the water of streams is of public right, and its appropriation by a first comer gives him a right as against lower riparian owners. The Civil law is more conducive to the use of water in agriculture than the Common law, and would be more beneficially applicable in Australia. In arid America the Common law has been in some States abolished, in some ignored, in all modified, to meet the actual facts. Legislation in Australia, to modify the Common law herein, should be by the Federal Legislature, but undertaken only under the advice, on the motion, and with the concurrence of the States concerned:—Unless the principle of the Civil law is applied to the Western Division of New South Wales, and the country served by the tributaries of the Darling, the central and western districts of that State must remain undeveloped:—It is a matter for legislation, which is the quickest mode of dealing with it, to declare a code of law with regard to the use of waters:—The Common law might, with advantage, be abrogated in respect of riparian rights, in so far that these should be vested in the Crown instead of in private owners. To this end the individual States must concur. The Crown could not alter the law here without this sanction:—In Australia, the Common law must be modified in its application to questions of riparian right. The Privy Council itself would, in such cases, modify the rigour of the Common law.

The New South Wales Water Rights Act.

Closely touching the proposed amendment of the Common law is the question of extending the principle laid down by the New South Wales Water Rights Act to the Commonwealth generally; on this witnesses were asked to express an opinion. The Act referred to vests in the Crown the right to the use, flow, and control of the water in all rivers and lakes that flow through or past, or are situated within, the land of two or more occupiers; reserving to the occupiers of land on the bank of the river or lake the right to use the water then being in the river or lake for domestic purposes, and for watering cattle or other stock, and for gardens not exceeding five acres in extent, used in connexion with dwellings. Speaking generally, witnesses approved of the principle of the Act, but did not commit themselves to an unreserved opinion that it should be extended to the whole Commonwealth. For instance:—"In some features, I think the New South Wales Water Rights Act worthy of being copied, inasmuch as it enables, though it does not compel, the Government to have works executed for the general benefit, which would otherwise be neglected; but I question whether it was necessary or desirable to vest the whole right to the flow of water in the Crown; at least without a much clearer definition of its rights and duties, as well as of the rights of individuals. It seems to me that the experience of the American States which have dealt with such questions ought to be closely studied before such an Act is extended":—The Water Rights Act of New South Wales should be extended to the other States, with some modifications and amendments, and with certain reservations of the rights of riparian owners:—The riparian Common law is probably unsuited to the physical conditions of Australia, and might advisably be modified, as for example it has been by the New South Wales Water Rights Act.

Future administration and control of joint works.

As to the administration of any Statute embodying an agreement among the riparian States, concerning their respective rights in the waters of the Murray basin, and as to the supervision and control of works their joint property and held for their joint benefit, the opinion seemed to be that these functions could not be effectively performed by a department of the Federal Government. The creation of a special Commission was suggested. And again:—The control of conservation, irrigation, and navigation might, by agreement, be in a central authority. But if such

authority should infringe the right reserved by Section 100 of the *Constitution*, its action might be upset by the Federal High Court.

Recognition of vested interests.

The proposition has been already enunciated in the opening paragraph of this chapter, that considerations of policy, of vested interests, and of the general welfare of the people must be accorded due weight in the allotment of the waters of the Murray basin to the use of the several States. The conservation of existing interests, especially of such as have grown out of the natural conditions of the country of their birth, and have remained for a lengthened time unchallenged, is a fundamental principle of law, no less than of the public sense of justice and right, among all civilised communities.

Navigation.

In the navigation and trade of the Murray and its larger tributaries a considerable capital has been already embarked; suitable vessels have been built and equipped, wharves constructed and warehouse accommodation provided; facts that cannot be ignored in any attempted settlement of rights. Provision will therefore be proposed for the continuance of a supply of water in those portions of the channels heretofore commonly navigated, sufficient to carry vessels of the like class and of the same draught as those hitherto employed in the river trade; such supply to be continued during the same period of each year as navigation has, in the past, been usually carried on.

Construction of weirs and locks.

The volume required for this purpose would be greatly reduced by the construction of weirs and locks in the channels, and a much larger volume thus released for employment in other ways. It will be recommended that these works be taken in hand as early as possible, their construction being a condition precedent to the proper utilisation of the resources available from the rivers. Judging by much that has from time to time appeared in the public press, there seems to be a good deal of popular misapprehension on the subject of weiring and locking the Murray, and of the benefits that might accrue therefrom. Locks have been spoken of as if they would be available for storage of the river water, and also as if the water stored would be available for diversion at higher levels, and at points more favourable than in the natural course. Let it be understood, once for all, that the weirs and locks proposed in this report will have as their essential, and, indeed, sole purpose, the maintenance of navigation for a maximum period in each year, if possible, for the whole year, with a *minimum* supply of water passing down the channel. It is possible that, in selecting sites for these works, some may be taken advantage of so conditioned as to be capable of rendering essential service in connexion with diversions. But to attempt to select sites, with an express view to diversion, would be to court failure for both it and navigation. The suggestion, that the works for facilitating navigation might also serve the purposes of storage, is impracticable—is, in fact, a chimera. Almost equally so is the suggestion that they will facilitate diversions by pumping. They will raise the level of the low-water surface of the river, certainly, and to this extent may facilitate pumping. They will provide no drop of water; that must be the function of independent storage.

Apportionment of available surplus.

After provision for navigation on the scale proposed, there will be a considerable, but variable, surplus available for irrigation and other industrial uses; variable, not only at the various seasons of the year, but also from year to year, as the year happens to be one of low, of mean, or of high discharge. The equitable apportionment of rights in this available, but variable, surplus is the most difficult part of the duty assigned to this Commission. If a solution of this difficulty can be arrived at, such as can be generally accepted and concurred in by the States, and by the citizens of the States, concerned, the most formidable obstacle to a general settlement of the whole Murray River question will have been removed. To this end, the country commanded by the river water—that is, the country that can be served by gravitation, either from the main river or from the tributaries—must be considered as a whole. The question to be solved is:—How, and on what principle, are rights to be assigned, so as to ensure the widest extent of permanent settlement, the maximum of productiveness, the most active internal trade, and the most profitable foreign commerce? The largest rights should, from this point of view, be assigned to the States that have the largest areas of irrigable land; whose land, commanded by the available water supply, is of the character and quality most likely to profit by being brought under irrigation; and whose land, of suitable

quality, can most readily and most cheaply be provided with the necessary works of conveyance and distribution. Some regard must also be had to vested interests that have already grown up, as at Mildura and Renmark, and in respect of rights conceded to certain of the Victorian Irrigation Trusts. Further, there must be recognition of, and concession to, what would be the riparian rights of the States, if they were private proprietors, or if the Common law of riparian rights could be held applicable to their case.

Precedence to supplies for domestic use and for stock.

There are numercus towns and villages, some of the former of considerable magnitude, scattered throughout the Murray basin. Bendigo, Castlemaine, Maryborough, Beechworth, Kyneton, Kerang, may be cited as typical samples of those in Victoria. Albury, Orange, Bourke, Balranald, Deniliquin, Wentworth, may be taken as representative cases in New South Wales. Also, there are numerous herds of cattle and flocks of sheep depasturing on the lands drained by the River and its tributaries, as well as settlers, both agricultural and pastoral, dwelling on these lands. The natural wants of the whole of these must be granted on a liberal scale, and must be made a first charge on the available water supply.

Cessation of pollution.

But, in recognition of this concession, there must be an end of river pollution, whether by the insanitary condition of towns or the dwellings of settlers, or by the continued appropriation of the watercourses of the country as common drains for the disposal of mine débris or of the waste products of factories.

River and tributaries must be dealt with as a whole.

Finally, in the considèration of claims and apportionment of rights, the River and its tributaries must be looked on as one. The Murray has, in fact, scarcely any existence apart from its tributaries. The only portion of the River proper having an independent source of supply is the Indi, from its point of origin at Forest Hill to its junction with the Swampy Plain River, the first important New South Wales affluent. From this point of junction the stream receives continual accessions, now from one side, again from the other. Any attempt to deal with each of these separately would be lost labour; they are essentially parts of a single system and must be so dealt with.

Cap. 11.—DIVISION OF AVAILABLE WATER AMONG THE STATES.

Proposals by Witnesses.

FEW useful suggestions have been offered in evidence as to the basis of allotment of the available waters, while, as to the volume necessary for navigation, there has been some conflict as to the facts. The Principal Engineer for Water Supply, New South Wales, proposes that certain laterals should be set apart for the sole use of the States through which they pass, and that certain other tributaries should be reserved for the sole use of the River channel itself. He assumed that, if no territorial boundaries existed, each mile of river frontage would have equal rights to the flow of the stream. On this basis the division of the water reserved for the main River is a simple matter. Taking the relative lengths in the several States, they would each be entitled to a third portion, to be delivered exclusive of losses by evaporation, at the points of diversion. He goes on to suggest "that the whole of the flow of the Murray above Albury, the whole of the flow of the Mitta, Kiewa, and Ovens be reserved for the supply of the Murray channel; and that each State have the sole use of the lateral streams, other than those mentioned, within its boundaries." The effect of this would be, in a year like 1896, which may be regarded as a typical low year, that, when the losses below the affluence of the Ovens were deducted, South Australia would get about 33,000 million cubic feet at her border line.

Mr. McKinney, on the assumption that New South Wales and Victoria are on perfectly equal terms with regard to the Murray, suggests certain volumes as the maximum which Victoria and New South Wales might equitably be allowed to divert from the Murray, Murrumbidgee, and Goulburn, without injury to the interests of South Australia.

Mr. J. W. Jones claimed, on behalf of South Australia, that all diversions from any part of the Murray or its tributaries (except, apparently, within South Australia itself) should cease when the flow of the river at the South Australian border falls to 600,000 cubic feet per minute. On this basis, in the year 1899, supposing South Australia had taken this quantity when it was to be had, and the reduced flow at other times, the amount left for division between New South Wales and Victoria would have been 47,000 millions of cubic feet, or about 16 per cent. of the total volume. He further thinks that, if the salt water were excluded from the lakes, the river locked in South Australia, and to a reasonable extent in the other States, and at least one reservoir constructed in South Australia, the works being at the expense of the Federal Government, the volume of flow at the South Australian border, below which all diversions by gravitation should cease, might be fixed at 300,000 cubic feet per minute.

Resolutions with regard to the Murray, agreed to at a Conference between Commissions representing New South Wales and Victoria, in 1886, have been given in the early part of this report.

All Available Water should be Reserved for Irrigation.

The proved value of water for irrigation, in the drier parts of the Murray Basin, where the land is fertile, makes it imperative that as much as possible should be devoted to this purpose. In New South Wales, though nothing on a great scale has yet been attempted, preparations have been made for initiating large schemes. In Victoria, while much has already been accomplished, further works, based upon accurate information, are likely to be proceeded with. It is absolutely necessary therefore that the volumes to be depended on from the rivers should be determined. The construction of storage reservoirs will not only have the effect of conserving the Winter supplies for use in the Summer, but the flow in the rivers will be equalised. If therefore, with storage, the total supply for a typical low year be taken, the volume available under normal conditions can be ascertained. The records point to 1896 as the year to be adopted; it is, however, anticipated there will be years of lower discharge than 1896, and provision is made for such a contingency, although the discharge of most years will be greatly in excess of it.

Provision for Navigation.

It has already been shown that no apportionment of water can be made between the States for irrigation and water conservation, without regard to the requirements of navigation. Sufficient water must be allowed to pass down the rivers to maintain navigability as heretofore, and, as time must elapse before the construction of locks and weirs, it is important to decide what are the conditions that will secure this meanwhile.

In his evidence before the Royal Commission on the utilisation of the Murray River waters, Mr. J. W. Jones, then Conservator of Water, stated that:—"For the present steamers a minimum depth of 4 feet would suffice to ensure uninterrupted navigation." He further stated that, except for small steamers, the river is not navigable when down to zero on the Overland Corner gauge.

Captain Barber, superintendent of deepening operations, who had been acquainted with the river for thirty-two years, stated that the Murray steamers draw from 3 to 5 feet. He fixed the Overland Corner gauge; the zero was 18 inches above the lowest-known low water, and when the gauge is at zero there is 3 feet 3 inches over the shallows. As to the period of navigability, Captain Barber remarked that steamers stop running for four months, but it is sometimes longer and sometimes shorter. With the exception of 1864, 1870, and 1871, navigation was stopped for some portion of each year up to 1887.

Mr. Graham Stewart said that the works carried out by South Australia, on the lower river, secure from two to three feet depth in the shallow parts at summer level.

Mr. Kenyon, an engineer of the Victorian Water Supply Department, in his evidence before this Commission, stated that the river might be considered open with a flow of 250,000 cubic feet per minute at Mildura, and that the smallest steamer could get through with a volume of 150,000 cubic feet per minute; that, on the South Australian river, steamers like the "Ellen" could get through, towing a

barge drawing 5 feet of water, with 250,000 cubic feet per minute; that, at Swan Hill, the river is open with a flow of 270,000 cubic feet; and that small steamers could get through at 150,000 cubic feet; that at Echuca the river is open at about 5 feet on the guage, or 250,000 cubic feet, and that small steamers can get through at 3ft. 6in., or 170,000 cubic feet per minute. This witness, we understand, has arrived at the conclusions regarding navigable volumes, stated in his evidence, by direct gaugings, made at times when steamers were just able to navigate. He travelled in the "Ellen" from Wentworth to Morgan, when she was towing a barge drawing 5 feet. The river he gauged at this time, and found the discharge to be 250,000 cubic feet per minute.

Mr. Alfred Battye, of Victor Harbour, asked by Mr. Burchell:—"Do you think 4 feet deep enough for river boats?" Replied:—"Well, 4 feet would take most of them; there may be some which would take 5 feet." And again:—"But even 5 feet would not admit the largest boats, would it?" "I think the largest boat draws 6 feet, but, loaded light, could go in 5 feet."

Mr. J. D. Ritchie, in answer to question:—"How long during the year is the river navigable?" said:—"As far as Wentworth I should say it is navigable, on an average, for somewhere about 9 out of the 12 months;" and, further:—"I think that is a very fair average, taking it right through."

Captain Oliver, on the other hand, who has been a master of river steamers for 25 years, said, in reply to question:—"How many months in the year is the Murray River navigable?" "As far as Wentworth, this last 3 years, it has only been navigable about 6 months." (Question):—"Formerly how long?" (Answer):—"Some time ago we would run for about 4 years in succession."

Mr. J. M. Smith, Chairman of the Renmark Irrigation Trust, in answer to question, "We understand that the river is navigable for about seven or eight months in the year?" replied, "About that."

Mr. Robert McMonnies, Storekeeper, at Euston, in answer to question, "How many months of the year, as a rule, can you get goods by boat?" stated, "Six or seven."

Mr. H. L. Harben, Storekeeper, Balranald, in a statement handed in, says, "Taking the average for past years, the navigability of the Murray and Murrumbidgee can only be relied on for about six months in each year, and as Balranald is the centre of a large district extending a distance of 150 miles back, the majority of the people have to depend for their supplies on the local storekeepers."

Mr. P. McM. Glynn, M.H.R., in his evidence before this Commission, said, "At Morgan, the nagivable discharge, I am told, is 340,000 cubic feet per minute." Being asked on whose authority that statement rested, Mr. Glynn said, "I think on the authority of the Conservator of Water (Mr. James W. Jones), given in his evidence before the Royal Commission on the Murray Waters in 1890, and it will be seen in the gaugings, in appendices to that report."

The Hon. Alfred Catt was asked by Mr. Burchell, "At present four feet of water is required at Morgan for navigation purposes;—do you know that is equal to 340,000 cubic feet per minute;—with locks you would not require anything near as much as that?" His reply was, "I do not think so."

Much consideration was given to the question of navigation in the debates of the Federal Convention, held in Sydney, Melbourne, and Adelaide, during 1897-8. At Adelaide, on 17th April, 1897, Mr. Glynn used the following words, page 810:—"The Murray at navigation level was 356,000 feet per minute. . . . The depth required to be kept in the river for the purpose of navigation is 4 feet. I am speaking from the evidence of experts before the South Australian Commission." Page 812:—"The constant depth ought to be about 4 feet. There are some boats, no doubt, with a capacity of 2 feet 3 inches; but for the purpose of trade they should rely on steamers that have a draught of between 3 and 4 feet. That is, at any rate, the effect of the evidence given by Mr. Landseer, who is a practical man, and

knows more about it than any hon. member of this Convention. I am taking an average, and I say, if you do not allow for a depth of about 4 feet, the use of navigation for the trade between these colonies will be gone." In his remarks at Melbourne, in January, 1898 (Vol. 1, p. 143), Mr. Glynn said:—"The discharge at Overland Corner goes down to 120,000 cubic feet per minute. Now, under locking, we would always keep a minimum of 350,000 cubic feet per minute, and that is the navigable discharge . . . . but the moment you keep the river near the navigable discharge—at, for instance, 300,000 feet per minute—then a compensation of 50,000 feet per minute would bring it up to navigable point." In Melbourne, in the course of his remarks, on the 1st February, 1898, Mr. Glynn referred to a map, put in at the Sydney Convention in 1897, prepared and signed by Mr. F. N. Burchell. A portion of this map (*see Appendix B*) shows the navigable depth of the Murray; the volume there given as necessary to secure navigation is 337,000 cubic feet per minute.

Conclusions from the Evidence.

The only conclusions that can be drawn from the evidence are:—(*a*) That, whilst the zero of the Overland Corner gauge is fixed at an assumed Summer level, it is at least 18 inches above the low level of the river, and 3 feet 3 inches above the shallows. (*b*) That when the river is from 4 to 5 feet deep, which corresponds with 1 to 2 feet on the Overland Corner guage, the condition of navigability has been secured. (*c*) That the steamers trading on the Murray draw from 3 feet to 5 feet. (*d*) That the zero of Overland Corner gauge corresponds with the zero of the gauge at Morgan. (*e*) That the volume of water passing Morgan, at Summer level, is 119,000 cubic feet per minute; at 1 foot above Summer level 164,000 cubic feet per minute; at 2 feet, 215,000; at 3 feet, 273,000; and at 4 feet, 337,000 cubic feet per minute. (*f*) That, in the opinion of some witnesses, if 5 feet deep pass down the river, ample provision will be made for navigation; whilst, in the opinion of others, it will be provided for by 6 feet depth of water, or 337,000 cubic feet per minute measured at Morgan.

The only witness who differed from these conclusions is Mr. Jones, Secretary to the Commissioner of Public Works, South Australia, who stated that a volume of 450,000 cubic feet per minute would be required for the larger vessels, and adds that "a good river year would be about 800,000 million cubic feet." By reference, however, to Mr. Moncrieff's evidence, it will be seen that from 1884 to 1901, inclusive, there had been only three years—viz., 1890, 1891, and 1894—when the discharge, as gauged by the South Australian Officers has exceeded this volume.

In addition to the requirements of navigation, and apart from the use of the water by the upper States, South Australia requires 12,500 millions of cubic feet per annum for irrigation, 42,000 millions of cubic feet to compensate for evaporation in the Lakes at the Murray mouth, and the volume required to make good the losses on the River in South Australia. Although we are of opinion that 42,000 millions of cubic feet, or about 14 per cent. of the total available quantity in 1896, to be devoted to the Lakes, is prodigal, in view of the comparatively small service it renders; we have, nevertheless, until locks and weirs are constructed, provided for this as well as the other South Australian requirements.

The following are the divisions proposed; and as they were arrived at in the shape of resolutions they are here stated in that form:—

Resolutions.

RESOLUTION I.

(*a*) The navigation of the lower part of the main river, and of certain portions of the larger tributaries, will eventually be provided for by the construction of locks and weirs. Until the initiation of such a system of works, the upper riparian States shall restrict their total diversions to about 440,000 cubic feet per minute for seven months, from July to January, inclusive, and during the months from February to June, inclusive, shall restrict their total diversions to about 370,000 cubic feet per minute.

(*b*) As, however, the Campaspe and Loddon rivers, and the Broken River, with its effluent the Broken Creek, and the Avoca and Wimmera Rivers, in Victoria,

and the Wakool, Lachlan, Bogan, Macquarie, Castlereagh, Namoi, and Gwydir rivers in New South Wales, make no effective contributions to the Murray River except during floods, rights of diversion from these rivers shall be accorded to the respective States in addition to those stipulated above.

(*c*) The requirements of South Australia, in respect of water to be sent down the river channel by the upper riparian States for supply, and to make good losses by percolation and evaporation in the river, and in the Lakes at its mouth, shall be for the seven months, July to January, inclusive, 170,000 cubic feet per minute, and for the five months, February to June, inclusive, 70,000 cubic feet per minute.

(*d*) Whenever the volumes of water available are insufficient to provide the foregoing—440,000 or 370,000, and 170,000 or 70,000 cubic feet per minute respectively, a proportionate reduction shall be made in each, so as to bring their sum within the total available. All of these concessions will be subject to the provision of storage as shall be hereafter decided. (Agreed to unanimously.)

RESOLUTION II.

(*a*) During the seven months, July to January, inclusive, the diversions on the part of New South Wales and Victoria shall be respectively 292,000 cubic feet per minute, and 146,000 cubic feet per minute, unless the volume of the river at Morgan exceeds 337,000 cubic feet per minute, in which case the diversions may be proportionately greater.

(*b*) During the five months, February to June, inclusive, the diversions on the part of New South Wales and Victoria shall be respectively 240,000 cubic feet per minute, and 127,000 cubic feet per minute, unless the volume of the Murray at the South Australian border exceeds 70,000 cubic feet per minute, in which case the diversions shall be proportionately greater.

(*c*) The foregoing quantities to be computed as follows:—

NEW SOUTH WALES.

Source.	Cubic Feet per Minute. For seven months, July to January, inclusive.	Cubic Feet per Minute. For five months, February to June, inclusive.	Points of Diversion.
Upper Murray catchment (to below junction of Kiewa)	60,000	60,000	From any point or points on the Murray River.
Murrumbidgee and Darling catchments ...	232,000	180,000	From any point or points on the Murrumbidgee or Darling.

VICTORIA.

Upper Murray catchment (to below junction of Kiewa)	60,000	60,000	From any point or points on the Murray River.
From Goulburn catchment	86,000	67,000	From any point or points of the Goulburn River, or an equivalent thereof, from any point or points of the Ovens River.

Carried—Mr. Burchell disagreeing.

RESOLUTION III.

That the rights of diversion accorded by Resolutions Nos. I. and II. are intended to secure the navigability of the Rivers, equivalent to that of their natural condition in typical years of low discharge, in so far as relates to the passage of boats of the class heretofore trading thereon, and shall be so accepted in the further discussion. Carried—Mr. Burchell disagreeing.

RESOLUTION IV.

That as the proposed Cumberoona Reservoir, on the Upper Murray, if constructed of a capacity of 25,367,000,000 cubic feet, will be capable, in conjunction with the natural discharge of the tributaries between the site of the dam and the gauging station at Albury, of so regulating the river as to ensure a practically uniform discharge of 180,000 cubic feet per minute below the affluence of the Kiewa; the volumes so regulated shall belong in equal shares to New South Wales, Victoria, and South Australia, conditionally upon these States bearing equal shares of the cost of the reservoir. Carried—Mr. Burchell disagreeing.

RESOLUTION V.

That, when the navigability of the lower part of the main river, and of certain portions of the larger tributaries, is permanently secured by the construction of locks and weirs, the restriction of diversions by the upper riparian States shall be amended, so that, in addition to the 60,000 cubic feet per minute (South Australia's allotment from the Upper Murray) an average of 55,000 cubic feet, equal to 28,908 millions of cubic feet per annum, shall pass down the main stream at the South Australian boundary. The total quantity, 115,000 cubic feet per minute, equal to 60,444 millions of cubic feet per annum, shall be held to make good the loss by evaporation in the Lakes at the river mouth, the loss occurring in the river between the South Australian boundary and those Lakes, and to satisfy the irrigation rights of that State. The increased loss from the Darling and the Murrumbidgee, due to the weirs thereon, and the volume necessary for working the locks on these rivers, being supplied from their own catchments, it is agreed by New South Wales and Victoria that a volume sufficient to make good the losses in the River between Albury and the South Australian border, with 55,000 cubic feet per minute as provided above, shall be supplied in the main river as follows:—

At the affluence of the Kiewa, being the excess available after providing the regulation volume	1.2	per cent. of the total required.
At the affluence of the Ovens	8.8	„ „ „ „
At the affluence of the Goulburn	16.5	„ „ „ „
At the affluence of the Murrumbidgee	28.7	„ „ „ „
At the affluence of the Darling	44.8	„ „ „ „
	100	per cent.

It is, however, stipulated that the obligations of either State shall be held to be fulfilled by the required volume being supplied from one or other or more of the tributaries named within its own boundaries. It is further stipulated that, should it at any time appear that the volume passing the South Australian boundary, together with those diverted by the States of New South Wales and Victoria, are such that the total stipulated would not be available for the year then current—that is to say, that they would be less for the year than 321,000 millions of cubic feet—then, and in such case, there shall be a *pro rata* reduction of the supplies to each of the three States, so as to maintain the same proportions as those agreed upon. Carried unanimously.

CAP. 12.—SPECIAL QUESTIONS REFERRED TO THE COMMISSION.

SEVERAL special questions have been referred to the Commission for report. These, which do not come strictly within the scope of the inquiry, as set forth in the original appointment, are as follows:—

Statement of the questions referred.

I. Pollution of the River waters, by the sewage and other refuse of towns, hamlets, and the dwellings of settlers; by boats plying on the River; by the waste products of factories; and by the sludge and débris of mines.

II. Proposed diversion from the Acheron River, a tributary of the Goulburn, by the Melbourne and Metropolitan Board of Works.

III. Proposed establishment of an irrigation settlement on a site about three miles north from Bourke.

The sewage question.

I. As to sewage pollution, it has been already stated in this report that precedence is, in all cases, to be given to demands for water for domestic, sanitary, and ordinary use. And it is just and reasonable that, in requital for this concession, every proper precaution should be taken to exclude sewage matter from the river channels.

The Mayor of Balranald complained to the Commission that the Murrumbidgee is at present (June, 1902) very seriously polluted. He said that the volume was then insignificant and the current sluggish, and the discharge of sewage from the towns above, such as Gundagai, Wagga, Narrandera, and Hay, had a very serious effect on the water, and Balranald was then threatened with an epidemic of typhoid, for which the river waters were held to be responsible. The Mayor admitted that the discharge from Balranald itself was as objectionable as that from towns higher up, although its injurious effect could not be felt to the same extent, inasmuch as Balranald is the lowest town on the Murrumbidgee. He said also that the Council had applied for a grant to carry out a sewerage system. At Hay a sewerage system is being carried out, which, when completed, will have the effect of remedying the nuisance now arising from the discharge of foul liquids into the river. At Narrandera a partial system, capable of being extended, is in operation.

The pollution of rivers by sewage is easily remediable in every case, and the residents in riverside towns should be impressed with the necessity of dealing with this question. The development and proved success of what is known as the septic system of sewage treatment has simplified the work and diminished its cost. So that, in towns where there is an adequate water supply, there is no reason that pollution of rivers by town sewage should be allowed to continue. The question is one that must be faced sooner or later; and important and wealthy urban communities cannot begin too soon to give it their serious consideration. The like remarks apply, with little less force, to the dwellings of settlers in the river basin, whose surroundings are, sometimes, of a most insanitary character; and to boats plying on the rivers, in which, as a rule, there are no proper sanitary provisions whatever. Either the provisions of the law relating to public health, in the several States, should be put in motion to induce efficient sanitation, or if the law, as it stands, is insufficient, it should be amended to give the necessary powers.

Mine pollution.

The pollution of rivers by mine débris, and by the sludge from batteries and puddling mills, and, following the example of the miners, by the waste products of factories, is of very old date. It is, in fact, as old as gold mining in the Australian States; that is to say its origin, is contemporaneous with the great access of population that ushered in the *modern era* in Australia. The miners, or, at all events, the mining industry, may be said to have established some kind of prescriptive right to use the watercourses of the country as its common drains. But here we may appeal to the well-known maxim, both of law and policy, that *the public welfare is the supreme law.* It cannot reasonably be contended that any body of men can acquire a prescriptive right to carry on their industry, however profitable, at the expense of the health and well-being of the entire community. In the issue of any future leases of land for mining, there ought to be a condition that no water used for washing auriferous earth, or for treating any auriferous matrix, shall be liberated after use, containing in suspension solid matters of more than a certain fixed percentage, to be determined by competent expert authority. A provision should also be inserted in an amendment of the *Mining Statute,* imposing the like restriction on the holders of claims under the Mining Bye-laws.

The Acheron question.

II. The officers of the Metropolitan Board of Works were heard in evidence, before the Commission, on the question of diversion from the Acheron. The case, as put on behalf of the Board, with the reply of the Victorian Water Supply Department, is embodied in a memorandum by the Chief Engineer of Water

Supply, who is a member of this Commission. The Commission concurs in and adopts the view of the Chief Engineer, as set forth in the memorandum, which is here given as a reply to the request of the Board :—

"(1) The Chairman and Officers of the Board having, at the request of Mr. Fitz Gibbon, been heard by the members of the Murray River Interstate Commission, have now placed on record, in a form more definite than, and slightly different from, any in which it has previously appeared, the request of the Board in respect of a right of diversion. Briefly stated, the right now asked for is as follows:—To divert from the Acheron River 10 millions of gallons per day throughout the year, except during the months of November, December, January, February, and March; during which five months all diversions shall be subject to the direction of the Chief Engineer of Victorian Water Supply. But no diversions to be made at any time when the natural volume of the Acheron is less than 10 millions of gallons per day; and all diversions to be subject to a condition that 10 millions of gallons per day, at least, shall be allowed to pass down the river at the off-take.

"(2) Having looked into the question with care, I am of opinion that we ought not to consent to a grant of right of diversion, in the Acheron, in the terms proposed by the Board; but I think that a right, that should prove of even greater service to the Board, may be accorded without tangible injury to the interests of settlers in the Goulburn Valley. The right I propose is as follows:—The Board to be entitled to divert from the Acheron River, at all times, except during the months of January, February, March, and April, during which four months there shall be no diversion, a volume not exceeding 20 millions of gallons per day; provided that there shall be no diversion when the natural volume of the Acheron is less than 10 millions of gallons per day; and provided also that during diversion a volume of 10 millions of gallons per day, at least, be allowed to pass down the river at the off-take.

"(3) From an analysis of the available gaugings of the Acheron River, which, however, extend over one year only, it would appear that the total volume of possible diversion for a year under the above proposed right would be about 3,863 millions of gallons. This volume would be the equivalent of about $15\frac{3}{4}$ millions of gallons per day for eight months, or $10\frac{1}{2}$ millions of gallons per day for the whole twelve months. I think, therefore, it may be taken to be more than a fair equivalent for the right asked for; besides which, it is, in my opinion, the only form of right of diversion from the Acheron that can be granted without tangible injury to the interests of settlement in the Goulburn Valley."

Proposed irrigation settlement, North Bourke.

III. The question of establishing an irrigation settlement at North Bourke appears resolvable into a proposal to provide an object lesson in irrigation, at the charge of the New South Wales Government. If this is so, clearly, the conditions ought to be, if not the most favourable possible, at least reasonably favourable. The conditions at North Bourke are not so. The soil is far from being of the best obtainable for the purpose, the water supply is deficient and uncertain, and there is no large market for the produce of irrigated land available in the immediate vicinity. It would be better if the Government were to depute a competent expert to select a site where the conditions are favourable. It is not likely that a settlement will be even self-supporting for some time after establishment. Seeing that it will demand a considerable outlay of public money, there should be an assurance that the result will be commensurate with the outlay.

Cap. XIII.—CONTROL OF THE RIVER AND TRIBUTARIES.

River control before Federation.

BEFORE Federation the South Australian portion of the main stream was controlled by the Government of that province. The upper portion, though forming part of the territory of New South Wales, was, as to control of Victorian vessels trading on the River and the collection of Customs duties on the goods landed on the Victorian bank, subject to the concurrent control of Victoria. Customs and Navigation are now under the jurisdiction of the Federal Government.

The control of Navigation being in the Commonwealth, and of Irrigation and Conservation in the States, it is necessary that their administration should be kept apart. Whilst, however, Commonwealth authority and control of State rights should be distinct, it is important that there should be proper concert between them.

Proposed Commission.

This object would be secured by the appointment of a Permanent Commission, representative of New South Wales, Victoria, and South Australia, to administer and control diversions, and to construct and control those works of irrigation and conservation in which more States than one are concerned, with powers to consult with the Federal Government, and to conclude agreements with it, on all such matters affecting the rivers as are subject to Commonwealth jurisdiction. The realisation of this proposal would demand concurrent legislation on the part of the States, with confirmatory action by the Parliament of the Commonwealth.

Its powers and duties.

The powers and duties of the Permanent Commission should be wide enough to enable it to deal, from time to time, with such questions as those remitted to this Commission. Its functions should be defined in regard to the broad lines to be followed, but not as to details of methods of procedure.

Matters specifically remitted to it, in addition to those mentioned, should be :—The direction and control of gauging of all streams within the Murray Basin, and keeping the records thereof :—The investigation of all proposals, for the construction of storage and other works, intended to serve the interests of more than one State, and the apportionment of the cost thereof :—The variation, where necessary to meet altered conditions, such, for instance, as the construction of navigation works, or to conform with the fuller information, from time to time available, of the volumes to be provided for navigation, or for the respective service of the several States :—The settlement of disputes arising, between the States, out of matters connected with the administration of the agreement, or modifications thereof, relating to the control and diversion of water from the Murray or its tributaries :—The making of regulations, either temporary or permanent, limiting the volumes to be diverted from time to time, or at any specified season, or diminishing or suspending diversions; providing against the pollution of rivers and streams; and for all other purposes necessary to the proper exercise of its functions.

The expenses of the Commission should be borne by the several States in the proportion of their respective populations.

Recommendations.

To give effect to the conclusions arrived at in the course of our enquiry, we desire to make the following recommendations :—

1. That the division of the waters of the Murray Basin among the three States shall be, before and after the construction of locks and weirs on the river, as set forth in the Resolutions in Cap. 11.

2. That the storage reservoirs at Cumberoona and Lake Victoria, and the weirs at the Murray mouth, shall be constructed at the cost of the three States in equal shares, and that the weir and head-works at Bungowannah shall be at the cost of New South Wales and Victoria in equal shares.

3. That a Permanent Commission be appointed to control and modify diversions of natural waters within the Murray Basin, and charged with the administration of all matters appertaining thereto, including the questions dealt with in Cap. 12 of this report.

4. That, inasmuch as the conditions in Australia are such that the Common law doctrine of riparian right is unsuitable, steps be taken to legislate on the lines of the *Water Rights Act* of New South Wales, and to vest the ownership and control of all natural waters in the Crown.

5. That, concurrently with the construction of the proposed Cumberoona Reservoir on the Upper Murray, we advise that the scheme for diverting water from Bungowannah be carried out by the Government of New South Wales, the estimated cost being £550,000; such scheme to provide for the conveyance and distribution of 50,000 cubic feet per minute from the Murray into New South Wales.

6. While admitting the benefit of a permanently navigable river, we are of opinion that the present traffic is not sufficient to warrant a complete system of locking. We think, however, that a beginning might be made with the Murray, from Blanchetown to the junction of the Darling at Wentworth, at an early date. For this, eight locks would be required, viz.:—Six between the South Australian border and Blanchetown, and two between the South Australian border and Wentworth. The estimate, according to the evidence of Mr. Moncrieff of South Australia, and of Mr. Wade of New South Wales, is £760,000. We recommend that the Federal Government be invited to consider the desirability of carrying out this first instalment of locking the River.

General map. The large map of the Murray River basin, which shows by colour the main and contributing portions of the catchment area, also existing and proposed works of water conservation within the area, has been prepared by Mr. A. W. Roberts of the Victorian Water Supply Department.

Accompanying the report and evidence are the following appendices and plans.

Appendices.

A. Diagram showing behaviour of proposed Cumberoona Reservoir.
B. Diagram (portion) showing volume of water required for navigation on the Murray. (Printed with proceedings of the Australian Convention 1897).
1. Tabulated Statement showing estimated monthly discharge of the Murrumbidgee River at Hay.
2. Tabulated Statement showing estimated monthly discharge of Darling River at Wilcannia.
3. *Tabulated Statement showing* estimated monthly discharge of Murray River at Albury.
4. Section showing Tuppal Cutting, New South Wales.
5. Section showing Eagle Creek Cutting, New South Wales.
6. Section showing Yanko Creek Cutting, New South Wales.
7. Section showing Willandra Weir Cutting, New South Wales.
8. Section showing Middle Billabong Cutting, New South Wales.
9. Section showing Crooked Creek Cutting, New South Wales.
10. Section showing Murray's Break Cutting, New South Wales.
11. Section showing Gunningbar Creek Cutting, New South Wales.
12. Section showing Greenbah Creek Cutting, New South Wales.
13. Section showing Moomin Creek Cutting, New South Wales.
14. Section showing Thalaba Creek Cutting, New South Wales.
15. Section showing Meehi Creek Cutting, New South Wales.
16. Section showing Carore Creek Cutting, New South Wales.
17. Statement of diversions from the Murray and tributaries within the State of Victoria.
17a. Statement of diversions from non-contributing streams within the watershed of the Murray River in the State of Victoria.
18. Schedule showing existing and proposed works on Murray River in South Australia.
19. Schedule showing details of Irrigation Trusts in Victoria.

Plans.

1. Sketch Plan showing suggested Storage Sites on the Upper Murray.
2. Plan of the Murray River Basin, showing main and contributing streams with their catchment areas, also existing and proposed works of water conservation.
3. Plan showing existing and proposed works of water conservation in the Murray River Basin in Victoria.
4. Plan showing existing and proposed works of water conservation in the Murray River Basin in South Australia.
5. Plan showing Murray and Murrumbidgee Rivers Districts New South Wales.
6. Plan showing Darling River District, New South Wales; also longitudinal section of the River.
7. Plan showing Lachlan River District, New South Wales; also longitudinal section of the River.
8. Plan showing Bogan, Macquarie, and Castlereagh Rivers District, New South Wales.
9. Plan showing Namoi River District, New South Wales.
10. Plan showing Dumaresq, MacIntyre, and Gwydir Rivers Districts, New South Wales.
11. Longitudinal Sections of Murray and Murrumbidgee Rivers, New South Wales, showing system of locks.
12. Plan showing proposed improvements to Lake Victoria, New South Wales.

In concluding this report we desire to leave on record our appreciation of the valuable services rendered by our Secretary, Mr. R. T. McKay. He has, by his zealous attention to his duties, and his unceasing efforts to bring to a successful issue the Commission with which we have been entrusted, secured our satisfaction and won our respect. We are also indebted to the Shorthand writers, Messrs. Frankham and Daunt, who have rendered valuable assistance during the course of our inquiry. To these we desire to express our thanks.

We have the honor to be,

Your Excellency's most obedient Servants,

J. DAVIS, M. Inst. C.E., *President.*
STUART MURRAY.
F. N. BURCHELL, SUBJECT TO DISSENT.

MELBOURNE, *9th December*, 1902.

DISSENT.

I most respectfully dissent from the foregoing report on the following grounds:—

1. Its terms are, in my opinion, calculated to confuse the real question at issue, *i.e.* particularly in regard to Resolutions II. and III., or any reference thereto.

2. The first and paramount duty of the Commission is, in my opinion, to determine the minimum flow necessary to be maintained for the purpose of navigation. The question of the just allotment of the waters between the States for Conservation and irrigation being subsidiary to the main necessity of keeping the rivers navigable.

3. The evidence shows that *the minimum* depth of water necessary for navigation of the River Murray is four feet above zero on the Overland Corner gauge (see exhibit 43), therefore, no diversion by or in any State should be permitted while this requirement is unsatisfied, except as mentioned in the next paragraph.

4. I admit that to impose the absolute condition that no water should be taken from the River while the flow is less than 4 feet above zero at Overland Corner, would injuriously affect the irrigation pumping schemes now in operation, and which, being already established, require special consideration. I think therefore, that this condition should, as a matter of Inter-state concession, be qualified to the extent of allowing a sufficient quantity of water to continue to be pumped at all times, for the supply of existing pumping schemes. But that this concession should extend only to the absolute necessities of the said schemes, and that, in all such cases, the abstraction of water should be controlled by the Inter-state Commission.

5. Subject to the maintenance of the River Murray as a navigable water-way, as stated in paragraph 3 of this dissent, the question of the just allotment of the waters to the use of the States of New South Wales, Victoria, and South Australia for irrigation is one concerning which I am prepared to recommend the utmost liberality to the States of New South Wales and Victoria. In my opinion, the surplus waters of the River Murray and its tributaries should be *distributed as follows*:—

New South Wales and Victoria in such proportions as they may agree upon between themselves $\frac{7}{8}$, and South Australia $\frac{1}{8}$.

6. I have dealt, so far, with the question upon the assumption that the rivers remain in their present natural condition, but should a system of weirs and locks be established, which in my opinion is desirable, then, contingent upon the exclusion of the sea water from Lakes Alexandrina and Albert by the erection of a barrage at near the mouth of the river Murray, a sufficient quantity of water should be allowed to flow into South Australia to:—

(a) Provide for navigation.
(b) Maintain the lakes at a proper level at all seasons of the year.
(c) Give sufficient water for a *reasonable development* of irrigation works in South Australia.
(d) Ensure the thorough effectiveness of a system of locks and weirs. The weiring and locking of the rivers would not only allow of these requirements being amply provided for, but will give more water to the riparian States for conservation and irrigation.

7. In reference to resolution 4, and as to the cost of the Storage Reservoir at Cumberoona, it is my opinion that if the upper riparian States desire to take so much water from the River that it would be rendered unnavigable, unless storage is arranged for to maintain navigability, then the States desiring to do this should pay for such storage.

8. In reference to Chapter XI., paragraph 21, I wish to point out that according to the diagram of gaugings of the River Murray, submitted by the Engineer-in-Chief of South Australia (Mr. A. B. Moncrieff), the *average navigability per annum* of the river—for all steamers—for the ten years, August, 1886, to December, 1896, was eleven months, and that during that period the river was continuously navigable for two years and four months, two years and nine months, and three years and seven months respectively *for all steamers*.

9. In reference to the following excerpt from Chapter XI., paragraph 19—"In 1897, Mr. Glynn referred to a map put in at the Sydney Convention, prepared and signed by F. N. Burchell. A portion of the map (see Appendix B) shows the navigable depth of the Murray; the volume there given as necessary to secure navigation is 337,000 cubic feet per minute."—I wish to state that this is an entire misconception of the purport of the said diagram:—

1. The zero on the gauges at Morgan and Overland Corner are not set at corresponding levels; *i.e.*, when the river is stationary, the zero on the gauge at Morgan is 18 inches lower than the zero on the gauge at Overland Corner.
2. The table of discharges on the margin of the diagram refers to the Morgan gauge, as is shown by the note.
3. The information giving the navigable depth at Overland Corner is on the portion of the plan which, for some reason, was not printed.

In my opinion the most reliable and complete evidence given to the Commission on the above subject is to be found on the official record of River Gaugings, taken at Morgan, Overland Corner, and Wentworth, which extended over a period of 18 years. This diagram (Exhibit 43) was put in by Mr. A. B. Moncrieff, Engineer-in-Chief of South Australia, and definitely states the depth required for the safe navigation of all steamers at the respective places named. It is a matter for regret that this diagram, which should have been accorded great weight as being official and impartial, has been entirely ignored in the preparation of the report.

9A. In this report no particular reference has been made to the gravitation diversion channel at Deep Creek, in connection with Cohuna Irrigation Trust, Victoria. It consists of a cutting on the Victorian side of the river Murray; the level of the bottom corresponds with summer level of the river, *i.e.*, 4 or 5 feet below navigation level (see question 3,604). I consider the above-mentioned work forms

a most serious precedent, and regard with great suspicion the effect it will have on the navigability of the river. I suggest that the off-take of any gravitation channel should not be below navigation level of the river.

10. I also dissent from recommendation 4, that the Common Law Doctrine of riparian rights is unsuitable in Australia, particularly in regard to the waters of the Murray Basin. I believe the riparian rights existing as between individuals, is the only equitable basis upon which to arrive at any decision in regard to the apportionment and distribution of the waters of the Murray River to the riparian States.

11. I further dissent from recommendation 5, as I consider that no obstruction should be placed across the River Murray for any such diversion as would be likely to impair the navigability of the river until such time as weiring and locking is undertaken for permanently ensuring navigation.

F. N. BURCHELL.
9.12.1902.

NOTE.

It is matter for regret that the representatives of the three States have been unable to reach unanimity on some of the issues dealt with in the report. We feel compelled to say, however, that the position assumed by the representative of South Australia seems somewhat inconsistent. Mr. Burchell, in his "Dissent," holds that the first and paramount duty of the Commission is to determine the minimum flow necessary for navigation; and insists that this minimum is four feet above zero on the Overland Corner gauge. He does not say that his colleagues have proposed to allow a less depth; but he leaves it to be inferred that they have, by going to much trouble to show that they have misconceived the meaning of a diagram signed by himself, on which the navigable depth and corresponding volume are figured.

At a meeting of the Commission on 12th November, and again on the 13th November, a resolution was submitted, beginning in the following terms:—"The navigation of the lower part of the main river, and of certain portions of the larger tributaries, will eventually be provided for by the construction of locks and weirs. Until the initiation of such a system of works, the upper riparian States shall restrict their total diversions, so that, for the seven months, July to January inclusive, the lower river shall be maintained in a condition of navigability equivalent to that of its natural conditions, in so far as relates to the passage of boats of the class heretofore trading thereon. This condition will be held to be fulfilled, when the level of water is not less than 4 feet on the gauge at Morgan. It will also be held to be met by restricting the diversions by New South Wales and Victoria, during these months, to about 440,000 cubic feet per minute." This resolution, concurred in by his colleagues, failed to secure the assent of Mr. Burchell; who, on the 14th November, proposed Resolution I., as it now stands on pages 52 and 53 of this report, and which was unanimously agreed to. In view of these, it is difficult to understand Mr. Burchell's position, or the grounds on which he refuses to concur in the finding of his colleagues.

Mr. Burchell says that—"The zero on the gauges at Morgan and Overland Corner are not set at corresponding levels." Assuming that what is meant is that the zeros do not apply to equal volumes, all that can be said is, that nothing of the kind can be inferred from the diagram put in in evidence, nor from that published with this report, and signed by Mr. Burchell himself. On the contrary, the diagram put in by Mr. Moncrieff states specifically that the zeros at Morgan and Overland Corner do correspond. What the navigable volume is Mr. Glynn evidently had no doubt when, at the Melbourne Convention, in 1898, he referred to Mr. Burchell's diagram, and to the navigable volume thereon shown as 337,000 cubic feet per minute. That Mr. Burchell himself adopted the same view at Adelaide, on the 24th May, 1902, may be inferred from his question, No. 135, to Mr. Catt: (See reference to this in page 51 of the Report).

In paragraphs 5 and 6 of the "Dissent," Mr. Burchell does not make himself quite clear. Evidently, however, the intention is to traverse Resolutions I. and V. in the report. Seeing that Resolution I. was proposed by himself, and that he agreed to both it and Resolution V., it is useless to subject these paragraphs to further criticism.

In paragraph 9, subclause 3, the following appears:—"The information giving the navigable depth at Overland Corner is on the portion of the plan which, for some reason, was not printed." In the reference column of the plan referred to, printed as Appendix B of the Report, is this note:—"Faint blue line F shows limit of depth of water required in river at Overland Corner to admit of safe navigation of steamers." The line F is shown on the printed plan, as well as the explanatory note above quoted. In Mr. Burchell's original plan, which is some 14 feet long, the note is repeated in identical words in another place. Surely it is too absurd for Mr. Burchell to complain that the Commission has not printed the whole of this plan.

J. DAVIS.
STUART MURRAY.

9TH DECEMBER, 1902.

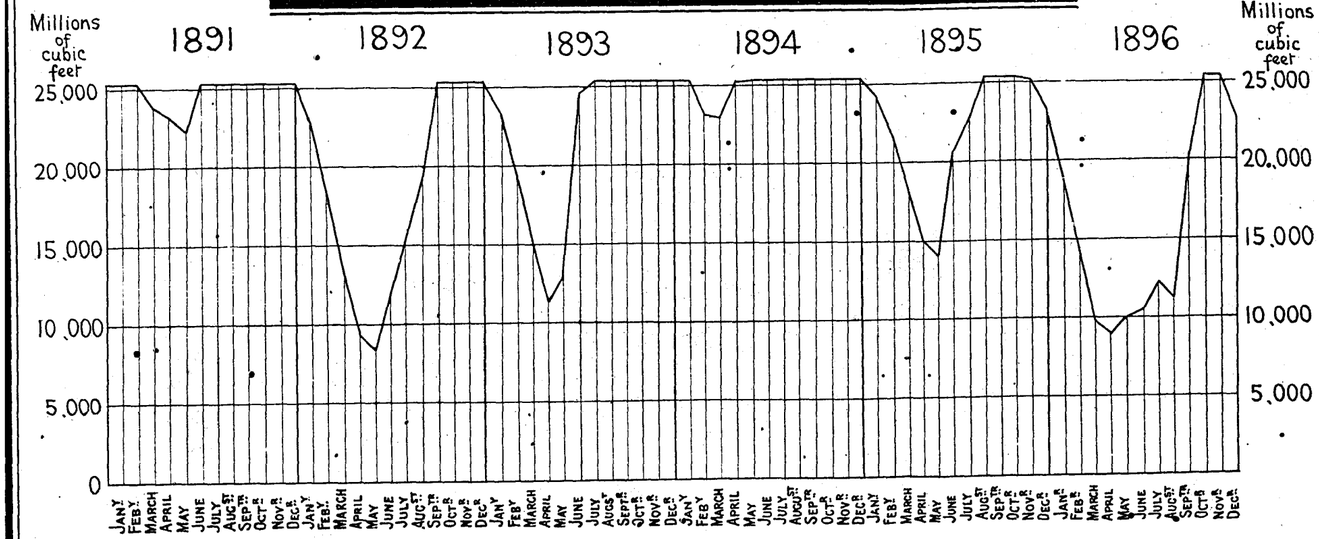
Appendix "A"

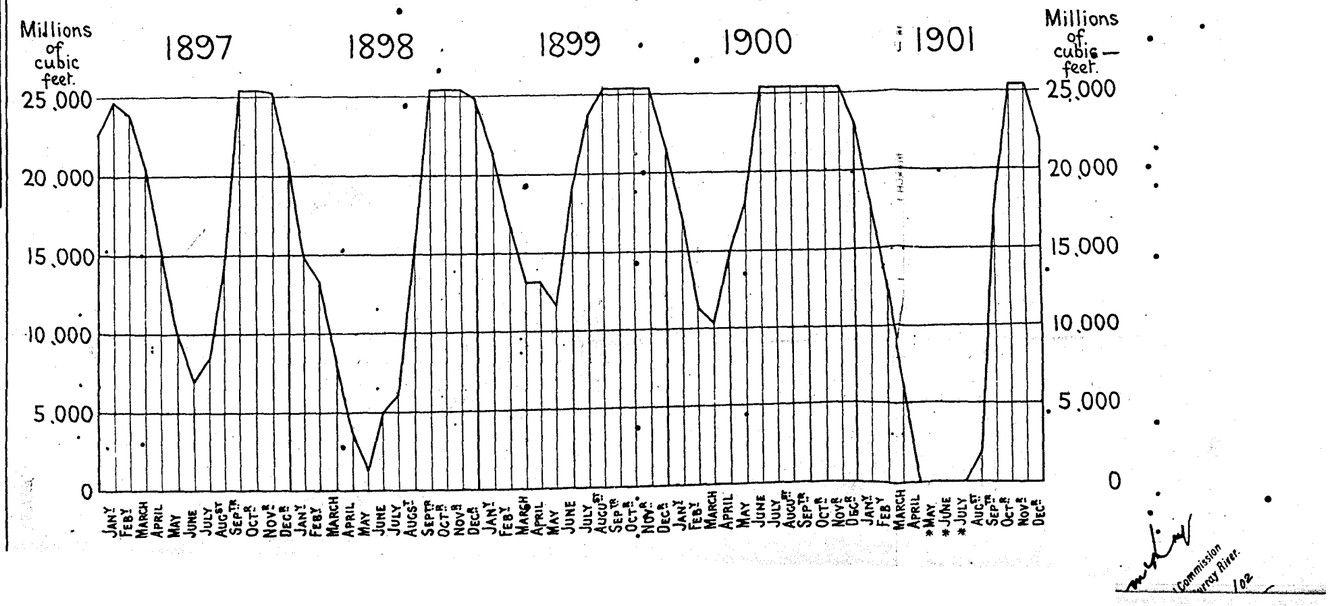
PROPOSED STORAGE RESERVOIR ON THE MURRAY RIVER AT CUMBEROONA

Diagram showing behaviour of reservoir in providing 180,000 cubic feet per minute at Bungowannah

Capacity of reservoir 253,67,000,000 cubic feet

J. Davis M.Inst.C.E. Present. 2nd Dec. 1902





Commission Murray River. 1902

Appendix "A".

PROPOSED STORAGE RESERVOIR

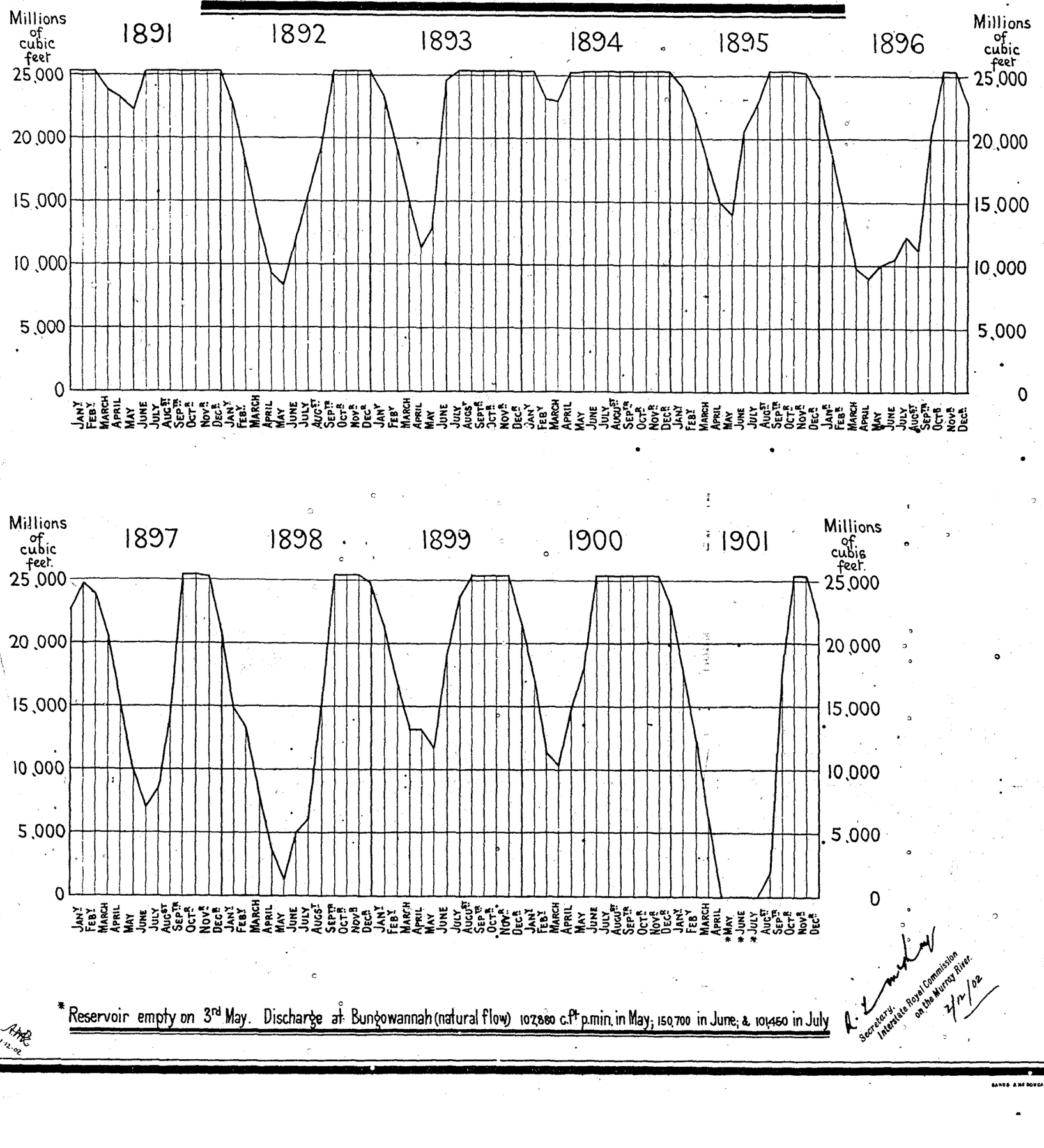
ON THE

MURRAY RIVER AT CUMBEROONA

Diagram showing behaviour of reservoir in providing 180,000 cubic feet per minute at Bungowannah

L. Davis M. Inst. C.E. Received 2nd Dec. 1902

Capacity of reservoir 25,367,000,000 cubic feet



* Reservoir empty on 3rd May. Discharge at Bungowannah (natural flow) 102,880 c.ft p.min. in May; 150,700 in June; & 101,450 in July

A. Lempriere
Secretary, Interstate Royal Commission on the Murray River.
2/12/02

1.12.02

SANDS & McDOUGALL LIMITED. MELB.

DIAGRAM OF GAUGINGS OF THE RIVER MURRAY.

Appendix "B".

JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

FEET. 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 2 FEET.

Cubic feet discharged per minute at various heights above summer level shown on the Morgan gauge, S.A. Gauged with improved current meter, with electrical register.

3,700,000
3,300,000
2,950,000
2,700,000
2,500,000
2,272,968
2,106,168
1,938,011
1,780,495
1,629,729
1,485,493
1,347,900
1,216,950
1,092,730
975,059
864,031
759,644
661,971
570,865
486,401
Export £121,555
408,579
337,453
272,911
215,012
163,758
119,175 SUMMER LEVEL.

REFERENCE.

1885

Firm red line A shows gaugings taken at Bourke, River Darling, N.S.W.
" yellow " B " " " Echuca, River Murray, Victoria.
" black " C " " " Wentworth, Junction Darling and Murray.
" blue " D " " " Overland Corner, River Murray, S.A.
Faint brown " E shows zero of river gauges, or summer level of River.
" blue " F " limit of depth of water required in River at Overland Corner gauge, to admit of safe navigation of steamers.
" yellow " G " the depth of water above summer level, at Overland Corner gauge, required to discharge the quantity of water proposed to be diverted from the Murray, in Report, 1886, prepared at the instance of the Royal Commission on Water Supply.
" dark " H " the depth of water above summer level at Overland Corner gauge, required to discharge the quantity proposed to be retained by N.S.W. in utilising the lakes along the Darling as storage reservoirs, suggested in Report, 1892 S. "Utilisation of the River Darling," added to the quantity suggested in Report by Victorian Commission, 1886.
" red " I " value of imports into South Australia via Darling and Murray.
" green " J " value of exports into Victoria and N. S. Wales via Rivers Murray and Darling.

1886

IMPORTS £1,138,000

EXPORTS £1,122,351

WENTWORTH

BOURKE

SANDS & McDOUGALL LIMITED, MELB.

AUSTRALASIAN FEDERAL CONVENTION, SYDNEY, 1897.

PLAN showing, at various points in their course during each month of several years, the levels of the Murray and Darling, the effect on trade of the rise and fall of the rivers; and to what extent, and within what time, a flood near the source affects the levels lower down.

1902.

INTERSTATE ROYAL COMMISSION

ON THE

RIVER MURRAY,

REPRESENTING THE

STATES OF NEW SOUTH WALES, VICTORIA, AND SOUTH AUSTRALIA.

MINUTES OF EVIDENCE

GIVEN BEFORE THE COMMISSIONERS.

SYDNEY: WILLIAM APPLEGATE GULLICK, GOVERNMENT PRINTER.
1902.

99294 *b*

INDEX TO WITNESSES.

Name.	Locality.	Page.
Adams, G.	Kerang	117
Adams, H. D.	Narrandera	170
Adams J.	Swan Hill	106, 111
Allan J.	Tatura	75
Allen, W. J.	Melbourne	307
Andrews, H.	Tallangatta	303
Baillie, A.	Tumbarumba	295
Baracchi, P.	Melbourne	191
Barnes, M.	Boort	96
Baseby, B.	Mannum	33
Battye, A.	Port Victor	13
Baylis, J.	Narrandera	168
Bedwell, J. F.	Numurkah	144
Bell, T.	Tumbarumba	297
Bennett, M.	Kerang	122
Billson, W. J.	Albury	222
Blackwood, R. O.	*Deniliquin*	177
Blair, J.	Berrigan	174
Body, F. E.	Gin Gin Creek	257
Bourchier, R. C.	Cobram	183
Boultbee, J. W.	Sydney	235
Bowman, T. R.	Milang	21
Bowen, W. J.	Gin Gin Weir	258
Boynton, T. H.	Balranald	66
Bradly, J. F.	Melbourne	189
Braund, I.	Echuca	91
Brewer, C. T.	Corowa	218
Brien, A.	Macorna	101
Brodie, J. A.	Sydney	248
Brooks, T.	Hillston	156
Brown, J. T., M.L.A.	Shepparton	83
Budd, W.	Euabalong	151
Burge, L.	Rushworth	71
Burgess, D.	Shepparton	84
Bussell, W. J.	Mannum	33
Butter, A. K.	Gin Gin Weir	257
Cameron D.	Echuca	85
Carey, J. A.	Tatura	76
Carruthers, J. H., M.L.A.	Sydney	237, 261
Casley, G.	Deniliquin	181
Castles, A. E.	Rushworth	72
Catt, Hon. A., M.P.	Adelaide	10
Chaffey, C. F.	Renmark	45
Chaffey, W. B.	Mildura	60
Chalmers, D.	Boort	99
Checchi, E.	Melbourne	4, 133, 191
Chesterman, A. H.	,,	310
Christie, J. S.	Numurkah	144
Clarke, J. A. K.	Shepparton	84
Clark, J. W.	Renmark	45
Coane, J. M., C.E.	Shepparton	77
Cobbett, P., M.A., D.C.L.	Sydney	242
Cochrane, M.	Blanchetown	34
Cowan, J.	Murray Bridge	30
Cox, W. G., C.E.	Sydney	248
Crawford, J.	Rochester	94
Crothers, T.	Rushworth	71
Crowe, C.	Tooma	299
Crowther, H.	Macorna	99
Cudmore, A. F.	Wentworth	47
Cudmore, H. D.	Port Victor	14
Cullen, J., M.L.A.	Kerang	114
Cullen, W. P., LL.D., M.L.C.	Sydney	229
Cumming, A.	Tocabil Station	154
Cummins, D. F.	Hay	165
Curlett, T.	Macorna	101
Curtis, W. H.	Cobram	185
Cutlack, F. W.	Renmark	43
Davey, W. J.	Kerang	124
Davy, H.	Balranald	65
Dennis, J. W.	Kerang	113
Dethridge, J. S.	Melbourne	124
Dill, J.	*Hay*	161
Doherty, P.	Rochester	95
Dowden, W.	Melbourne	104
Dunk, A. L.	Morgan	39
Dunk, W. P.	Milang	22
Farrall, H. H.	Cobram	187
Fitzgerald, J. P.	Bourke	250
Forge, T.	Echuca	88
Forrest, M.	Gin Gin Weir	257
Fowler, T. W., M.C.E., F.R.G.S.	Melbourne	188
Franklin, F. A., *M. Inst.* C.E.	*Sydney*	278
Fraser, M. C.	Shepparton	83
Freeman, F.	Melbourne	215
Garnett, F.	Milang	25
Garson, G.	Rushworth	68, 74
Gibson, R.	Hay	157
Glover, R.	Shepparton	82
Glynn, P. McM., M.H.R.	Adelaide	6, 200
Goode, T.	Goolwa	18
Gordon, G.	Shepparton	81
Gorman, E. J.	Berrigan	170
Gorman, R. F.	,,	176
Grant, C. J.	Mildura	52
Gray, J.	Swan Hill	105
Greggery, W. J.	Berrigan	177
Gunn, W.	Rushworth	71
Hackett, G. G.	Milang	23
Ham, H. M.	Rochester	95
Hammond, J. J.	Bourke	253
Harben, H. L.	Balranald	67
Hare, A. J.	Sydney	235
Harriman, T.	Rushworth	72
Harris, L.	Berrigan	176
Harrison, J.	Cobram	186
Harvey, M.	Kerang	124
Hastings, R.	Swan Hill	106
Hawkes, F. J.	Mildura	60
Hayes, F. W.	Albury	220
Hector, W.	Tatura	74, 77
Heinecke, G. T.	Tumbarumba	294, 300
Holding, W. J.	Wentworth	50
Holmes, R. W.	Deniliquin	181
Horan, M. J.	Euston	63
Horton, G.	Hay	164
Huie, J.	Narrandera	167
Hyde, F. E.	Milang	23
Jameson, A.	Deniliquin	182
Jeffercy, G.	Victor Harbour	12
Johnston, D.	Swan Hill	108
Johnston, J.	Hay	165
Jones, J.	Murray Bridge	29
Jones, J.	Berrigan	175
Jones, J. W.	Adelaide	210
Jones, O.	Hay	164
Kater, E. H.	Warren	254
Kelly, T.	Mildura	56
Kelly, T.	Numurkah	145
Kennedy, D.	Boort	97
Kennedy, P.	Albury	221
Kenyon, A. S.	Melbourne	5, 125, 130, 190
King, H.	Morgan	37
Kinnivane, J.	Warren	256
Knight, J.	Cudgellico	152
Lancaster, B.	Numurkah	142
Landseer, A. H.	Milang	24
Langlands, D.	Tooma	297
Langtree, J.	Berrigan	173
Leary, J.	Wentworth	49
Lindon, R.	Cudgellico	153
Lindsay, S.	Balranald	67
MacGregor, J.	Numurkah	83, 145
Mackenzie, D.	Kerahg	114
Macpherson, W. A.	Balranald	64
Mann, A.	Kerang	123
Mann, C. E.	Macorna	100
Martin, A. L.	Murray Bridge	30
Martin, E. D.	Bourke	250
Mason, J. W., M.L.A.	Rushworth	73
Matthews, J.	Albury	222
McCaughey, S., M.L.C.	Narrandera	165
McClelland, D. J.	Kerang	119
McDougal, H.	Victor Harbour	13
McFarlane, A.	Wellington Lodge	26
McGrady, E.	Berrigan	176
McInnes, D.	Tumbarumba	296
McIntosh, S.	Morgan	34
McIvor, D.	Macorna	102
McKee, R.	Rochester	94
McKellar, D. E.	Cudgellico	153

Name.	Locality.	Page.
McKenzie, H.	Echuca	90
McKinney, H. G., M. Inst. C.E.	Sydney	265, 272
McMaster, C. J.	,,	304
McMonnies, R. R.	Euston	62
Meiklejohn, J.	Numurkah	143
Meldrum, J.	,,	142
Miechel, P.	Shepparton	85
Miers, A.	Adelaide	197
Mills, S.	Sydney	146, 270
Mitchell, W. E.	Bringenbrong	309
Monaghan, P. M.	Swan Hill	110
Moncrieff, A. B., M. Inst. C.E.	Adelaide	10, 193
Montgomery, J.	Warren	255
Moodie, J. E.	Berrigan	175
Morphett, H. W.	Wood's Point	27
Morton, G. H.	Kerang	111
Moyle, W.	Murray Bridge	51
Mullen, A. W.	Bourke	252
Murray, P. M.	Balranald	63
Murray, T. J.	Tallangatta	302
Nally, M.	Melbourne	6
Newell, W. F.	Goolwa	19
Newton, J.	Hay	158
Nicholls, F.	Point Sturt	20
Nicholson, D.	Macorna	101
Nugent, J.	Shepparton	80
Odgers, W. H.	Boort	98
O'Donnell, P. J.	Kerang	116
O'Dwyer, A. J.	Echuca	89
O'Dwyer, E. D.	Berrigan	172
Ogier, J. C. H.	Melbourne	215
Oliver, A., M.A.	Sydney	223
Oliver, C.	Wellington Lodge	26
Orr, W., M.L.C.	Shepparton	81
Osmond, G.	Tooma	300
Overall, A.	Murray Bridge	31
Pagan, G.	Melbourne	187
Paton, T.	Tooma	299
Paton, A.	Tallangatta	302
Peacock, M.	Kerang	115, 123
Peel, G.	,,	123
Peel, T.	,,	114
Phelts, T. G.	Berrigan	177
Phillips, T. F.	Tumbarumba	297
Pickering, F. W.	Mildura	58
Pickhills, G. D.	Bourke	252
Piggin, A. A.	Corowa	218
Piggin, F. C.	,,	217
Price, J. H.	Wentworth	50
Ramsay, S. F.	Tumbarumba	296
Randall, A. D.	Kerang	121
Ready, R.	Corowa	219
Rees, R. B.	Swan Hill	107, 111
Reid, W. S.	Victor Harbour	12
Reynoldson, G.	Berrigan	172
Reynoldson, J. R.	,,	174
Richardson, R.	Kerang	118
Ringwood, F. W.	Adelaide	198
Ritchie, G., M.P.	Goolwa	15
Ritchie, J. D.	,,	19
Ritchie, P. K.	Corowa	216
Rockett, W. J.	Euston	62
Rogers, G. V.	Milang	25
Ronald, A.	Hay	162
Roscholler, W. R.	Boort	98
Rouvray, A. A.	Echuca	90
Russell, G.	Numurkah	145
Russell, H. C.	Sydney	148
Ruttle, A.	Cobram	186
Salmond, J. W.	Adelaide	207
Scott, T.	Morgan	40
Scott, T. M.	Gin Gin Weir	256
Seaver, T. W.	Hillston	156
Semmens, E.	Mildura	59
Senior, A.	Bourke	251
Sharman, G. A.	Lake Victoria Station	46
Sinclair, D.	Echuca	89
Slatter, F.	Boort	96
Smail, H. S. I., B.E.	Sydney	279
Smith, J. M.	Renmark	40
Smithwick, R.	Talmalmo	68
Sparrow, F.	Deniliquin	183
Stewart, J. H.	Swan Hill	108
Stewart, R. W.	Hillston	154
Stickles, G.	Shepparton	85
Stickles, G.	Numurkah	144
Sutton, C.	Boort	97
Sutton, W. H.	Bourke	252
Sutherland, H.	Macorna	102
Sutherland, J.	Shepparton	84
Sutherland, P.	Tallangatta	303
Symonds, J.	Warren	254
Taverner, F. J.	Kerang	113
Te Kloot, H.	Warren	256
Tetlow, J.	Echuca	87
Thompson, A. H.	Rutherglen	219
Thompson, G. A.	Albury	220
Thomson, H. P.	Mildura	62
Thomson, J.	Tumbarumba	295
Thorne, J.	Shepparton	82
Thwaites, W., M. Inst. C.E.	Melbourne	103
Todd, M. A.	Bourke	251
Tompson, F. C.	Warren	255
Turner, V. H.	Sydney	281
Vains, G.	Koondrook	117
Vandeleur, F. E.	Swan Hill	109
Wade, L. A. B.	Sydney	1, 149, 284, 305
Waddy, R. W. M.	Adelaide	193
Walker, J.	Warren	255
Walker, J. W.	Mannum	32
Watson, J. W.	Tumbarumba	296
Watson, T.	Rochester	95
Watt, W. H.	Hay	160
Waugh, A. J. B.	Swan Hill	110
Waugh, J.	Tarrandera	169
Webb, W. T.	Rochester	91
Welch, G.	Macorna	102
Wheeler, W.	Hay	164
White, A. W. H.	Echuca	90
Wilkinson, J.	Lake Victoria Station	47
Williams, F. H.	Albury	222
Williams, J.	Milang	24
Williamson, D. W.	Kerang	113
Wilson, B. R.	Echuca	86
Wilson, W. C.	Wentworth	51
Wiltshire, D.	Swan Hill	111
Winkley, J. H.	Koondrook	118
Wolter, W. A. L.	Goolwa	16
Wood, P.	Adelaide	192
Wright, J., C.E.	Sydney	258
Wright, P.	Tallangatta	301
Young, D. H.	,,	304

MINUTES OF EVIDENCE.

FRIDAY, 16 *MAY*, 1902.

[*The Commission met in the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Leslie Augustus Burton Wade, Principal Engineer for Water Supply and Sewerage, sworn and examined:—

L. A. B. Wade. 16 May, 1902.

1. *President.*] What is your name, and what is your position? Leslie Augustus Burton Wade, Principal Engineer, Water Supply and Sewerage.

2. You have prepared a map showing the drainage area of the Murray River so far as New South Wales is concerned, which you put in? Yes. [*Exhibit* I.]

3. You put in the discharges taken by officers of the New South Wales Government in respect of the Murrumbidgee River at Hay, and the Darling River at Wilcannia, from the year 1885 to present date; I find that these records are incomplete;—will you explain? In the case of Hay, the very high rivers are not included during the years 1889, 1891, and 1894. Wilcannia is complete. The discharge of the Billabong we can neglect altogether. [*Appendices* 1, 2.] Discharges of Murrumbidgee and Darling.

4. You have also prepared the monthly discharges of the River Murray at Albury, from the year 1885 to date? Yes. From these discharges we could only give one complete year—1896; the remainder are all broken in the higher discharges. It would be interesting to compare these discharges with those obtained by the Victorian Water Supply Department, as the methods used in obtaining them are different. [*Appendix* 3.] Discharge of Murray at Albury.

5. *Mr. Murray.*] What methods do you use? Our records were obtained entirely by the rod system.

6. *President.*] The Commission asked that information should be supplied relative to the navigable levels of the Murray, also a statement of the river-borne traffic during the past twenty years;—have you got them? I put in a statement of the traffic as supplied by the Customs Department. River-borne traffic.

Commonwealth of Australia,
Customs and Excise Office, Customs Office, Sydney, 15 May, 1902.

MEMORANDUM.

Subject:—Tonnage and River-borne Traffic on the River Murray during the last sixteen years.

The reason of there being so little outward shipping at Moama is explained by the fact that all the facilities for loading are at Echuca, on the Victorian side of the Murray, and the principal articles of commerce are supplied by Victoria. Thus, a steamer lands all her cargo at Echuca, and then clears at the Customs for Moama, and is taken into the shipping statistics at that station as having entered inwards from Victoria; she then clears coastwise for another port in New South Wales, and consequently is not taken into statistics as having entered outwards. The same applies to shipping on the return trip. All vessels clear from Swan Hill Crossing, or other New South Wales station direct to Echuca; thus Moama would have practically no outward shipping.

Owing to the country between Albury and Moama (a distance of about 300 miles) being supplied with railways and bridges, the river traffic has ceased between those towns.

I am unable to express an opinion as to the probable trade which will be dependent upon the facilities for, and the enterprise embarked upon, irrigation areas.

The trade will undoubtedly increase with a permanent river; but to what extent, and within what period, it is difficult to say.

N. LOCKYER,
Collector of Customs.

The President, Inter-State Royal Commission on the River Murray, Sydney.

Tonnage of Vessels entered and Cleared at each Port of the Murray from 1886 to 1901.

Year.	Inwards.			Outwards.		
	Tonnage with Cargo.	Tonnage in Ballast.	Total Tonnage.	Tonnage with Cargo.	Tonnage in Ballast.	Total Tonnage.
			Wentworth.			
1886	25,366	.....	25,366	26,174	.....	26,174
1887	34,547	845	35,392	29,473	5,919	35,392
1888	22,427	.....	22,427	21,929	.....	21,929
1889	30,020	8,315	38,335	29,666	4,621	34,287
1890	38,444	4,193	42,637	34,971	3,241	38,212
1891	33,847	4,141	37,988	39,301	7,448	46,749
1892	28,138	2,933	31,071	30,621	9,843	40,464
1893	35,156	4,732	39,888	38,324	9,565	47,889
1894	41,416	5,808	47,224	40,754	14,378	55,132
1895	33,622	3,867	37,489	27,722	14,935	42,657
1896	36,771	1,852	38,623	36,256	11,207	47,463
1897	21,443	3,079	24,522	23,904	6,745	30,649
1898	19,987	2,332	22,319	21,860	5,827	27,687
1899	20,361	1,285	21,646	23,105	6,453	29,558
1900	19,395	1,071	20,466	27,387	2,846	30,233
1901	17,397	1,582	18,979	17,122	6,165	23,287

L. A. B. Wade. 16 May, 1902.

Year.	INWARDS. Tonnage with Cargo.	INWARDS. Tonnage in Ballast.	INWARDS. Total Tonnage.	OUTWARDS. Tonnage with Cargo.	OUTWARDS. Tonnage in Ballast.	OUTWARDS. Total Tonnage.
			Moama.			
1886	16,978	454	17,432	.....	200	200
1887	29,061	1,267	30,328	.....	356	356
1888	27,010	1,329	23,339	300	.....	300
1889	26,078	933	27,011	442	194	636
1890	25,850	902	26,752	.....	85	85
1891	29,330	1,039	30,369	.....	.....	.....
1892	20,870	1,006	21,876	.....	.....	.....
1893	19,967	2,703	22,670	.....	.....	.....
1894	19,331	3,547	22,878	.....	.....	.....
1895	18,239	2,871	21,110	2,176	485	2,661
1896	18,356	1,762	20,118	.....	2,183	2,183
1897	15,825	4,481	20,306	517	.....	517
1898	16,042	1,459	17,501	123	905	1,028
1899	17,991	267	18,258	.....	.....	.....
1900	25,011	663	25,674	.....	.....	.....
1901	16,661	3,394	20,055	.....	.....	.....
			Swan Hill Crossing.			
1886	9,650	138	9,788	8,792	.....	8,792
1887	10,742	25	10,767	15,630	.....	15,630
1888	14,963	89	15,052	13,342	944	14,286
1889	7,910	201	8,111	12,751	1,016	13,767
1890	12,563	142	13,605	13,601	145	13,746
1891	17,752	315	18,067	18,372	300	18,672
1892	16,980	130	17,110	11,708	40	11,748
1893	9,764	85	9,849	13,870	.....	13,870
1894	13,318	309	13,627	14,540	895	15,435
1895	4,845	23	4,868	15,149	63	15,212
1896	6,172	262	6,434	13,644	187	13,831
1897	18,910	.....	18,910	14,645	413	15,058
1898	20,466	24	20,490	15,450	2,102	17,552
1899	24,875	307	25,182	11,083	4,300	15,383
1900	28,111	78	28,189	21,743	96	21,839
1901	20,890	.....	20,890	16,158	.....	16,158
			Tocumwal.			
1886	.....	.....	.....	600	96	696
1887	142	.....	142	1,300	100	1,400
1888	.....	.....	.....	1,000	.....	1,000
1889	1,780	.....	1,780	1,808	180	1,988
1890	1,406	.....	1,406	1,206	196	1,402
1891	.....	.....	.....	650	.....	650
1892	.....	.....	.....	.....	.....	.....
1893	.....	.....	.....	.....	.....	.....
1894	.....	.....	.....	.....	.....	.....
1895	.....	.....	.....	.....	.....	.....
1896	.....	.....	.....	.....	.....	.....
1897	.....	.....	.....	.....	.....	.....
1898	.....	.....	.....	.....	.....	.....
1899	.....	.....	.....	.....	.....	.....
1900	.....	.....	.....	.....	.....	.....
1901	.....	.....	.....	.....	.....	.....
			Euston.			
1886	.....	.....	.....	.....	.....	.....
1887	.....	.....	.....	.....	.....	.....
1888	.....	.....	.....	.....	.....	.....
1889	488	.....	488	535	332	867
1890	1,292	690	1,982	169	100	269
1891	684	700	1,384	1,743	3,204	4,947
1892	6,765	140	6,905	1,781	7,176	8,957
1893	10,689	.....	10,689	483	10,206	10,689
1894	15,743	2,782	18,525	3,932	14,491	18,423
1895	10,683	4,062	14,745	5,808	9,237	15,045
1896	7,074	3,174	10,248	1,885	8,690	10,575
1897	7,835	1,843	9,678	3,718	3,679	7,397
1898	1,601	327	1,928	4,230	3,585	7,824
1899	2,595	1,561	4,156	8,040	5,494	13,534
1900	3,010	1,994	5,004	6,300	6,681	12,981
1901	1,696	1,588	3,284	4,250	7,030	11,280

Customs and Excise Office, Customs House, Sydney, 15th May, 1902.

N. LOCKYER, Collector of Customs.

Section of Murray.

7. You have prepared longitudinal sections of the River Murray from Wentworth to Albury, giving levels of the flood of 1867, the bed of the river, and what you consider would be the navigable level of the river at various points along the course, which you put in? Yes. [*Exhibit* 6.]

Section of Murrumbidgee.

8. On the same sheet there is a longitudinal section of the Murrumbidgee between its junction with the Murray River and Gundagai, showing the like information with regard to that river? Yes.

9. You have also prepared other information with regard to the navigable levels of the river? Yes; a diagram of the river heights at each gauging station, showing the periods of navigation on the basis of the navigation levels shown on the longitudinal section. [*Exhibit* 7.]

Diversion works.

10. You have a plan showing the Murray and Murrumbidgee Rivers diversion works, also the catchment areas, with the impounding reservoirs at the head of these rivers, the existing weirs, and the proposed works? Yes. [*Exhibit* 8.] The Works already constructed by the Department for the purpose of diverting water from the Murray consist of a cutting at head of Tuppal Creek, and a cutting at the head of Eagle Creek. In connection with these I put in two diagrams showing particulars of these diversion works. [*Appendices* 4, 5.] These are the whole of the existing works constructed by Government, so far as New South Wales is concerned. The only other diversion on the Murray is under the authority of

L. A. B. Wade. 16 May, 1902.

of the Wentworth Irrigation Act—54 Vic. No. 7, N.S.W.,—a copy of which I put in. At the present time there is a pump in operation capable of throwing about 2,500 gallons per minute. The area included in the Trust is 10,000 acres.

Proposed works on Murray River.

11. Have you any information as to quantity of water actually being pumped? No; there is very little being done. The proposed works on the Murray are a canal to take off either at Bungowannah or Tocumwal, as may be ultimately determined; the quantity to be taken in connection with the canal at Bungowannah has been set down at 1,300 cubic feet per second. In addition, two storages have been proposed, one at Cumberoona and one at Talmalmo, on the main stream of the Murray. There is also another possible storage at Murray Gate, on the Swampy Plains River, New South Wales, which may be utilised in addition to those mentioned. That includes the whole of the existing and proposed works on the Murray, with the exception of water that has been appropriated under licenses issued under the Water Rights Act, which I will put in at a later date. The only diversion constructed by the Government on the Murrumbidgee is at the head of the Yanko Creek. I put in a diagram showing particulars of the diversion. [*Appendix* 6.]

Yanko Creek.

In addition to this, an Irrigation Trust has been constituted at Hay under an Act of Parliament, which I put in—55 Vic. No. 25, N.S.W. The area of the Trust is 2,880 acres. The capacity of the pump is about 2,500 gallons per minute.

Hay.

The works proposed to be constructed by the Government are two canals, taking off at Narrandera—the one on the northern side having a capacity of 500 cubic feet per second, and that on the southern side a capacity of 1,000 cubic feet per second.

Murrumbidgee canals.

It is also proposed to construct a weir in the Murrumbidgee, at a point corresponding with No. 8 lock site in the proposed locking scheme below Hay. This weir is for the purpose of diverting water over the area of flooded country indicated in blue on *Exhibit* 8. The actual quantity of water proposed to be diverted at this weir has not yet been determined, but the matter will be placed definitely before the Commission later on. It is also proposed to construct a storage reservoir at Barrenjack, on the Upper Murrumbidgee. An Act of Parliament is also in existence authorising an Irrigation Trust at Balranald. Advantage has not yet been taken of these powers, nothing having been done in the matter. The area proposed to be included in the Trust is 2,000 acres. I put in a copy of Act 56 Vic. No. 26, N.S.W. This includes the whole of the existing and proposed works, with the exception of water appropriated under the Water Rights Act for which licenses have been issued. This information will be provided later on.

Murrumbidgee weir.

Reservoir, Barrenjack.

Existing and proposed works on Lachlan River.

12. You put in plan showing the work carried out and proposed on the Lachlan River? Yes; also, on the same sheet, a longitudinal section of the river. [*Exhibit* 15.] The Lachlan is the main branch of the Murrumbidgee. The works constructed by the Department for the diversion of the water are a weir and cutting in the Lachlan River, at the head of the Booberoi Creek. Booberoi Creek is an ana-branch of the Lachlan, and the water diverted into it eventually goes back again, no water being permanently diverted from the river. A weir and cutting have also been constructed at the head of the Willandra Billabong. The water diverted through this cutting flows in a westerly direction from the river, and none of the water diverted returns. I put in diagram setting forth the capacity of these works. [*Appendix* 7.] It is proposed to raise this weir and increase the capacity of the cutting. This information is also shown on the same diagram. Another weir and cutting has been constructed on the Lachlan, at the head of Middle Billabong Creek. The water diverted flows in a south-west direction, and a portion at the present time returns again to the river through the Box Creek; but it is proposed to throw a dam across that creek to prevent the return of any of the water to the river. I put in a diagram showing the capacity of the work at Middle Billabong Creek. [*Appendix* 8.] It is proposed to increase the capacity of this work, and the increased capacity is also shown on the same diagram. A cutting has been made from the Lachlan to Lake Cudgellico for the purpose of filling the Lake for storage purposes. It is also proposed to construct a weir in the river, below the mouth of this cutting, to increase the facilities for filling the storage. The capacity of Lake Cudgellico storage to the height to what it is proposed to be filled is 1,185,000,000 cubic feet. It is proposed to divide the water so stored equally in the dry summer months between the channel of the Lachlan and the Willandra, and Middle Billabong divisions. It is also proposed to construct a large storage in the Upper Lachlan, at Wyangalla, near Mount McDonald, particulars of which will be supplied. This includes the whole of the existing and proposed works, with the exception of water appropriated under the Water Rights Act, for which licenses have been issued, which information will be supplied later on.

Lachlan River.

13. *Mr. Murray.*] I understood you to say, speaking of the Murrumbidgee, that the Lachlan is the main branch of the river? No, it is the main tributary, but it contributes only to a small extent to the flow of the Murrumbidgee. You will see on the plan exhibited a larger area, coloured blue, just above the junction of the Lachlan and Murrumbidgee. That area is flooded country, and even in moderate seasons, owing to the enormous area, the Lachlan contributes only a small portion to the flow of the Murrumbidgee.

14. I suppose it is taken up by evaporation? Yes; by evaporation and soakage.

15. *Mr. Burchell.*] To what depth would it be flooded? It is flooded in patches.

Depth of flooding.

16. Would it average 12 inches? In the low places it would be feet deep. I dare say the whole flow in a big flood would average 12 inches. The portion marked 950 miles on the plan is where the channel is well defined. Below Oxley the river is little more than a gutter, and the water is lost over the reed beds. During the highest freshets the water overflows above Oxley. In the very big floods, even after this country is flooded, much drains off, and contributes to a certain extent to the Murrumbidgee; but in medium years the contribution from the Lachlan is very small. The portion of the country to the south of the Murrumbidgee is of rolling polygonum country, and you get gutters where you could swim a horse, and in other places it is only covered a few inches.

Zones of floods.

17. What does that country carry—stock? Unless it is flooded it carries nothing; but after a flood it would carry one sheep to the acre. As you come from Hay to Balranald, the banks of the river get lower, and there are practically three zones of flooding. The first flooding takes place where the banks are very low between Balranald and the junction of the Lachlan; the next zone, where the banks are slightly higher between the Lachlan and Maude; the very highest zone, which is only covered in exceptional floods, is the zone above Maude. The lower zone between Balranald and the junction of the Lachlan would be flooded to a certain extent, probably two years out of every three; but I could supply fuller particulars later on with regard to that matter.

18. When do you begin flooding? It is flooded naturally.

19. *Mr. Murray.*] Has your Department considered the question of defining the Lachlan through the flooded country? No.

20. Have you considered whether it would be advisable? We have thought it would not be advisable; that portion of the country gets naturally irrigated.

21.

L. A. B. Wade. 16 May, 1902.

Details of works on Darling.

21. Have you made any estimate of the cost of defining? No; in addition to the portion of the Lachlan shown on *Exhibit* 15, the details of work, so far as New South Wales is concerned, are shown on *Appendix* 7, except the upper portions of the river, which will be shown on another sheet (*Appendix* 8). The only works constructed on the Darling by the New South Wales Government, are a lock and weir at Bourke, shown on *Exhibit* 18, built with a view of ascertaining the most suitable type of weir to be used in connection with the scheme for locking the whole river. It is proposed, and surveys are in hand at the present time, to divert a supply of water down the Great Ana-branch into the lakes along the course of that channel. Another diversion, which has not yet been surveyed, is proposed from the Darling down to the Talyawalka Creek, for the purpose of supplying the lakes along the creek. The water diverted into these lakes will not again return into the river. There is also a proposal to make a cutting at the head of Acres Billabong; but this being an ana-branch, all surplus water not retained in the channel will return to the river. *Exhibit* 18 shows a section of the Darling from Wentworth to Boggabilla, a length of about 1,500 miles.

Works constructed and proposed on Bogan, Macquarie, and Castlereagh Rivers.

22. *President.*] You put in a plan showing the Bogan, Macquarie, and Castlereagh Rivers with branches to the Darling, showing the works constructed and proposed on these rivers? Yes. The first branch on the eastern side is the Bogan, upon which no works have been constructed or proposed. The catchment area is very small compared with the length of the stream, and in a dry or moderate season very seldom runs through to the Darling. On the Macquarie a weir has been constructed at Gin Gin for the purpose of diverting a supply down the Ewenmar Creek. This creek is an ana-branch, and all surplus water returns to the Macquarie. It has been proposed to connect the Ewenmar Creek by a series of cuttings to the Marthaguy Creek and Gum Creek; but since that proposal was made very extensive supplies of artesian water have been struck in the basin, and it is improbable now that these cuttings will ever be constructed. A cutting has been constructed to divert a supply from the Macquarie in the Belaringar Creek at Murray's Break. A weir and cutting has been constructed in the vicinity of Warren to divert a supply down the Gunningbar Creek, Duck Creek, and Crooked Creek; the water diverted down Belaringar Creek and Gunningbar Creek ultimately goes into the Bogan River, that diverted down Crooked Creek finds its way into the Marra Creek, then into the main Darling Channel, so that any surplus water not conserved in these creeks eventually finds its way into the main channel of the Darling. I put in diagrams showing the capacity of the works in connection with these diversions. [*Appendices* 9, 10, 11.] It may be mentioned that in dry years the flow of the Macquarie never goes past the Macquarie marshes into the Darling River, and even in moderate years the quantity passing through is not very great. It is proposed to construct a storage reservoir on the Upper Macquarie at Wotton, slightly below the town of Bathurst. [*Exhibit* 22.] This includes the whole of the existing and proposed works with the exception of water appropriated under the Water Rights Act for which licenses have been issued. This information will be provided later on. The Castlereagh has a very small catchment with a long sandy channel, and seldom contributes anything to the flow of the Darling.

Works proposed and completed on Namoi River.

23. You put in plan showing the Namoi River, and the works proposed and completed? Yes. [*Exhibit* 23.] No diversion works have been constructed on the Namoi River; but surveys have been completed for a cutting at the head of Pian Creek, a large ana-branch of the Namoi which leaves the river slightly above Wee Waa, and joins it again near Walgett. That includes the whole of the existing and proposed works, with the exception of water appropriated under the Water Rights Act for which licenses have been issued.

Works proposed and constructed on Dumaresq, McIntyre, and Gwydir Rivers.

24. You have also prepared a plan showing the Dumaresq, McIntyre, and Gwydir Rivers, and the works carried out and proposed thereon? Yes. [*Exhibit* 24.] At the present time works are under construction for the purpose of diverting a supply of water from the Gwydir River into the Meehi River; thence from the Meehi into the Moomin Creek, and from the Moomin Creek into the Thalaba Creek. I put in diagrams showing the capacities of these diversions. [*Appendices* 12, 13, 14.] It is proposed to construct a cutting from the Gwydir at the head of Carore Creek for the purpose of diverting a supply down that creek into the Gil Gil Creek. It is also proposed to cut through a bar in the channel of the Meehi Creek at its bifurcation with the Gwydir. The water diverted by the whole of these works which is not absorbed or conserved in the bed of the channel referred to will eventually find its way into the main channel of the Darling. The early history of the Gwydir River will throw some light on the effect of these works. The Gwydir River originally bifurcated into the channels known respectively as the Gwydir and Meehi Channels. Within the last forty years, however, an accumulation of timber has taken place in the channel of the Gwydir at what is called "The Raft." This accumulation of timber has collected silt, and formed a solid bar across the river extending between 3 and 4 miles. Consequently the whole flow of the Gwydir has been diverted and spread over what is known as "Water-course country," covering an area of 1,130 square miles, and shown on the plan by a blue tint. [*Exhibit* 24.] The effect of the cutting mentioned will be to divert a portion of this water that would otherwise spread over the Water-course country, and be evaporated, into well-defined channels from which the surplus water will eventually find its way to the Darling. It is not at present proposed to construct any works either on the Dumaresq or the McIntyre Rivers. I put in two diagrams showing the capacity of the proposed works at the bifurcation of the Gwydir and the Meehi and at the head of the Carore Creek. [*Appendices* 15, 16.] This includes the whole of the existing and proposed works, with the exception of water appropriated under the Water Rights Act for which licenses have been issued.

TUESDAY, 20 MAY, 1902.

[*The Commission met at Modern Chambers, Collins-street, Melbourne.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Ettore Checchi, Chief Assistant Engineer in the Victorian Water Supply Department, sworn and examined:—

E. Checchi. 20 May, 1902.

Gaugings of Murray River and tributaries.

25. *President.*] What is your name? Ettore Checchi.
26. What is your position? Chief Assistant Engineer in the Victorian Water Supply Department.
27. You have prepared certain information for the Commission? Yes.
28. You hand in a publication bringing up, in a concise form, the whole of the river gaugings to 1900, so far as Victoria is concerned? Yes [*Exhibit* 30]; also gaugings of the river Murray tributaries for the year 1901, which have not yet been published. [*Exhibit* 31.] These are all I have with me.

E. Checchi. 20 May, 1902.

29. *Mr. Murray.*] Is the method of making the gaugings fully described in the publication? Yes.
30. Would it be possible for you to give the Commission an approximate estimate of the contribution of each of the tributaries to the main stream, at the point of junction? Yes; I could do so in the course of a few days.
31. Could you give with it a diagram showing, for typical years, the gains and losses to the main river, from point to point to the boundary of South Australia? Yes.

Alfred Stephen Kenyon, Assistant Engineer in the Victorian Water Supply Department, sworn and examined:—

A. S. Kenyon. 20 May, 1902.

32. *President.*] What is your name? Alfred Stephen Kenyon.
33. What are you? Assistant Engineer in the Water Supply Department.
34. You have prepared certain information relating to this inquiry, have you not? Yes.
35. Have you the map asked for? I have a map with key, showing the schemes of water supply, constructed and proposed, in the State. [*Exhibit* 32.]

Discharges of Victorian streams at junction of Murray.

36. Have you prepared a map of the Murray basin, showing the contributing streams, with their catchment areas figured in square miles? Yes. [*Exhibit* 33.] The discharges shown are annual volumes.
37. I notice you have not taken in the Avoca or any rivers to the west of that? No; they do not contribute except in very exceptional years, and I should explain that the discharges shown are the estimated discharges at the junction of the Murray, and do not include any diversions—*i.e.*, they show the estimated discharges if no diversion had taken place, so that any diversions would have to be deducted.
38. *Mr. Murray.*] I see they are marked "Annual discharges," would it not be better to say "Natural annual discharges"? Yes; I could do that.
39. *President.*] You have prepared discharges of the contributing streams at the point of junction with the Murray, and the areas of their respective catchments? These are shown on the map.

Authorised and unauthorised diversions.

40. Have you prepared a statement of the diversions which have been made from the main stream and its several tributaries in Victoria, under the powers conferred by Order-in-Council and the various authorities dealing with water supplies in Victoria? I have a statement here which applies only to the State of Victoria and the tributaries contributing to the Murray. The Avoca, Richardson, and Wimmera are omitted. No record is kept of the unauthorised diversions; but, as a matter of fact, every homestead along the Murray and its contributing streams has a diversion of some kind, either by windmill, horse-works, or engine.
41. Could you give the approximate volume used in this way? No estimate is possible that would be worth having.
42. Do you know the number? No; but the total area irrigated by pumping from the Murray and its tributaries would not exceed, say, 2,000 acres as the extreme limit.
43. These unauthorised water supplies are chiefly for domestic purposes and stock? Yes.
44. *Mr. Murray.*] In your opinion, would the total of the diversions referred to in your reply to the President equal the quantity compiled from the official figures? No; but they might compare with the quantity used by the smallest irrigation trust.
45. Which is the smallest irrigation trust? Kerang South.
46. What is the quantity diverted by that trust? Ninety-three cubic feet per minute in winter, and 63 cubic feet in summer.
47. Would the total unauthorised diversions exceed or fall short of that amount? They would exceed it.
48. Would they amount to double the quantity? About that.

Volume of unauthorised diversions.

49. Then the conclusion to be derived from what you say is, that the total unauthorised diversions along the banks of the Murray would not exceed an average of 200 feet per minute? That is as near as I can estimate it.

Mining diversions.

50. *President.*] You desire to make some further statement, do you not? Yes; I put in a list of the mining diversions under authority of the Mines Act, 1890. These diversions do not include the rights conferred under the mining by-laws of the various mining districts, of which no record is kept by the Mines Department. In all cases of diversion for mining purposes the volumes diverted are returned to the streams from which they are taken. [*Appendix* 17.]
51. You have copies of reports relative to the projected water supplies in the Murray basin? Yes. [*Witness here put in a large quantity of printed matter. Exhibit* 35.]

Navigation levels.

52. You have some information relative to the navigation levels of the river Murray? Yes.

NAVIGATION LEVELS OF THE MURRAY RIVER.

Mildura.—The river may be considered open when the gauge reads 3 feet 6 inches or over. This height corresponds to a river flow of 250,000 cubic feet per minute. The smallest steamer without much load can get through at 2 feet or 150,000 cubic feet per minute.

On the South Australian river, steamers like the "Ellen" can get through, towing a barge drawing 5 feet of water, with 250,000 cubic feet per minute flow.

Swan Hill.—The river may be considered fully open when the flow is 270,000 cubic feet per minute, or 11 feet on the gauge. Small steamers can get through at 150,000 cubic feet per minute, or about 8 feet.

Echuca.—The river is open at about 5 feet on gauge, or 250,000 cubic feet per minute. Small steamers can get through at 3 feet 6 inches, or 170,000 cubic feet per minute.

Barges vary in their draught, some loaded, say, 40 or 50 tons, draw only 3 feet, but generally draught is from 4 feet for small to 7 feet and over for large barges.

53. Have you a statement of the tonnage and nature of the river-borne traffic on the river Murray? I have no knowledge of that.
54. Nor any information as to whether the river is continuously navigable? No.
55. Have you any information as to the locking of the Murray in your office? I do not know of any.
56. Will you give your opinion as to the desirability, or otherwise, of locking the Murray? I did not come prepared to answer that question.

Canalisation of Murray.

57. Have you formed any opinion? I think that for a large portion of the river in Victoria, taking the minimum flow as it exists at present, with additional storage in the Upper Murray, there would be sufficient water to carry on navigation without locking, if the river bed were canalised by dredging and snagging. It is just a question as to which would be the simplest method.
58. You favour canalisation? Yes; for the portion of the river between Echuca and Mildura.
59. How would that answer in regard to irrigation? It would do for navigation only. It would be of no benefit for irrigation.

A. S. Kenyon. 20 May, 1902.

60. *Mr. Murray.*] Would you include locking? No. I mean dredging and snagging without locks.
61. *Mr. Burchell.*] How would you manage with a lower river? The lowest volume I am aware of in that part of the river is 25,000 cubic feet per minute, and you could, with that volume and the fall of the river, have a channel about 6 feet deep by about 150 feet in width.

Low river.

62. At what part? Between Echuca and Mildura.
63. But when you clear the snags the water would get away more quickly? Yes; but the volume would be the same.

Volume required for navigation.

64. Would 25,000 feet per minute be sufficient for navigation? Yes, in a canal, to carry steamers.
65. What would you do with the sand below Wentworth when the river is as low as at present? I am not speaking of that portion of the river.

M. Nally. 20 May, 1902.

Matthew Nally, clerk, Victorian Water Supply Department, sworn and examined:—
66. *President.*] What is your name? Matthew Nally.
67. You are confidential clerk to Mr. Stuart Murray? Yes.
68. You have brought with you certain resolutions agreed upon by the Water Supply Commissions of New South Wales and Victoria in 1886, in respect to the diversions of the Murray waters for all purposes between these two States? Yes.
69. Also the minutes of that Conference? Yes.
70. Will you please read the resolutions arrived at by that Conference:—

Resolutions.

Resolutions of Water Supply Commissions of 1886.

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. That 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 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 which may, at the sanction of the Trust, be fixed on as most suitable for the requirement 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 utilised, shall be equal.

4. 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 utilisation of the Murray River 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 regulations until they shall be dealt with by the Legislatures of both colonies.

Signed on the part of New South Wales:—
WILLIAM JOHN LYNE, *President.*
RUSSELL BARTON.
D. McMORDIE.
F. A. FRANKLIN.
HARRY GILLIAT.
JOHN B. DONKIN.
FREDK. B. GIPPS.
WALTER S. TARGETT.

Signed on the part of Victoria:—
ALFRED DEAKIN, President.
WALTER MADDEN.
JAMES BALFOUR.
GEO. YOUNG.
JAMES SHACKELL.
THOMPSON MOORE.
WILLIAM H. STEEL.
W. W. CULCHETH.
THOS. B. MUNTZ.
ALEXANDER BLACK.

The Conference adjourned *sine die.*

71. You have some further material which you think would be of use to us in connection with this inquiry? Yes.
72. What is it? There is a printed paper, prepared by the Secretary of the Victorian Royal Commission on Water Supply, 1884; statistics of river-borne traffic to and from Murray River ports; an article on the locking of the Murray, and correspondence *re* River Murray Royal Commission of South Australia, 1890. [*Exhibit* 37.]

FRIDAY, 23 MAY, 1902.

[*The Commission met in Committee Room "C," Parliament House, Adelaide, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Patrick McMahon Glynn, M.H.R., sworn and examined:—

P. McM. Glynn, M.H.R. 23 May, 1902.

73. *President.*] Will you give your name? Patrick McMahon Glynn.
74. You are a member of the House of Representatives? Yes.
75. You have taken great interest in this question? Yes, for the last seventeen or eighteen years.

South Australian case.

76. We would like you to put before us what you regard as the South Australian case? I may say that I was on a Commission appointed in 1887 by the South Australian Government to inquire into the utilisation

P. McM. Glynn, M.H.R. 23 May, 1902.

utilisation of the waters of the river Murray for irrigation purposes and water conservation, and for this purpose to consult with the Commission appointed by New South Wales and Victoria on the same subject. My appointment dated from 24th June, 1889. South Australia was particularly anxious that there should be a conference between the representatives of the three riparian States, at which some suggestion might be made for a scheme to determine the proportion of the water of the river Murray, and the Darling, and any river whose waters fed the main arterial rivers, to be utilised by the riparian States. That was the policy of the Government, and also the policy of the Commission, as a body, appointed to act in accordance therewith, with representatives of the other States. We were anxious to secure a reasonable proportion of the water passing into South Australia, both for the purpose of securing and maintaining the permanent navigability of the rivers, not only of the Murray, but of the Darling also, because we had a very large interest apart from schemes, existing and possible, of irrigation, in keeping the Murray and its tributaries as a highway for Interstate commerce. For reasons which I need not go into, no joint conference took place, but the Commission drew up a second progress report in 1890, in which they suggested, after referring to the failures to secure an Intercolonial conference, that the Commission, instead of being dissolved, might be allowed to suspend its operations, and that the Government should try to arrange a conference. In that second report there was a suggestion made by myself, which, I think, gives a rough outline of what might be considered by the riparian States in order to secure an equitable distribution of the waters of the rivers.

77. Will you read it?

In consequence of the failure of all efforts to secure a conference with the Commissions of the Colonies of New South Wales and Victoria, the Commission is not in a position to report upon the best means of preserving the navigation and water rights of this province in the river Murray. The best means, which might involve a compromise of opposite claims, could only be settled at a conference representative of all the interested Colonies. The following suggestions are, therefore, made with deference:—

The water rights of the province to be preserved depend a good deal upon the extent of their recognition by the other Colonies. What they are, according to the principles of International and private law—the analogy of which should guide us in defining them—may be clearly stated; but the mere statement of the Colonies' respective rights in the river, unless made the basis of an agreement for the mutual exercise and respect of them, would be of little use. There is no tribunal to which a Colony, on breach of its water rights, can appeal for a remedy, so that the rights are legally ineffective. The Judicial Committee of Privy Council can only interfere on voluntary reference to it of disputed questions. The dispute between New South Wales and Victoria about Pental Island (which is not mentioned in the evidence taken by the Commission) was settled by such a reference. An appeal by one Colony to the paramount authority, the Imperial Parliament, would be open to the objections that—

1. The Imperial Parliament could only pass an Act declaratory of the respective rights of the riparian Colonies in and to the river; in other words, could only express what either is known already, or had been agreed upon as the terms of the enactment by the Colonies interested. The obligation of existing rights would be no greater from being declared, and an enactment in the terms of an agreement is excluded by the assumption that the appeal is by one only of the interested Colonies. The Declaratory Act, as well as the common law, would want an execution to enforce it.

2. An adverse appeal to the Imperial Parliament would be out of keeping with the spirit of constitutional liberty in the colonies. The Imperial Act, under which our Constitutions have been framed, leave the power of suggesting the legislation to the Colonies or Colony interested, and our relations with the mother country imply a gradual extension of this power.

A Colony might endeavour to secure respect for its water rights by reprisals; but a policy so repugnant to international morality should only, if at all, be applied in the last instance by parts of the same empire towards each other.

I believe, therefore, that the best means of defining and securing respect for the mutual rights of the riparian Colonies in and to the river Murray and its tributaries is an agreement treaty. When the tempers of all the Colonies shall have grown to sympathy with such a means of settling disputes (a close precedent for which exists in the case of the Danube), an agreement might be entered into declaring—

1. Generally, the mutual rights and equities of the riparian Colonies in and to the river Murray and its tributaries.
2. Particularly the minimum quantity of compensation water that should be allowed to flow into or pass by each Colony for each month of the year, both before and after the construction of locks or other conservation works on the river.
3. Subject to clause 2, the proportion in which New South Wales and Victoria should share for irrigation purposes.

And making provision for the creation of a joint trust, with ample powers to secure enforcement of the agreement.

P. McM. GLYNN.

We approve—JAMES W. JONES, THOS. BURGOYNE, A. H. LANDSEER, F. KRICHAUFF.

That could stand in the main; but some of the difficulties we had then are now removed by Federation, and the power which exists of Federal Courts declaring the rights of citizens resident in different States, so far as they are affected by diversions of water, but since, if not before Federation, a citizen could sue in any other State, the Government, on a petition of right, or apply to one of the Courts for an injunction to restrain either the Government or another citizen from making diversions which were injurious to the citizen taking action. (I say that on the authority of an American decision given in 1884, where an application of the kind was made—in Connecticut, I believe it was.) But the idea is not that we should trust to individual citizens, or even to the States, to decide so important a question; it would be far better to have an agreement, following the lines of the resolution I drafted, and forward it to the Governments of Victoria and New South Wales for consideration, in the terms in which it was passed by the Commission in 1890, which are as follows:—

Extract from Exhibit No. 38—"*A Review of the River Murray Question, Riparian Rights, &c.*" *By P. McM. Glynn, B.A., LL.B.*

That the Government be requested to call the attention of the Governments of New South Wales and Victoria to the progress report of this Commission, and suggest the desirableness of a conference of the Royal Commissioners of Victoria and South Australia, together with any such representatives of New South Wales as may be appointed, being at an early date held to consider and report upon the heads of a Bill, or treaty, declaring:—1. Riparian rights in the Murray and its tributaries. 2. The compensation water that each Colony should receive during each month of the year to secure navigation, being the minimum at which irrigation should cease. 3. The compensation water, in excess of the discharge at the minimum navigation level, that for each month of the year each Colony should receive for irrigation purposes—first, before locking or conservation; second, after locking or conservation; and providing for the appointment of a Riverian Commission, composed of members representing the riparian Colonies, to administer the Act, or treaty, and generally to consider and report upon all matters within the scope of their authority.

In that resolution I mention "before and after locking," because I wished to cover both alternatives. I might mention that the whole matter has been dealt with, from the South Australian point of view, in a pamphlet which I wrote, and which the Royal Commission referred to, caused to be printed. [*Pamphlet entitled "A Review of the River Murray Question, Riparian Rights, &c.," handed in. Exhibit* 38]. The

South

P. McM. Glynn, M.H.R. 23 May, 1902.

South Australian view is, I think, well expressed by the spirit of the addendum I read, and the resolution that, so far as possible within the rights laid down by the Courts as to riparian ownership, and the spirit of treaties between European nations not as civilised as we are, some arrangement should be made between riparian States which would procure the navigability of navigable rivers right through the year, and a fair proportion of the surplus waters of the rivers for irrigation. Our opinion is that it would be far better for the Federal position to be defined before extensive schemes are undertaken by the States. The Federation has power, not only to maintain, but to make permanent navigation between the States, and according to the American decisions, and the view which now obtains in England, any schemes which interfere with the navigability of the rivers, would be unconstitutional. I understand that the water required to give a fair navigable depth, or to secure the existing navigability during the year, would be comparatively small, whereas the huge irrigation schemes suggested in the other States would require a great deal, and it would be better if the Federal necessities should be first defined, so that the State undertakings should be gone on with, understanding what the Federation required. I would like to be emphatic on the point that we are concerned not only in navigation, but also in irrigation and water for stock purposes. During the last ten years settlement on the Murray has largely extended, and the lakes near the Murray mouth—Lakes Alexandrina and Albert—according to the evidence we obtained in 1890, watered over a quarter of a million stock, and diversions which interfered very much with the level of the river would render the water in the lakes brackish, and thus destroy its use for watering stock. There seems to be three interests, which I put with confidence, though, at the same time, with some degree of diffidence, which should be consulted, viz., the maintenance of the navigability of the river, a fair share of the flow of the water for all purposes, which includes, in addition to the navigability, irrigation, and water for stock; also, of course, a supply to settlers who may be within a reasonable distance of the river for other purposes. Now that such an exceedingly hopeful step has been taken as the appointment of this Commission by the States concerned, and that such a broad Australian view has been taken as that expressed by the Premiers and other speakers at the Corowa Conference, we are all sanguine that some definite decision should be come to, especially as the question has been mooted from time to time for over half a century. As far back as 1857, when the first Draft Bill for a federal union of the Colonies was drawn up, one of the powers proposed to be vested in the Federation was the control of rivers for the purpose of securing their navigability; and in 1863, at a conference of the three riparian States held in Melbourne, it was declared that the utilisation of the waters of the great rivers should be a federal question in the sense of being regulated by the three States concerned. In a pamphlet which I read, it was stated that in two Public Works Reports on New South Wales it was said that the work of locking the river Darling should be undertaken by the Federal Government, and we carried a motion in the House of Assembly here in 1889 that action should at once be taken in regard to the question of locking the river Murray and its tributaries. I mention this to show that all the States apparently desire to treat the rivers from a federal point of view; unfortunately, however, with politicians, other considerations take weight—we, perhaps, play too much to the galleries at times. The jurisdiction of the Commonwealth, according to American decisions, extends to rivers which are either permanently or intermittently navigable, and forming by themselves or in connection with others, a channel of communication between States or with countries, and according to the authority of Prentice and Eagan (American) the power of the States ceases as soon as federal action is taken in respect of the requirements of interstate navigability; but, of course, any action taken by the States, either before or afterwards, which respected federal authority would not be declared unconstitutional, and they could carry on local works for the purpose of deepening the channel, fixing buoys, or the collection of tolls. In South Australia we also consider that, to render about 3,000 miles of river permanently navigable, would be a splendid work of development. According to a Commission which sat in England, the cost of water carriage was only a fourth of that by road, and Sir Arthur Cotton, who gave evidence before a Commission in 1883, stated it was only one-tenth of that by railway. Morgan is only 75 miles by road from Renmark, and is about 200 by water; but carriage by water is only 10s. per ton, while by rail it is over £5, and I believe that at the present time they cannot get produce down or fodder up, owing to the land rates being prohibitive, and the river not navigable.

Unconstitutional schemes.

Interests involved.

Utilisation of waters.

Requirements of South Australia.

78. I understand that the South Australian view is that it requires provision made for the maintenance of navigation, a certain proportion of the water for irrigation, and a further quantity for domestic purposes and stock? Yes; generally speaking, that would be so.

79. Have you formed any opinion as to the quantity required? I understand that the quantity required would vary each month. I suppose the distance between the banks would make a difference. At Morgan the navigable discharge, I am told, is 340,000 cubic feet per minute.

80. I suppose, as an Australian statesman, you would say that the water of its rivers should be used to the best advantage, and it would, manifestly, not be to the best advantage to allow a large quantity to go out to sea in order to maintain navigation? That involves conclusions which I cannot agree to. As to the first part, the general putting of the water to the best use would be of very great advantage, so long as the rights of all the States concerned in the use of the water were regarded; secondly, I think that to ensure permanent navigability would not interfere with the requirements of irrigation and general purposes.

81. Assuming that it is desirable that navigability should be maintained the whole year round, I suppose you would hold that the less water devoted to that purpose, provided it could be put to a more useful purpose, the better? Yes, as long as the required depth is maintained.

Lock necessary.

82. To bring that about, I suppose your opinion is that the locking of the Murray would be necessary? From inquiries I have made, I think locks would be necessary on the Darling, and also on the Lower Murray, *i.e.*, the Murray in South Australia. I say "think," because I have heard some experts say that other means might be possible from Wentworth downward.

83. What other methods? The deepening of the channel; but I prefer the locks, as the estimates show that the expense would not be disproportionate to the gain.

Volume of river traffic.

84. Have you any idea of the volume of the river traffic? I have a fair idea. In the pamphlet I handed in I have given the river trade, both when the river is high and when it is low. The volume sometimes shrinks with a low river to one-tenth of what it was when the river was high. In 1883 the traffic on the Darling amounted, I believe, to £5,000,000; and I have a statement of the vessels employed even under the present conditions; traffic is not only interfered with by low rivers, but by the unfederal and stupid policy of cut-throat railway rates which obtains in order to divert the trade from the river. Captain King's boats will carry cargo 500 miles for 6d. per ton, whereas the South Australian railways charge 24s. 1d., and the Victorian railways 23s. 2d. I think that the difference in the rates shows that the development of the river would be a tremendous gain to the settlers.

P. McM. Glynn, M.H.R. 23 May, 1902.

85. You do not think the present use of the river would be a fair criterion of what the volume of trade would be? No, I do not.

Navigability a federal question.

86. Do I understand that, so far as the navigability of the river is concerned, you regard it as a federal matter? Constitutionally it is; and I think as a matter of policy it should be so also. I think the constitution of the Federation gives the Federal Authority power to prevent interference with the navigability of the rivers, and I believe that any State schemes which unduly interfered with it would have to be prepared to go to the wall.

Irrigation limited.

87. To what extent do you think South Australia should participate in the waters of the Murray for purposes of irrigation? That would, of course, depend upon the irrigation schemes possible. I am not sure of the number of settlers, but believe there are 100 now for every 10 twelve years ago; but I do not believe that the rivers can ever be used very extensively for irrigation. Colonel Home condemned the Darling utterly for extensive irrigation. Nature has put limitations greater than is generally considered, to the possibility of irrigation from our rivers; but I would irrigate as much as possible without interfering with other rights.

Area irrigable from the Darling.

88. Could you put your answer in a more specific form;—what amount do you think South Australia claims for irrigation? That is the extent of land we think we could irrigate, and have water for,—no; an expert should answer that question; but, speaking generally, it cannot be of very great extent, because Mr. McKinney, I think, put down the total irrigable area from the Darling, to be secured by locking the river, at 120,000 acres, and various reports that I have seen say that a series of pumping schemes between the locks, rather than extensive conservation in shallow basins, would be better.

Rights of riparian settlers.

89. Would you give us your reasons for assuming, seeing that South Australia does not contribute to the waters of the Murray to any appreciable extent, that she is entitled to the water for irrigation and stock? There is no difference in rights of riparian settlers at its mouth and those near its source; that is my opinion based upon the analogy with private rights, and international treaty rights declare equality of right on all the great arterial waterways. There is no difference in the rights of those up stream or down stream.

South Australia has a right to a regular flow of the river.

90. Would that apply to diversions of the waters;—would South Australia have the right to divert water from the channel, to which she did not contribute? Undoubtedly, her rights are to a regular flow of the river, and any diversions up stream which interfered with the regular flow, could be stopped under our Federal system. I do not think the rights at all depend upon the locality of the watersheds, either in law or in equity. The States should not be fighting one another for priority of right.

What constitutes a navigable river.

91. *Mr. Murray.*] Did I understand you to say that the English Courts are now taking a wider view of what constitutes a navigable river? At one time the English Courts inclined to limit the meaning of the words "navigable river" to rivers which were tidal, but the application of such precedents to South Australia would be too narrow: in later decisions, however, a wider meaning is given to the term "navigability," even in English jurisprudence, but the American decisions which regard as navigable any rivers, permanently or intermittently navigable, whether tidal or not, would be those the analogy of which would apply here. I have amplified a statement of the case as to riparian rights or equities in the waters of the rivers, at the end of the pamphlet before referred to.

92. Am I right in assuming that English decisions make a difference between great and small ships—*i.e.*, between those which carry cargo and those which do not? The question which the Courts considered formerly was whether the rivers were tidal or not, but the rivers have been so improved that the Courts are now giving a wider interpretation than previously as to what constitutes a navigable river.

93. What do you mean by "unconstitutional"? Any schemes which so interfered with the natural flow of the river as to render it less navigable than formerly would be unconstitutional since Federation was established.

94. Are you speaking of English law? No, Australian; but I referred to the English law to show that they justified the present interpretation. I did so merely by way of illustration.

95. Are you acquainted with the case of Lord *v.* The City of Sydney? The case upon which is founded the applicability of the riparian law of England, to the Colonies; it was about 1854 or 1856? Yes, generally; but I do not know the details.

96. You think it conflicted with the common law of England? I think not; it decided that a right to the flow did not depend on ownership of the soil.

Riparian rights.

97. You also consider that the American law has grown up out of conditions more analogous to our own? In some States, but not in all. In the Western and some other States where irrigation has prominence, they vary the law as to riparian rights in favour of the interests of irrigation, but the English common law is still, where not so expressly varied, the reserve law of America, the reservoir upon which they draw for decisions. The variations have taken place in some cases, as I have said, in favour of irrigation, but for the purpose of interstate commerce and Federal jurisdiction they give the widest possible meaning to the words "navigable river." It is of interest to remember that some of the States have, for local purposes, declared all waters to be public, and provisions to that effect will be found in some of their Constitutions.

98. Do you know Hall, on the question? I have not found, in any of the libraries a book which deals comprehensively with the whole question, although there are many authors from whose books opinions such as those I have expressed can be drawn. I know Hall's book on the International Law, but the one dealing specifically with the question I have heard of but not seen.

99. I see that in your pamphlet you say that the opinion expressed by Sir Henry Parkes, that the whole of the waters of the Murray to the point where they enter South Australian territory, are the property of New South Wales, was peculiar to the writer? What I mean to call attention to was that his opinion, which, I believe, is not in accordance with the law or the spirit of the statute—*i.e.*, 18 and 19 Victoria, chapter 54—was not that of Australians generally who have considered the question, and I know that it was dissented from by the *Daily Telegraph* and the *Sydney Morning Herald*.

100. I think his opinion is sustained by Hearne, in his "Codification of the Common Law of England"? I should be sorry to form an opinion different to that expressed by such an authority as the late Professor Hearne, but, nevertheless, must maintain my conviction, the reasons for which I have amplified at the end of the pamphlet handed in, that Sir Henry Parkes's claim, as expressed in his letter of 6th March, 1890, was erroneous, and it is significant that in that letter he cautions South Australia against interfering with the normal level of the river lower down, and outside New South Wales territory.

P. McM. Glynn, M.H.R. 23 May, 1902.

101. In another remark you made on the navigation of the river, you stated that the navigable depth of the river would require a discharge of 340,000 cubic feet per minute;—will you say upon whose authority *that statement rests?* I think on the authority of the Conservator of Water (Mr. James W. Jones), given in his evidence before the Royal Commission on the Murray waters in 1890, and it will be seen in the gaugings in appendices to that report. Of course, as I said, that only applies to Morgan gauge, and, speaking as an amateur, I should imagine that the navigable discharge would vary with the breadth, inclination, and character of the banks of the river. *Of course, as regards the quantity of water required,* this point must be remembered: that, where the water is near the navigable limit at which we propose by locking to keep it, the diversion of a few thousand feet makes all the difference between the river being navigable or unnavigable—*as 10,000 or 20,000 cubic feet per minute—when the river is within that* amount of the navigable level, would be of great importance, and render it navigable or unnavigable, according as it was allowed to run or diverted. This shows that the diversion of a small quantity of water, when we have only a depth close to the navigable limit, becomes of great importance, and also that impounding to the navigable depth, otherwise wasted waters, enables a small quantity to maintain the depth at all times.

Volume required for navigation.

Small diversions from low river important.

102. We have it in evidence that 25,000 cubic feet per minute would be sufficient for navigation? That *may be correct, but it does not clash* with the estimate I gave of the requisite volume at Morgan—*25,000* feet may be sufficient in a narrow river.

Alexander Bain Monerieff, M.Inst.C.E., *Engineer-in-Chief for Public Works, South Australia,* sworn and examined:—

A. B. Monerieff, M.Inst.C.E. 23 May, 1902.

103. *President.*] What is your name? Alexander Bain Monerieff.
104. You are Engineer-in-Chief for Public Works in the State of South Australia? Yes.
105. You have had prepared in your office *certain information which you were asked to supply?* Yes.
106. First of all you have a plan showing the contributing streams to the Murray in South Australia, with their watershed lines, and the catchment in square miles? The *first item* which I propose to hand to the Commission is a plan giving the quantity of water pumped or required for domestic and irrigation purposes within the Murray River Basin. That information is contained on plan No. 1 [*Exhibit* 39]. I also hand in a schedule of the information prepared. [*Exhibit* 40.]
107. With the plan and schedule which you have handed in you also hand in a statement giving a description of the works, either carried out or proposed to be carried out, with full particulars, and the numbers given on this statement correspond with the numbering on the plan also? Yes. [*Appendix* 18.]
108. Referring to the schedule (*Exhibit* 40), which you have put in, you also put in plans Nos. 2, 3, 4, 5, 6, 7, and 8, as described therein? Yes. [*Exhibit* 42.]

Gaugings of River Murray.

109. You also put in a diagram of the gaugings of the River Murray in South Australia from 1883 to the present date? Yes. [*Exhibit* 43.]
110. You also put in plan of the River Murray *from Morgan to the eastern boundary* of the State, marked 10 on schedule [*Exhibit* 40]? Yes. [*Exhibit* 44.]. I regret to say that gaugings and the discharge of contributing streams at their junction with the Murray in South Australia are not available. They are comparatively small and *very intermittent.*
111. You think then that the quantity is so small from the contributing streams, that it may be neglected? In some years there is a very considerable flow from them; *but the Murray may run for years without* there being any flow from them.

Contributions to Murray in South Australia a negligible quantity.

112. And therefore you say that for practicable purposes the quantity may be neglected? For practical purposes, it may be said to be a negligible quantity. I propose to communicate with the Commission *regarding the depths or levels* of water required for permanent navigation of the River Murray in South Australia, this being a matter on which I am not prepared to speak to-day. Further information on the subject will be available to the Commission at an early date. I also wish to put in a number of Parliamentary papers, in compliance with the request of the Commission; and with these papers I hand in a schedule giving the numbers of those papers and a description thereof. [*Exhibit* 45.]
113. Is there anything further you wish to put in at this stage? No.

SATURDAY, 24 MAY, 1902.

[*The Commission met in Committee Room "C," Parliament House, Adelaide, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

The Honorable Alfred Catt, M.P., Chairman of Committees in the House of Assembly, South Australia, sworn and examined:—

Hon. A. Catt, M.P. 24 May, 1902.

114. *President.*] Will you give us your name? Alfred Catt.
115. *You are Chairman* of Committees in the House of Assembly? Yes.
116. You have made a special study of the question *that is engaging our attention? In the past I have.* During the time I was Commissioner for Public Works, some two years, and during the time our Commission, of which I was Chairman, sat, I took an active part in the question.

Relative importance of navigation and irrigation.

117. Would you kindly favour us with your views in a concise form;—*first of all as to the navigability* of the river? I am not so strongly impressed with what aspect of the case as I was formerly. I used to think in the earlier part, when I studied this question, that that was the most important aspect, as far as our interests were affected in South Australia; but I have come to the conclusion since that the question of irrigation is one of far greater importance. Of course I recognise that if we could have a system of locks in the river, we could possibly use it more for navigation than we do at present, and also for irrigation; but I am not sufficiently well informed as to the cost of these locks to express an opinion as to their practicability.

Hon. A. Catt, M.P. 24 May, 1902.

118. *Supposing they were practicable,* then, I suppose, you would put the case thus: the cost of the weirs on the one side of the scale and on the other the use to which they could be put? Undoubtedly. Speaking from a South Australian standpoint, the most important aspect of the case to me is the keeping *out of the salt water from* the mouth of the river in the first place, that is to say, our Lakes Alexandrina and Albert are very much affected sometimes by the inflow of the salt water at the Murray mouth. There is a large tract of country there, which is settled upon, which is very badly off for fresh water, and *should the flow of the river be very much decreased* by extensive irrigation works, these lakes would become salt, and we should suffer very materially. I *think an estimate was given* to the Murray Waters Commission that a weir could be placed some little distance from the mouth for about £68,000, and I *have always contended that as far as South Australia is concerned,* that should be the initiatory scheme. That is where we should commence operations; by that means we could keep back the salt water, and conserve the fresh.

Weir at Murray mouth.

119. *The object of that weir would be for the purpose* of keeping out the salt water, so that the lakes would be available for the purpose of irrigation and stock? Yes.
120. That would scarcely refer to the question of navigation;—looking at navigation for the moment as apart from water conservation and irrigation? Perhaps not. At the same time that would rather help than interfere with the question of locks further up the river. I do not see that it would make much difference. Supposing you have locks at Mannum or higher up the river, you then have the lower part of the river still suffering from the inflow of the salt water from the ocean, and necessarily spoiling the water for stock. During my early experience on the Murray, I think in 1856, 7, 8, I found in the summer-time the lakes were so brackish that the stock would not drink the water.
121. But the erection of the lock that you refer to at the mouth of the river would not serve any useful *purpose in connection with navigation,* seeing, as I understand, that navigation for the length that you have referred to—between the mouth and Mannum—*is possible the whole year round?* Nearly so. I dare say it would be navigable all the year round.
122. *The question is,* as to that not being necessary as far as navigation is concerned? I do not think so. We felt here in South Australia when *Mr. McKinney proposed to cut canals on the Murray* and Murrumbidgee, and with the works in progress, and suggested works in Victoria, that our river would be *so low in South Australia as to deprive us of its use* for navigation purposes for the greater part of the year, and also deprive us of the water we should like for irrigation purposes. Hence our protest some years ago in not being allowed to confer with New South Wales and Victoria as to our rights. New South Wales declined to meet us, and Victoria said it was no use meeting us inasmuch as New South Wales would not be a party to the contract. We kept our Commission in existence for some years; but, seeing we could make no progress, we disbanded. I have not, since that time, taken such an active part in the question; but I realise this: that the importance of the Murray River to South Australia is paramount. We have on its shores land that we can irrigate if we can get the water; but if you deprive us of the water on the upper reaches of the Murray, *it will be a very serious question.*

South Australian interest.

123. Will you give us your opinion as to the desirability or otherwise of constructing locks between Mannum and Wentworth, assuming for the sake of argument that those locks would cost £350,000;—in other words, do you think that the volume of *the river-borne trade is sufficient to warrant such an* expenditure? Well, I am doubtful whether it is at present; but the question is: shall we not have an *increasing river traffic if the river is locked?*

Desirability of locks.

124. Supposing the records show that *the traffic has been uninterrupted for three years in succession,* do you not think that would be a fair criterion to go by in order to arrive at a conclusion as to what the *probable river-borne traffic would be?* I should think so; if it can be shown that for three years in succession the river was *navigable all the time.*
125. Leaving now the question of navigability, what do you say as to the question of irrigation;—you seem to attach a good deal of importance to that? I think that our future near the Murray depends *largely on the question of the utilisation of the waters of the Murray for irrigation purposes.* At present, excepting at Renmark, we are not utilising it to any extent, and to my mind there is scope for a very large extension of irrigation works.

Importance of irrigation.

126. *Would you say that your experience at Renmark* would warrant further extension of irrigation? Yes, I think so. My experience teaches me that all the *irrigation colonies that have been started passed* through some such time as the Renmark colony has, that is to say, the first settlers, perhaps, make a *failure of it,* and those who come after are successful. My reading of Californian experiences confirms me in that.

Extension of irrigation warranted.

127. So that, although Renmark might not have been so successful as the promoters anticipated, you are not discouraged? No.
128. And you still think that *South Australia has to consider the question of the irrigation of the land* in the immediate vicinity of the banks of the Murray? Decidedly.
129. Can you give us any opinion as to what extent? Not until I know what water you could spare. I *recognise that New South Wales and Victoria* have certain water rights, and until we know what quantity we can depend upon in the lowest year, I do not think it would be wise for us *to carry out any further* works of an extensive character. In 1884 and 1885 we had a very low river, and those are the years we *should take our estimates from.* Of course it would not do for us to enter upon any irrigation works when we could not depend upon a supply, and if the *larger States are using water, as I have mentioned,* we should have no water at all, and in that case it would not do for us to extend our operations.

Irrigation limited.

130. *Mr. Murray.*] *When you spoke of locking the river,* did you mean for the purpose of conservation? I take it that locking would have a twofold effect. *It would enable navigation to be carried on* all the year round, and also secure at all times a larger supply than we have at present.

Effect of locking.

131. *It would enable a larger quantity to be diverted?* Yes. You would have a larger quantity to draw from; your water would not run away.
132. *President.*] It must occur to you that if you put in locks for the purpose of navigation, and, as you say, you must take a low river, if you draw upon the water between the locks, and there is no water coming down the river to replenish it, of necessity, you can see at once that the object of the locks—navigation—is frustrated? We should have more water coming down the river.
133. For practical purposes, I understand, at present there is little water coming down the river? I know it is very low at present.

Hon. A. Catt, M.P. 24 May, 1902.

134. So that, if you take the present condition of things as a criterion, you can see how difficult it would be to work the two things, navigation and irrigation, together, without having some adjunct in the way of storage? Yes.
135. *Mr. Burchell.*] At present 4 feet of water is required at Morgan for navigation purposes;—do you know that is equal to 340,000 cubic feet per minute;—with locks you would not require anything near as much as that? I do not think so.
136. Do you know that if the water was impounded no more would be required for navigation than for irrigation, except the small quantity required to pass boats through the locks? I believe not.
137. That shows that navigation would not be *wasting the water*? *Just so.*
138. By constructing locks then we would be able to carry out irrigation with the minimum quantity of water? Just so.
139. Do you think a period of three years high river would be a sufficient basis to form an opinion upon as to the future increase in navigation on the river? I think three years would hardly be sufficient. Of course for the three years mentioned the river must have been high. I am speaking of a low river, and not establishing irrigation works beyond what a low river would enable us to carry out successfully.

Future increase of river traffic.

140. Do you know that the last year's output of Renmark was £30,000? Yes; I have heard so.

MONDAY, 26 MAY, 1902.

[*The Commission met at the "Grosvenor Hotel," Victor Harbour, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

George Jeffery, Harbour Master, Victor Harbour, sworn and examined:—

G. Jeffery. 26 May, 1902.

141. *President.*] What is your name? George Jeffery.
142. You are Harbour Master? Yes.
143. How long have you been in that position? Six years.
144. Is the volume of trade from the port increasing or decreasing? It is decreasing.
145. To what extent since you have been Harbour Master? *That I cannot say.*
146. Have you any figures in regard to the volume of trade which you could put before us? No; I only keep a record of the shipping inwards and outwards.
147. Are the vessels which trade here large or small? They are both.
148. Principally in connection with wool, I suppose? Yes.
149. Mostly from the Murray? From the Murray and the Darling.

Diminution of trade.

150. To what do you attribute the diminution of trade? Mostly to the construction of the railways.
151. How many ships have you had in the harbour this year? Two ocean-going vessels.
152. What was their tonnage? One 2,000 odd tons and the other 1,300.
153. What did they load with? Wool.
154. What is your opinion as to the effectiveness of the harbour works carried out here? They are efficient and good.
155. Then, so far as the harbour is concerned, if the trade was to be done, it could be? Yes

---

William Stevenson Reid, Shipping Agent, Victor Harbour, sworn and examined:—

W. S. Reid. 26 May, 1902.

156. *President.*] What is your name? William Stevenson Reid.
157. You are an agent? Yes; representing Mr. A. H. Landseer, shipping agent.
158. Have you been resident here long? Twenty-six years.
159. Have you had to do with the trade of the port the whole time? Since 1877.

Trade of Victor Harbour.

160. Looking back on your experience, what do you say as to the volume of trade which has passed through Victor Harbour? The figures from 1870 are as follows:—Wool: 1870, 6,090 bales; 1871, 12,328 bales; 1872, 1,477 bales; 1873, 9,551 bales; 1874, 5,524 bales; 1875, 7,183 bales; 1876, 16,913 bales; 1877, 10,770 bales; 1878, 28,369 bales; 1879, 17,261 bales; 1880, 8,316 bales; 1881, 9,548 bales; 1882, 22,322 bales; 1883, 30,688 bales; 1884, 32,679 bales; 1885, 6,549 bales; 1886, 13,529 bales; 1887, 20,450 bales; 1888, 1,785 bales; 1889, 11,691 bales; 1890, 12,596 bales; 1891, 10,494 bales; 1892, 13,470 bales; 1893, 18,035 bales; 1894, 14,898 bales; 1895, 2,486 bales; 1896, 13,085 bales; 1897, 6,459 bales: 1898, 4,344 bales: 1899, 711 bales: 1900, 4,272 bales; 1901, 4,466 bales. In addition to the foregoing there has been 8,000 tons of hay, 6,577 tons of flour, 70 tons of bran, 350 tons of bark. These are the bulk of the exports during those years.
161. Then the tendency is for the volume of exports to materially decrease? Yes; since 1896 we have only reached four figures.
162. And in 1899 you only had three? Yes.
163. Which was mostly wool from the Murray? From the Darling.

Decrease in trade.

164. How do you account for the decrease? The drought has a good deal to do with it, also the diversion of the trade by means of the railways at Murray Bridge and Morgan.
165. Then it does not follow that the River Murray has been used less in later than in former years, but rather that the trade has gone to other ports in South Australia? Yes, that is to some extent; but the want of the river being navigable has had a great deal to do with it.

Goolwa Canal.

166. With respect to the proposed canal from Goolwa, do you think it would foster the river trade if it were constructed, thus doing away with the necessity of carriage by rail? Well, I do not know. I think if we had a good navigable river, and transhipped by rail as at present, it would be all we want, but I know that I stand alone in that opinion.

W. S. Reid. 26 May, 1902.

167. What is the cost of transhipping wool at present? From Goolwa to free on board—greasy, 13s. 6d.; scoured, 19s.
168. What does that include? Everything—rail carriage, wharfage, lighterage and shipping.
169. *Mr. Burchell.*] Does it make any difference in cost whether the quantity dealt with is large or small? No; the charges are the same in any case.
170. Have you ever known of goods being brought here by ocean steamers to go up the river? Yes.
171. Could you give any figures? No.
172. How do the charges inwards compare with the charges outwards? It is a question of class rates, and varies from 1s. 6d. to 8s.
173. Do you not think the charge excessive? No, it could not be done for less; it has been reduced to those figures, and was much higher at one time.
174. What does it cost to tranship wool from river boats to train, to be taken to Adelaide? 11d. per ton.
175. Have you any idea of the freight from Goolwa to Port Adelaide? Undumped, 16s. 10d.; dumped, 15s.; scoured, undumped, 22s. 4d.; scoured, dumped, 18s. 7d.
176. Do you know what is the extra charge to bring wool from Wentworth to Morgan, or to Goolwa? The rate is the same.

Hugh McDougal, storeman, Victor Harbour, sworn and examined:—

H. McDougal. 26 May, 1902.

177. *President.*] What is your name? Hugh McDougal.
178. What are you? A storeman.
179. You reside at Victor Harbour? Yes.
180. How long have you lived here? Thirty-six years.
181. You have had some experience in connection with the harbour? Yes.

Shipping facilities.

182. Do you consider the facilities for shipping are as perfect as they can be made? They are quite sufficient for the trade of the port.
183. Supposing there were more trade to be done, could you do it without difficulty with the present appliances? Yes.
184. You heard the evidence of Mr. Reid, to the effect that the volume of trade has greatly diminished of late years? Yes.
185. What, in your opinion, is the cause of it? It is due to the drought on the Darling, the lowness of the river, and to the competition of the railways.
186. You heard it suggested that there should be a canal cut between Goolwa and Victor Harbour, do you favour the idea? I would rather not give an opinion on the question; I have not gone into it.

Albert Battye, storekeeper, Victor Harbour, sworn and examined:—

A. Battye. 26 May, 1902.

187. *President.*] What is your name? Albert Battye.
188. You are a storekeeper? Yes.
189. Residing at Victor Harbour? Yes.
190. Have you been long here? Since 1876.
191. You are well acquainted with the trade and with the harbour improvements? Yes.

Victor Harbour improvements.

192. What was the cost of the *improvements*? *Commencing from* the causeway to the end, also the small jetty—the jetty, I believe, cost about £5,000; then from the causeway to the breakwater and the screw-pile jetty the cost was a little over £120,000.
193. So that you put the total cost down at £130,000? Yes.
194. I suppose the improvements made give facilities for shipping on a very much larger scale than is carried on at the present time? Yes; the idea was that the trade which came to Victor Harbour from the river warranted the amount of the expenditure.

Trade diverted from natural channel.

195. That trade has not come up to expectations? It is not what it used to be; but of recent years, on account of the river being tapped in various places by railways, the trade has been diverted from its natural channel.
196. The trade has found its way along the lines of least resistance? It has been taken away when it should have been brought here.
197. To what ports does the trade go which you think should come here? Well, some of it goes to Port Adelaide, *via* Morgan and Murray Bridge.
198. *Mr. Burchell.*] You consider this the cheapest outlet for river-borne goods? Yes.
199. You think it could be made still cheaper by constructing a canal than by the present railway? Yes.
200. *You know the rates—they are from 13s. to 19s.?* Yes; I think they could be made cheaper.
201. Do you think the railway rates could be reduced? I do not know that.
202. You think the present rates high? Yes.
203. And consider that water carriage would be cheaper? Yes.

Proposed Goolwa Canal.

204. Do you consider water carriage would be cheaper if the canal from Goolwa cost £570,000 as estimated? Yes.
205. Do you know the length of the proposed canal? Nine and a quarter miles.
206. What size boats would it provide for? About 6 feet draft.
207. Do you think 4 feet deep enough for river boats? Well, 4 feet would take most of them; there may be some which would take 5 feet.

Draft of river boats.

208. But even 5 feet would not admit the largest boats, would it? I think the largest boat draws 6 feet, but loaded light could go in 5 feet.
209. From your experience, do you consider it would be safe for river boats to go out in all weathers to the ocean vessels? *Most decidedly.*
210. What is the largest boat which has loaded here? I think somewhere close on 7,000 tons.
211. Do you know the largest amount of wool loaded here in one year? About 30,000 bales, I believe.
212. How much more could be handled with the present appliances at Victor Harbour? I believe we could handle any quantity they brought.

Daniel

Daniel Henry Cudmore, grazier, of "Adare," Victor Harbour, sworn and examined:—

D. H. Cudmore. 26 May, 1902.

213. *President.*] What is your name? Daniel Henry Cudmore.
214. You are a grazier residing at Victor Harbour? Yes.
215. You have made a study of the question that we have to inquire into? Yes, in a measure; I have studied the rivers and the gaugings of the floods.
216. You desire to make a statement on the subject? Yes.
217. Will you do so? I have known the river since 1865, and resided for twenty-five years at Avoca Station, near Wentworth, on the River Darling. I kept daily records there of all river gaugings published which referred to the Murray, Darling, and Murrumbidgee for the twenty-five years previous to 1895, and my brothers have kept them since. Our reason for keeping these records was that we were interested in the great Ana-branch of the Darling, on which we ourselves, as well as the neighbouring squatters, had spent large sums of money in conserving water, and it was important to us to know at what date the flood-water would reach any particular point. In the flood of 1879-80 we conserved an enormous quantity of water in the lakes, by throwing a dam across the Ana-branch of the Darling. The depth of this water varying from 6 to 18 feet in the different lakes. A number of particulars of this work may be seen in the report of the Select Committee of New South Wales, on pastoral dams, in 1884. I put in a statement showing the duration of the floods at Wentworth, from 1877 to the present time. [*Exhibit* 46.] From that statement it would appear that the river was navigable for small boats drawing 4 feet of water, for an average of 293 days per year. At times it was navigable for longer periods, and at one time for four years at a stretch; but the average is as given. The longest period below that level was from the 27th December, 1885, to the 4th July, 1886, a period of nearly seven months. I have also an extract from the report on the locking of the Darling in New South Wales, in 1890, showing the value of the imports and exports from the town of Wentworth, from 1875 to 1889, for South Australia and Victoria. [*Exhibit* 47.] In 1882, the value of exports to South Australia exceeded £1,000,000. I have had some experience of irrigation, both at my own place on the Darling and at Mildura, and I think there is a great future for irrigation on the banks of the Murray and its tributaries. I think that had it not been for internal dissension Mildura, as an irrigation colony, would have astonished Australia. In support of that statement I would like to read an extract from the report of the Engineer-in-Chief for Water Supply in Victoria:—

> It may readily be inferred that the allegations made against the management of the settlement have frightened away intending investors, turned aside the stream of population and the influx of capital, marred the prosperity of the place, and seriously straitened the finances of the firm.

I think, in view of the possibilities of the river, that a canal should be constructed from Goolwa to Victor Harbour. Mr. Lindon Bates, the expert who reported upon it, states that "Several alternative lines were run, and on the occasion of my personal inspection the local topography was very carefully examined. As a result it was found practicable to decide, beyond all question, that such a canal was feasible, to determine its general alignment, and its termini. Sufficient data were collected also to warrant an approximate estimate of its cost." The cost of the canal is given as £570,000; but I think that an excessive estimate. It seems to me the work is extremely feasible as far as Middleton, where some rock will have to be contended with, and there will also be a deep cutting at the back of Port Elliott; apart from these, I think there are no engineering difficulties. It is imperative that the settlers should have cheap water-carriage, to enable them to get their produce away to the markets of the world. Mildura alone could easily supply the markets of Australia with fruit. I have myself tested the soundings of Victor Harbour, and found them to agree with the chart in Sir John Coode's plan. The depth of water in the sheltered area inside the breakwater is from 33 to 36 feet. I think it is a very safe port for vessels to enter; there is a wide entrance. The breakwater measures 1,030 feet in length on top, the screw-pile jetty is only 272 feet long; but there is 25 feet of water at the end of it.

Dam at great Ana-branch.

Period of navigability.

Future of irrigation.

Goolwa Canal.

Cheap water carriage imperative.

Port of Victor Harbour.

Cost of canal.

218. In giving your opinion as to the canal, you are aware that it is estimated to cost over £500,000, and that, therefore, the annual cost, reckoning interest at 4 per cent., would amount to £20,000, not taking maintenance into consideration, and that that, at 15s. per ton, assuming it cost that amount to tranship produce between Goolwa and Victor Harbour, would require 27,000 tons per annum, *i.e.*, to balance both sides of the ledger you must ship at least 27,000 tons of produce per annum from Victor Harbour in order to pay interest on the bare cost of the canal;—did you take that aspect of the case into consideration when you gave your opinion? I consider that rate of interest altogether too high. I formed my opinion as to the canal, in a measure, from the statement of Mr. Lindon Bates, that it would be exceptionally economical to construct and work the canal; but I also bore in mind the probability that the increase of trade would be enormous.

Probable increase of trade.

219. You heard Mr. Reid this afternoon give the volume of the trade since 1872; the very highest tonnage that has been shipped from Victor Harbour was in 1884, when it reached 32,679 tons, in other words, the very best year that Victor Harbour has ever known would not pay interest on the cost of constructing the canal, even supposing the boats came through for nothing;—did you take that into consideration in giving your opinion? I think 4 per cent. altogether too high an estimate for so large a work.
220. You spoke of the importance of irrigation on the banks of the Murray and the Darling Rivers, and you have had some experience of irrigation? Yes.
221. Do you think, seeing that in the major portion of the cases the water would have to be pumped, that irrigation is likely to be increased to any very great extent? Yes; I think so; I maintain that it is a success at Mildura, and it ought to have been a very much greater one.

Proposed works, great Ana-branch.

222. What is your opinion about the great Ana-branch of the Darling;—there is a proposal to divert some of the water of the Darling down that branch, by means of a cutting, and by putting a weir across the Darling;—what do you think of that proposal? I may say that it has been a pet scheme of mine for some years; under my supervision the Ana-branch cutting of the Darling was completed for 10 miles from the river, so that all that is necessary is a weir to divert the water down that branch, and as I said before, in time of flood I conserved 182 square miles of water, averaging from 10 to 12 feet in depth.

Irrigation by gravitation.

223. You think it would be a good work? Certainly; at a place in the neighbourhood, below the 183 dam, which is well known there, a dam might be constructed which would conserve an enormous amount of water, backing it right back to the Darling, and this water could be drawn off by gravitation, for irrigation, from that part of the neighbourhood, say, 40 miles down to the Murray. I have not taken any levels of the land that would be irrigated; but I know the levels of the Ana-branch for 50 miles up there,

there, and I feel sure that if a large dam were put there, between the high banks, the water could be drawn off by gravitation, as required, for the irrigation of a large area between, say, Bunnarunzie and the Murray.

D. H. Cudmore. 26 May, 1902.

224. *Mr. Murray.*] Having regard to the character of the country bordering on the Darling and Murray, do you consider navigation or irrigation the paramount interest? Navigation.

Navigation paramount.

225. Suppose the river were kept open by works of some kind, so as to maintain navigation in every year a sufficient length of time to enable all the produce of the country bordering the Murray and the Darling to be brought to the mouth of the river, do you think that, in addition to that, it would be essential to construct an outlet to Victor Harbour, or do you think land carriage would answer the purpose? I think it would be very valuable to construct a canal, as a great deal of produce, wool and wheat, comes down, and the handling is such a great item.
226. You mentioned Morgan as a river port for the transhipment of produce;—what gain would there be in bringing the stuff to Port Victor, instead of to Morgan, that is, what would it amount to per ton? I could not say; were it not for preferential railway rates, water carriage would bring it here. As the Murray is at present it answers all purposes of navigation; but if any further great quantity of water is withdrawn from it in the higher parts of the river, I think it would seriously affect navigation, and also destroy the immense quantity of land around the lakes here owing to the salt water coming in.

Effect of further diversions.

227. I suppose you know that these objections to reducing the quantity of water can be combatted artificially? Yes; but as the river is at present, although a large quantity of water has already been diverted from it, it answers all purposes of navigation in ordinary seasons. It would, of course, be very desirable to have it made permanent.
228. You say it is now open a sufficient length of time each year to enable the produce to be brought to the river mouth? Yes.
229. I presume that refers to the Murray alone, not to the Darling or the Murrumbidgee? That is so.
230. Then we may infer from your evidence that the Darling could also be kept open for navigation without incurring any exhorbitant cost? I have not gone into the cost. The Lower Murray is the main highway for all the rivers, and therefore has, I think, the paramount importance.

Fluctuations of trade.

231. *Mr. Burchell.*] This afternoon we had a list showing for a great number of years the trade coming to Goolwa; is it not sometimes the case that when there is a large volume of water coming down from the source of supply, the seasons have been very bad along the river banks further down;—would that not account for the fluctuations? That is so; and I take it that it arises partly from drought, and occasionally that the flood comes down the Darling previous to shearing-time—too soon, in fact; and the produce has to remain over until the following year.

Freight, &c.

232. Do you think the present cost of carrying wool on the river is reasonable? I think it very reasonable; but the charges at the terminus are the trouble. I consider them excessive.
233. Where was your station? Fifteen miles from Wentworth, up the Darling.
234. What does it cost to bring wool from there;—15s. to Goolwa and 19s. to the ocean boats? Yes, 15s. to Goolwa; but I am not sure of rate thence to Victor Harbour.
235. You consider water carriage the cheapest? Yes.
236. Do you think wool could be brought from Wentworth to Adelaide by railway as cheaply as by river? No.
237. At what difference in cost, do you think? It costs more to bring it from Morgan to Adelaide than from the station to Goolwa.
238. Then the railways could not compete with the river? No, never.

TUESDAY, 27 MAY, 1902.

[*The Commission met at the Court-house, Goolwa, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

George Ritchie, M.P. for Alexandra, sworn and examined:—

G. Ritchie, M.P. 27 May, 1902.

239. *President.*] What is your name? George Ritchie.
240. You are one of the Parliamentary representatives of this district in the Legislative Assembly? Yes.
241. Have you prepared a statement on the question that is engaging our attention? I have. The evidence which I have to give is gained from practical experience—that is, in trading upon the rivers. I have traded upon the rivers Murray and Darling for some sixteen to eighteen years. I have made a study of the rivers question for the past nine years, and my evidence is based on the assumption that South Australia is entitled to a reasonable amount of the Murray water for navigation purposes in South Australia, and also for facilitating the trade which South Australia has built up—and which we hope she will maintain—with regard to the Darling. America is specially noted for her railway systems; but they also recognise the use to which their water can be put for irrigation and navigation purposes, and I understand the navigation question is superseding the irrigation question there. [*Witness here quoted from Exhibit* 48 *to show that navigation has assumed very large proportions in America, and also quoted from the same Exhibit giving particulars of the Manchester Ship Canal.*] With regard to the trade of the river, and the amount of freight which might be expected under conditions which exist on the rivers at the present time, the distance from Bourke to Goolwa, downstream, is 1,800 miles, and goods can be carried profitably, I estimate, at 30s. per ton placed, f.o.b. Victor Harbour, that is, assuming the canal is constructed. No criterion can be obtained, by which to judge the volume of the trade that could be done on the rivers, from present conditions. I estimate the probable trade in an ordinary season, provided it was allowed to proceed in its natural channels, at approximately 500,000 tons per annum. The imports of New South Wales and Victoria *via* the Murray in 1882 amounted to £861,000, and the exports in the same year amounted to £347,000; but in 1900 the imports fell to £181,000, and the exports to £45,000. The reason of the falling off is due to railways having been constructed in the different States, which have had the effect of diverting the trade to the large centres. In 1878 there

River trade.

G. Ritchie, M.P. 27 May, 1902.

there were 17,000 bales of wool lying at the Goolwa wharf at one time waiting to be unloaded. In 1879, when M'Culloch and Company had their extensive business here, there were 10,000 tons of goods shipped over the Victor Harbour jetty in five weeks. This was in addition to a coasting, steamer making weekly trips, that was trading between Port Adelaide and the Murray mouth. The wool shipped at Victor Harbour in 1887, was, 20,588 bales. In the year 1889 there were 36,384 bales received at Morgan, which is connected with Adelaide by rail. There where shipped at Victor Harbour in the same year 16,404 bales of wool. So that the quantity of wool that came to South Australia that year was 52,788 bales. From January, 1887, to February, 1892, the tonnage of the vessels that came into Victor Harbour was 97,110 tons; the wool exported was 75,596 bales; wheat, 12,718 tons; chaff, 7,894 bags; timber, 200 tons; bark, 200 tons. The imports totalled 3,710 tons. I think that navigation and irrigation should go hand in hand, because if navigation is to be overlooked, what is to become of all the produce which we hope to see growing in our Colonies along the river by the irrigation schemes which it is proposed to construct? Weirs have been proposed in connection with irrigation schemes and could be made in conjunction with the locks. It would cost very little extra while those weirs were being constructed to make them into locks, and a twofold purpose could thus be served. There is another advantage gained by water carriage, and that is, that your water-ways never wear out. Your railways, macadamised roads, &c., have always to be kept in a state of repair, whereas, with our water-ways there is no expense. That is one reason, I suppose, why water carriage can be conducted so cheaply. [*Witness here quoted from Exhibit No. 49, a comparison between water and land carriage.*] Wool is carried from Morgan to Adelaide, 104¾ miles (by rail), at an average of 18s. 8d., whereas a squatter or producer of wool in South Australia has to pay an average of £1 14s. 8½d. An outsider gets his goods carried from Adelaide to Morgan for £1 2s. 6d., river-borne, whereas the South Australian has to pay an average of £2 1s. 3d. In Victoria, from Echuca to Melbourne (144¾ miles by rail), for wool, river-borne, from the Darling, the average rate is 23s. 3d.; from the Murrumbidgee, 26s. 9d. Whereas the ordinary rate is 44s. The rate for goods to Echuca from Melbourne, river-borne, is 19s. 6d. to 22s. 6d., average 21s.; for the Murrumbidgee, in New South Wales, they have to pay 40s. over the same line of rail for the same class of goods. Whereas the ordinary rates for the residents of Victoria are 19s. to 87s. 6d (a great portion are the highest rate goods) average 53s. 3½d. New South Wales again has similar rates from Bourke to Sydney, 504 miles. The rates last year for wool averaged £4 10s.; since that they have reduced them still lower. The rate at the present time for scoured wool is £4 5s. per ton; for greasy, £3 3s. 9d.; from Hay to Sydney the rate for scoured wool is £4 2s. 3d.; for greasy, £3 1s. 8d. The goods from Sydney to Bourke over the same line of railway average £5 15s. per ton in truck loads of 6 tons, while the ordinary New South Welshman has to pay from £6 9s. 11d. to £11 5s. 4d. These quotations are taken from the tariff books of the three States, and I understand outside of those rates further rebates are allowed. I am of opinion that if any arrangement can be arrived at between the three States, whereby no water should be taken out of the river when it fell to a certain level, a happy conclusion would be arrived at. That level would require to be taken, perhaps, in a series of years. In ordinary seasons the river is navigable to Wahgunyah, on the Murray, to Wagga, on the Murrumbidgee, and to Walgett on the Darling. I think by arriving at this level that I spoke of just now locks would be necessary from Wentworth down. At the present time, with flood-waters coming down, it spreads over immense tracts of country. When the river starts to fall, the billabongs and flat tracts of country serve as feeders and help to maintain navigation. Therefore, I think that locks in the Lower Murray are absolutely necessary. In the big floods we river traders have often complained that there has been too much water. During the 1890 flood on the Darling I have steamed for hours without seeing dry land in daylight. In one instance I took a vessel, which was then the property of my brother and myself, 25 miles back away from the Darling with 40 tons of cargo on board (*witness here quoted from an article by the Albury correspondent of the "Melbourne Age" in regard to cheap water carriage, Exhibit 49*). Victorian settlers recognise the importance of navigation, and that not only South Australia, but also Victoria, is interested in navigation. I am of opinion that the advantages gained now under federation by interstate freetrade should greatly increase the river trade. The small islands which occur at certain intervals along the course of the Murray would, in my opinion, be good sites for locks and weirs. Twenty miles below the South Australian boundary there is Chowilla Creek. There the Murray is very narrow, and it would be a suitable place for a lock. Then there is Riley Island, 45 miles lower down; Media Island, 3 miles; Kapunda Island, 2 miles; Craigee's Island, 5 miles; Pyap Island, 15 miles; Moorook Island, 2 miles; Thurk Island, 8 miles; Bell Island, 12 miles. I do not know whether a foundation can be found at Bell Island, but there is a rock there termed "The Bell Rock," and, perhaps, by boring, a good solid foundation might be found there on which to construct a lock; Hart's Island, 25 miles; and Glen Foslyn Island, 60 miles. The majority of those islands are close to either one bank of the river or the other, and there is any amount of material available right on the spot. The Murray in the past, during my experience, has been open for navigation for nine to ten months out of every year. As regards Mr. Lindon Bates' report, I might state that I furnished him with the following information:—

Navigation and irrigation.

Land and water freights.

Locks.

Suitable sites for locks and weirs.

> The seasons of year at which the rivers Murray and Murrumbidgee are navigable are reported in the following terms:—
>
> These rivers rise annually about May or June, and remain navigable till about February or March.
> Sometimes the seasons are such that the Murray is navigable for two or three consecutive years.
> From 1889 to 1895 the river was navigable as far as Wentworth, with the exception of about six weeks.
> The height of the floods in these rivers varies in different years.

There is another point, and that is, since our irrigation colonies have been established and are yielding fairly good results, it is rather unfortunate that the fruits are ripe and ready for market when the river is low. Of course, if there is no river, and the fruits have to be sent by rail, it will make a big difference in carriage. Since the canal schemes have been constructed on the upper river, and we have experienced the dry seasons, our lakes Alexandrina and Albert have been salt even as far as Pomonda. South Australia has a great asset in the lands adjoining the lakes. It is very fertile country, and what is not used for agriculture is used for grazing, and the effect of the salt-water will be detrimental to that property, and will depreciate its value in the parts affected by the salt-water. The Moira Lakes, in Victoria, on the Murray; Pamamera, Cowandilla, and Speculation, lakes in New South Wales, have a depth of from 6 to 10 feet, and cover an area of 120 square miles. In years gone by I have known navigation to be open for a month to six weeks from the lower part of the Darling to Menindie, when it has not been navigable above in consequence of the flood-waters coming in from the lakes named.

Lakes.

G. Ritchie, M.P. 27 May, 1902.

242. *President.*] From the statement which you have made, it would appear that you regard navigation as being more important than irrigation? I think that both navigation and irrigation are necessary; but my argument is chiefly based on the assumption that irrigation should not supersede navigation.

Preferential railway rates.

243. The figures that you have given prove pretty conclusively that the trade is leaving Goolwa and Victor Harbour? Consequent upon the preferential rates.

244. That to some extent is due to the action of the Government of South Australia in the management of their railways? The South Australian railway authorities did that to compete with the other railways. The other railways reduced their rates first, and South Australia reduced its rates to meet them. We did not take the initiative in the matter.

245. The effect of the action of the South Australian Government in respect to their railways was to practically kill the trade of Goolwa and Victor Harbour? The action of the New South Wales and Victoria railways.

246. What I understand you to say is that a good deal of the trade was diverted *via* Morgan? Yes. I stated that the Morgan line was constructed after the breakwater at Victor Harbour owing to the change of Government; but I do not think I stated that was the reason why we lost the trade.

247. Is it not a fact that a good deal of the trade is diverted, *via* Morgan, to Port Adelaide? Yes; but, only through the other States lowering their rates; they reduced their rates to come on to a level with our South Australian rates.

248. While navigation should be cared for, you would say that no more water than would serve the the purpose of navigation should be devoted to it? South Australia, I think, would be content, provided she had sufficient water for safe navigation.

249. To what further extent do you think that South Australia should be considered in respect to irrigation? That is a question upon which I am not able to give an answer; as regards the quantity.

Saltness of lakes.

250. Regarding the saltness of the lakes, you say that saltness of the water is felt to the extent of 40 miles up the river? Yes; for the last two or three years.

251. What has been the usual experience in regard to the saltness of those lakes in the past? I have known the water to be salt as far as Point Sturt, some 16 miles from here, and then only rarely.

252. I understand from you that, owing to the dryness of the season, and, you think, to some extent owing to the fact that Victoria has diverted some of the waters in that State, the saltness is being experienced further up than it was ever felt before? We have come to that conclusion on account of never having experienced such a thing before those canal schemes were constructed in Victoria, except on one or two rare occasions.

253. Do you advocate the construction of weirs at the mouth of the Murray, to prevent saltness? I have not gone into that question at all, as I was only to-day made aware that plans of proposed weirs had been made by the South Australian Government. If the canal system between Goolwa and Victor Harbour were completed a lock could be put in at the excavation in the Port Elliott Hill at a small expenditure, as there would be a high rocky bank on either side, and if the canal was deep enough to discharge all the river water, the Murray mouth would, in my opinion, close up in the course of a year or so, as the sand there is very yielding.

254. *Mr. Murray.*] You said that the falling off in the river trade has been due to iniquitous railway rates in New South Wales and Victoria;—do you not think it is due in an almost equal degree to the falling off in production? I stated that we could not take the present season as a criterion. If the Government charge their own settlers or citizens nearly double the rate they charge outsiders, I contend that they are either robbing their own people of the difference, or that they are carrying the other peoples' goods at a loss.

255. Which of the two factors do you think the more responsible for the reduced river traffic, the falling off in production or the iniquitous rates? Both have had their effect.

Water of tributaries.

256. You spoke of South Australia's claim to a share in the river waters;—have you considered that claim to extend to the river tributaries? Certainly. The tributaries are a portion of the Murray.

257. Do you consider the river is South Australian property before it flows in the State channel? I think so. The tributaries are its feeders. If we only had the Murray without the feeders, it would not be of as much benefit as it is at present. I consider that South Australia has an interest in any water that runs into the Murray.

258. *Mr. Burchell.*] With regard to those quantities of wool, &c., that were shipped from Goolwa in 1887 or 1889;—how was it taken to Victor Harbour? By the railway. Any wool that was taken through the Murray mouth was taken to Port Adelaide.

259. There has been some taken through the mouth? Oh, yes. The "Queen of the South" and other river vessels made many trips there.

260. Do you think it would be advisable to lock it higher up as well? For navigation purposes I should like to see the Darling locked, but that is a New South Wales question. When I referred to Wentworth, perhaps I should have said from the boundary down, but Wentworth, I suppose, would be sufficient.

261. From your experience in navigating the Darling, do you think there would be any difficulties in locking it? I think it could be locked.

262. And you think it could be locked from Wentworth higher up the Murray as well? I should think so. Of course, above Wentworth it would be an easier matter, owing to the number of rocky beds there.

263. Do you know that the persons living on the Upper River at present are suffering great disadvantage, owing to the river not being navigable? I do not know just now.

264. Do you know that there are 300 tons of fruit at Renmark that cannot be got to market? I understand so.

Cartage, &c.

265. Do you know what it costs by road? Fifty shillings or 60s.

266. You do not know that it is £5 a ton? I was not aware of that. The carriage by river would be about 10s.

River freight.

267. Will you tell me the ordinary freights for wool from Bourke to Goolwa,—when you have an ordinarily good river, and there are no difficulties in navigation? I have not been engaged in river business for five or six years, but I think the rates at the present time—that is to say, if the river was open, and vessels were able to carry full loads—would be about 30s. to £2 per ton. It is about 1,800 miles.

268. And from Wentworth to Goolwa? I should say £1 per ton.

269. That is 620 miles? Yes if there was a large quantity, it could be carried at a much lower rate.

G. Ritchie, M.P. 27 May, 1902.

270. In face of that, do you not think that 13s. and 19s 6d. from Goolwa to Victor Harbour are exorbitant? Very excessive.
271. What is the nature of the islands you referred to;—are they rocky? Bell Island is the only one where rock is to be found at all.
272. They are subject to inundation? Some of them. When the river is in flood, the weirs and locks would be unnecessary.

Alternative schemes.

273. Have you ever heard of any other means of getting goods from Goolwa to Victor Harbour than by this proposed scheme? There are two schemes; one was to make the Murray mouth navigable; and one was to make a cutting direct from Goolwa to the ocean.
274 Do you know much about that scheme? No; but my private opinion is that neither of them would be practicable.
275. On what grounds do you say that? Because the nature of the sand upon which the moles or breakwaters would be constructed is so yielding that I think they would at times sink in the sea.
276. Have you seen an estimate by an engineer of those schemes? Yes.
277. With regard to Mr. Lindon Bates' scheme for the canal to Victor Harbour, has it ever struck you that the interest on the capital cost would be rather against the freights? I think that the estimate made by Mr. Bates is excessive. I think that the canal could be excavated for about one-third of the amount. We had an estimate for that work some twenty-five years ago, and it was from £150,000 to £160,000, and then we had not the modern appliances that we have at the present time.

Thomas Goode, storekeeper, Goolwa, sworn and examined:—

T. Goode. 27 May, 1902.

278. *President.*] What is your name? Thomas Goode.
279. You are a storekeeper, residing at Goolwa? Yes.
280. You have been here for a number of years? Since 1852.
281. You are, therefore, acquainted with the volume of trade that has been done at Goolwa for some years past? Yes.
282. Has it decreased in late years? It has.
283. Materially? Very considerably.

Causes of reduction in trade.

284. Have you got any definite idea as to the cause or causes? Yes; the construction of railways having more than equalled the increased volume of river business, and the preferential rates on the different lines of railways, South Australian, Victorian, and New South Wales. The fact is that while the railways have been fighting for the trade we have suffered somewhat.
285. Do you think that the principal reason why the bulk of the trade has left you? That and the low river. As a matter of fact the trade now into South Australia is not so great as it was a while ago, before Morgan had its preferential rates.
286. Dealing with Goolwa and Victor Harbour, the trade has virtually been diverted from those places to other places? Much of it.
287. You say the reason for that has been owing, first of all, to the droughts, and then to the preferential rates on the different railway systems connected with the river? Yes.

Remedy.

288. Do you suggest any remedy? Yes; I would advocate the bringing of the ocean vessels into touch with the river steamers.
289. What scheme have you in your mind to accomplish that? I am not prepared to advocate one or the other with certainty. I believe that we have still to get expert opinion on that. I have conversed with engineers who have thought that the best way was to cut right through the sand-hills. I was here when the surveys were made, and an estimate of £355,000 was given by the engineer at the time to do that work. Others have advocated the Murray mouth, and now we have the canal to Victor Harbour advocated by Mr. Bates. That same canal was not only on the boards, but an amount of £150,000 was actually brought forward in the Loan Bill of 1874 by Mr. Boucaut for a canal to Victor Harbour; all recognising the main point that we should bring the river steamers into touch with the ocean vessels.
290. *Mr. Burchell.*] With respect to the land around those lakes and the island, what is it principally used for? Grazing and farming.
291. Is it good grazing land? Yes.
292. There is no wheat? Wheat is not their principal staple now. The land is more used for grazing and dairying.

Hindmarsh Island.

293. What is the area of Hindmarsh Island? Twenty-one square miles.
294. How many people are there residing on the island? I should think twenty families; all doing well.
295. What is about the value of moderately good grazing land? Three to five pounds per acre.
296. Provided the cost of both schemes was the same for, say, taking the produce *via* the canal to Victor Harbour as it would be to construct this short canal into Goolwa, so as to admit ocean boats to come alongside of the river boats;—which of the two methods do you think would be most beneficial? I have always thought that if you can put ocean vessels alongside this wharf you have a harbour unsurpassed.

William Adolph Ludwig Wolter, Captain of river steamer, sworn and examined:—

W. A. L. Wolter. 27 May, 1902.

297. *President.*] What is your name? William Adolph Ludwig Wolter.
298. You have been trading on the river Murray for a number of years as master of one of the river steamers? I have; for thirty-nine years.
299. On an average, how many months in a year would the Murray be navigable above Blanchetown? With my boat it would be navigable for about ten months in the year.

Period of navigability.

300. Can we take that as an average for the number of years you have been trading on the river? For my boat—yes.
301. Have you found any difference in late years as compared with former years? No. Owing to the improvements by means of breakwaters or training-walls, the river in South Australia has been so much improved that we actually have found it better in latter years than in former years.
302. So that, except for two months each year, you think, for purposes of navigation, the river as it is at present is all that could be desired? As far as navigation is concerned, yes, on an average for my boat.

Saltness of water.

303. Have you noticed any difference in the saltness of the water of late years compared with former years? I have known the water to be salt as far as Wellington in former years, but in latter years the saltness has been experienced more often. 304.

W. A. L. Wolter. 27 May, 1902.

304. Has it ever gone up beyond Wellington latterly? I have not found it so. I heard engine-drivers of the Melbourne express complaining of their boilers priming owing to the brackish water taken in at Murray Bridge.
305. The trade has very much diminished of late years? Very much.
306. It has not been, therefore, from what you have stated, due to the fact that the river has been less navigable than it was formerly? No.
307. What do you attribute it to? I presume you speak of the river above Morgan; above Morgan it is simply drought and the diversion of the trade by preferential rates in the other Colonies, which have made such a difference to us. At one time we were sole possessors of the Darling, but of late years Victoria wanted to have a slice in it, and imposed preferential rates, and gave us masters a bonus of 6d. per bale for bringing the Darling wool on to Echuca.
308. So you attribute the diminution of the trade which has occurred, first of all, to the preferential rates; and then, secondly, to the fact that the produce, owing to the drought, has not been there to convey;—is that the way you put it? Yes.

John David Ritchie, Town Clerk, Goolwa, sworn and examined:—

J. D. Ritchie. 27 May, 1902.

309. *President.*] What is your name? John David Ritchie.
310. In the past, you have been joint owner and master of river boats? Yes.
311. Trading on the Murray? Yes.
312. At present you are Town Clerk at Goolwa? Yes.
313. How long have you been acquainted with the Murray? I have had eighteen years' experience on the Murray, Murrumbidgee, and Darling.

Period of navigability.

314. How long during the year is the river navigable? As far as Wentworth I should say it is navigable on an average for somewhere about nine out of the twelve months.
315. Have those conditions changed in late years;—has there been an improvement or otherwise? As far as I know, I cannot say that there is very much difference. I think that is a very fair average, taking it right through.

Trade diversion

316. The trade that was formerly done on the river has been more or less diverted? Yes.
317. Partly through Morgan, partly through the State railways in Victoria, and partly through the State railways in New South Wales? Yes; that has diverted the trade from here, from this part particularly. Of course, we do not expect the same trade at the present time, in a severe drought, as we do in a good season.
318. Do you think that anything you could do would restore—what you very much desire—the trade between Goolwa and Victor Harbour? I believe if this canal was cut from here to Victor Harbour it would greatly improve the trade—that is, as far as this end is concerned, because, as has already been stated, the rates would be very much cheaper. It goes without saying that water must be cheaper than rail carriage, and if we had communication with the ocean at Victor Harbour, by a canal, it would be a great advantage.
319. Do you know that the canal is estimated to cost a large sum of money? I believe Mr. Bates' estimate is somewhere about half a million.
320. Do you know what the interest on that at 4 per cent. per annum is? Yes; it would amount to a very large sum; but I do not think it would cost anything like that. I think Mr. Bates' estimate is far too high. I am not prepared to say what it would cost, but to cut 9 miles through low-lying country the estimate seems outrageous.
321. *Mr. Burchell.*] Do you know if the railway existed as now from Goolwa to Victor Harbour before the railway at Morgan? There was a tramway at the time.
322. Have you any idea, when the railway was made, as to whether the rates were as high as they are now? I think they were higher.
323. Do you think that that had any bearing upon the construction of the Morgan line? I do not think so.
324. Taking Goolwa, 200 miles further down, how do you account for the fact that river boats are expected to bring wool down here for the same price as to Morgan? I know one firm on the river who would not do it. We used to do it simply because we used to like to see the trade come down to this end of the river. It was the natural outlet for the trade, and we had our homes down here. Sometimes it was a saving of time if bound for Goolwa; if we struck Morgan of an evening, and it would be morning before we could discharge, we would not lose anything by coming on here.

Walter Frederick Newell, fisherman, Goolwa, sworn and examined:—

W. F. Newell. 27 May, 1902.

325. *President.*] What is your name? Walter Frederick Newell.
326. Are you a resident of Goolwa? Yes.
327. For how many years have you been here? From childhood.
328. Are you acquainted with the lakes? Yes.
329. Do you know anything about the saltness of them? Yes; as I am a fisherman, I follow the salt water.
330. How far do you have to follow it? From Goolwa to Point Pomonda.
331. In former years it used not to come up as far as Point Pomonda? We fished about Point Sturt.
332. How much further up the river have you felt the salt of late years? It has been practically salt this last three or four years as far as Pomonda.
333. Does that occur the whole year through, or only in the dry portion of the year? Only in the dry portion of the year.
334. You say it is pretty well salt all the year round? This year, last year, and the year before that, it was very little better.
335. Have you any idea as to the cause? Principally owing to there being very little rain upon the watersheds, and also owing to irrigation.
336. Do you think the effect of putting in weirs would be to flood a lot of land that was cultivated? Yes. If the effect of the proposed weir that was surveyed below Goolwa was to raise the level of the lake 2 feet, it would flood a lot of the low-lying land round the lakes.
337. *Mr. Burchell.*] How far have you caught salt-water fish up the lakes? We have caught them at Port Agnes and Brinkley. There have been one or two caught up at Wellington.
338. Does the salt-water kill the codfish? Yes.
339. Where have you noticed them? At Point Sturt.

WEDNESDAY,

WEDNESDAY, 28 MAY, 1902.

[The Commission met on board the s.s. "Tarella," Lake Alexandrina, South Australia, between Point Sturt and Milang, at 2·30 p.m.]

Present:—

JOSEPH DAVIS, Esq. (President).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Frank Nicholls, Point Sturt Station, representative of Mr. J. H. Angas, at Point Sturt Estate, sworn and examined:—

F. Nicholls. 28 May, 1902.

340. *President.*] What is your name? Frank Nicholls.
341. You are manager for Mr. Angas? I represent Mr. J. H. Angas, of Collingrove, Angaston, owner of Point Sturt Estate.
Area of estate. 342. What is the acreage of Point Sturt Estate? A little over 3,500 acres.
343. Have you known the estate for long? I have been working the estate for the past twelve years.
Saltness of lakes. 344. Have you noticed any difference in the saline properties of the water of the lakes recently? Yes, very considerable difference.
Date of change. 345. How far does the change date back? We had trouble first in 1896. It had been salt to some extent previous to that year; but in 1896 we lost over £2,000 worth of stock owing to their drinking the water. Previous to 1896 we had no wells.
346. What caused the water to become so salt in 1896? Shortage in the river.
347. To what do you attribute that shortage? To drought.
348. It is the sort of thing which happens occasionally, and over which no one has any control? Yes.
Irrigation. 349. What do you use the water for? Irrigation and watering stock.
350. What irrigation do you carry out on the estate? We have a plant, consisting of a Crossley oil engine and a centrifugal pump, capable of throwing 15,000 gallons per hour, and irrigating 50 acres, which is all laid out with drains and piping wherever necessary; but this last season we have not been able to irrigate to any extent, owing to the saltness of the water.
351. You used windmills previously? Yes.
352. So that the plant to which you refer has not been used very extensively? No; but one reason for obtaining the plant is to enable us to avail ourselves of the fresh water when it is obtainable.
353. What quantity of water do you think you will use for irrigating the 50 acres you mentioned? As much as our engine will throw, from the end of November to (say) February inclusive, going the whole time.
354. That is, one-third of the year? Yes.
355. You also use the water for stock purposes? Yes.
356. Do I understand that you use the water from the lake direct? Yes; but since 1896 we have provided against the lake becoming too salt to use, and have provided all the paddocks with fresh water from wells.
Wells affected by lakes. 357. So that if the lake became continuously salt it would only affect you to the extent of the 50 acres you irrigate? I would not like to say that, because I have tested the depth of the water in the wells, and find that they are very sensitive to the rise and fall of the lake, the water being on a level with the lake—in fact, we were not able to use the water from one well for a while, which is within 50 yards of the lake.
358. Do I understand that although you use water from the wells for stock purposes your fear is that, supposing the lake were salt, it might have the effect of causing the water in the wells to become salt also? I am very much afraid so, except in the case of small soakage wells, the supply from which would be inadequate.
Fodder killed by salt water. 359. The quality of the water only affects you in the two ways I have named? The salt water coming up has spoilt our frontages as far as the growth of reeds, which is a very valuable summer fodder, is concerned; in fact, our neighbour, Mr. J. Oakley, cannot keep more than half the stock he used to, owing to the salt water killing the reeds on the frontage.
360. You regard it as vital that the water in the lakes should be maintained in a fresh condition? I do.
Nature of bottom of lakes. 361. *Mr. Burchell.*] Do you know anything of the nature of the soil in the bottom of the lakes? No; but wherever we have put down fences it is of a sandy nature, with limestone underneath.
362. What is the rainfall on your station? The average is about 20 inches.
363. Have you ever known a drought since you have been there? Yes; we have them occasionally. This year we are very short of feed, and have been carting hay to the stock for the last two months.
364. Is the country suitable for stock, in your opinion? It is one of the best classes of country for that purpose.
365. Do they never get coast disease? No; the only loss we have had so far has been from the cattle drinking the salt water.
366. They have never drunk the water since the occasion you mentioned? No.
367. Are there not long spurs running out into the lakes, which are covered with fresh-water rushes? We have had them, but it was very difficult to find any last summer; a few grew, but not 25 per cent. of what we have had previously.
368. Was the river affected by the influx of salt water? Yes; in 1896, but not since.
369. Have you ever had the saline properties of the water tested? Yes.
370. What was the greatest amount per gallon? We had the test made in 1890, when our piping and fluming were laid; in that year the lake was particularly high and fresh.
371. *Mr. Murray.*] I understood you to say that you irrigate 50 acres? Yes, 40 to 50, perhaps 45 would be more correct; the sheds, &c., have to be deducted from the 50 acres.
372. If you allow some water for stock, it would be equivalent to an increase of the acreage, so far as the quantity of water is concerned? Yes.
373. You said you could pump 90,000 gallons per day for ninety days in the year? We did not irrigate for ninety days, owing to the saltness of the water; as a matter of fact, we could only irrigate five days during last summer.
374. 90,000 gallons for ninety days per year is equivalent to 7½ inches per acre;—I think you have obtained a good result from the water? Yes; and if you had seen the paddocks earlier you would have agreed that the areas irrigated warranted the expenditure.
375. Has it a good effect on the grass? It is lucerne. 376.

F. Nicholls. 28 May, 1902.

376. Does it keep the stock in good condition? Yes; it makes good beef and good milk.
377. That is all the irrigation you have? Yes; but I may say that Mr. Angas agreed to take this plant as an experiment, and it was only to be the first of a number if it proved a success; we have not, however, had an opportunity of thoroughly testing it. We have 750 acres of lucerne on the estate, and it is his intention, if this had proved a success, to put down more plants. We have places much better adapted for irrigation than the paddocks you have seen, both in regard to levels, position, and quality of soil.
378. The water used is slightly salt at times? No; we watch it closely, and do not pump if there is any risk of its being salt.
379. Have you any idea how much salt it contains? No; it varies so much, and has been as salt as the sea.
380. You know the Yan Yean water supply to Melbourne;—that contains three grains of salt per gallon? Our instructions are not to use water which contains more than one-eighth of an ounce to the gallon.
381. One-eighth of an ounce would be over 100 grains? That was the maximum given by Mr. Goyder, the Government Analytical Chemist.

WEDNESDAY, 28 MAY, 1902.

[The Commission met on board the s.s. "Tarella," at Milang, Lake Alexandrina, South Australia, at 4 p.m.]

Present:—

JOSEPH DAVIS, Esq. (President).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Thomas Richard Bowman, grazier, of Campbell House Estate, Baker's Peninsula, sworn and examined:—

T. R. Bowman. 28 May, 1902.

382. *President.*] What is your name? Thomas Richard Bowman.
383. You are a grazier? Yes.
384. Of Milang? Of Campbell House Estate, Baker's Peninsula.
Area of estate. 385. What is the area of the estate? About 30,000 acres.
386. Have you been long resident there? Twenty-seven years.
Change in quality of water. 387. Have you noticed any change in the waters of the lake so far as its saline properties are concerned? When we first went down I started a garden and irrigated it, growing vegetables and fruit trees perfectly well for a number of years; but latterly the magnesia seemed to get into the water, and now the garden has gone off entirely for all fruit trees. I do not think the water has ever been too salt for stock to drink it; but it has done them a great deal of harm, and some years ago I lost a lot of stock as a consequence, while others suffered for twelve months from the scouring it caused.
388. That is, while years ago you were able to cultivate a garden, and your stock were able to water without injury; in later years owing to the waters becoming salter, the fruit trees have been killed, and the stock injuriously affected? Yes; but I still irrigate for my ostriches, I send them two loads of cabbages or lucerne per week.
Area irrigated. 389. Then while you ceased to irrigate your garden you still irrigate for produce for your ostriches;—what area do you irrigate? Eleven or 12 acres.
390. What do you grow on it? Cabbages and lucerne; so far the lucerne has not been affected to any great extent.
391. How do you get the water on to the ground? By windmills.
392. Do you irrigate the whole year round? No; for about five months of the year.
Amount used. 393. What quantity per day do you put on the ground? In a reasonable breeze, one mill throws 7,000 gallons per hour, the other 3,500.
394. Is that the whole of the water you use on your property from the lake, except what the stock drink? Yes.
Increased saltness. 395. Have you noticed the lakes perceptibly salter during latter years than formerly? Lake Albert, certainly, for several years.
396. What about Lake Alexandrina? The cattle have been injured by using the salt water which has come in.
397. But the saltness is not so pronounced as in Lake Albert? At Loveday Bay, it is often so salt that stock cannot drink it.
398. But Loveday Bay is at the mouth of Lake Alexandrina, is it not? Yes.
399. Therefore, it would be affected sooner than the large lake itself? Yes.
400. Do you anticipate any trouble beyond what you have already experienced? If they take off great bodies of water up the river the lakes will become salt lakes altogether.
401. What will be the effect of that? I do not know what we should do for water.
402. Could you not get fresh water by sinking? We can get a little on the surface; but as we go down we get it as salt as the sea.
Cause of increased saltness. 403. What, in your opinion, is the cause of the lakes becoming salter than originally;—is it that there have been great droughts on the upper rivers? No doubt that has a great effect; but the lakes are at such a low level that if any more water is taken away for irrigation, the sea will come in at the mouth, and the lakes must become salt.
Land charged with salts. 404. You do not think that the saltness is wholly due to the droughts? No; it is owing to the lakes getting low. The land adjoining the lakes is charged with magnesia and other salts, and when rain falls it carries these salts into the lakes.
Remedy. 405. What remedy would you propose to prevent it? I think whatever is done should be done near the Murray mouth; but that is a question for engineers. What is wanted is to keep the lakes, say, 2 feet higher—thus keeping the salt water from coming in.
406. But that is a South Australian concern, seeing the land belongs to South Australia—is it not? I think it more a question of riparian rights.
Magnesia. 407. *Mr. Murray.*] You said that twenty-six years ago you had no difficulty in using the water for irrigation? No, there was none; but since then the water has been spoiled by magnesia.
408. Do you attribute the increasing saltness of the lake to diversions higher up the river? It is difficult to say; but my impression is that if they go on with it, it would do so.
409. That is rather impression than experience? I think it is a very great certainty.
Wells. 410. *Mr. Burchell.*] How many wells have you sunk close to the borders of the lake? Twenty or thirty.
411. All round the lake? Yes; and inland. 412.

T. R. Bowman. 23 May, 1902.

412. To what depth? They vary from 6 to 20 feet.
413. Were they all fresh enough for stock? Not all; they are mostly fresh on the surface; but as you go down they become salt.
414. What quantity per day could you get out of the wells? We have not tested them as to quantity.

Loveday Bay.

415. With respect to the well water at Loveday Bay, the Corrong is very salt, is it not? Yes; but I have seen it fresh up a good distance—as far as McGrath's Flat.
416. It is generally supposed to be salter than the sea, is it not? No; I think not.
417. How has it become salt? I think owing to the water coming in from the Murray mouth by the Mundoo Channel. It drives up the Corrong instead of coming into the lakes.
418. You do not think it has been added to by evaporation from the lakes? To a certain extent, no doubt, but it is immaterial.
419. With respect to fresh water from wells, have you ever had any advice from the Conservator of Water as to the prospect of getting good water from bores? Yes.
420. What hope has he given you of getting good water? He thinks there is a prospect of getting it, but I have no such idea.

Lake Albert

421. What is the depth of water in the middle of Lake Albert? Seven to 10 feet.
422. Is there much of it that depth? No; that is the greatest depth.
423. What is the nature of the bottom of the lake? Limestone, sand, and mud.
424. Any weeds? Not so many as years ago; they have died out.
425. How do you account for that? I think it is that the lakes have become salter.
426. Is the land on the banks any good for wheat-growing? It is better for barley than wheat.
427. Is it reckoned to be good farming land? Yes.
428. Do you know the average value per acre? It runs from 2s. 6d. to £3 or £4 for the country south of the lakes and out towards the desert.
429. Have you kept any record as to the periods when Lake Albert became brackish or salt? Only by the effect it has had on my garden. I have not kept a record of the months.

William Peter Dunk, contractor and commission agent, Milang, sworn and examined:—

W. P. Dunk. 28 May, 1902.

430. *President.*] What is your name? William Peter Dunk.
431. You are a resident of Milang? Yes.
432. What is your business? Contractor and commission agent.
433. How long have you resided in Milang? Forty-three years.
434. Are you pretty well acquainted with the conditions of the country and the lakes? Yes.
435. You heard the evidence given by Mr. Bowman just now with regard to the saline properties of the lakes;—do you agree generally with him? Yes, generally.

Diversions.

436. Would you like to qualify it in any way? No; except that I think the lowness of the lake is caused very largely by the water taken out for irrigation below Wentworth.
437. You attach more importance to the diversions than he did? Yes.
438. You think the effect of that has been to reduce the quantity of fresh water which has come down from the Murray year by year, so that the waters are not as fresh as in former years? That is so. I think they have kept too much water back when the river is not in flood.

Weir at Murray mouth.

439. Do I understand that the time when the water is of value to those who have irrigation plots is also the time you need it most here, and, as a consequence, you have suffered? Yes; the only hope I see is in a weir at the Murray mouth, which would allow 2 feet more than we have at present; that would keep the salt water out.
440. What do you say as to Mr. Bowman's idea with regard to the salt coming from the land? I have had no experience of it.
441. You can see at once that if the salt is reaching the lakes from the land, even if the sea were excluded, there would still remain the element referred to? I differ from Mr. Bowman in regard to that.
442. From your experience, do the saline properties of the water increase after the water is reduced to its present level? Yes, owing to the sea water coming in from the Murray mouth.

Importance of navigation.

443. Do you attach much importance to navigation? A number of us depend entirely upon navigation for our living at the present time.
444. *Mr. Burchell.*] Is there much shipping done here from the upper river? Not at the present time; but at one time two-thirds of the shipping from the Darling used to be done from Milang.
445. Where did you send the produce to from here? Menindie, Wilcannia, and Bourke, and right up the river.
446. Where was the outlet for the wool? It was sent to Port Adelaide.
447. By the railway? No; there was no railway in the early days; we carted it to Port Adelaide.

Effect of wind on lakes.

448. The wind has a great effect on the waters of the lake at this place, has it not? Yes; a westerly wind blows it up and an easterly wind blows it out.
449. What is the depth of the water at the end of the jetty? Five feet 8 inches.
450. The wind has been so strong as to blow the water right away out as far as the end of the jetty, has it not? It left about 3 feet right at the end of the jetty.
451. It has not often been reduced to that extent, has it? No; but a good blow from the north will reduce it a foot.
452. Do you do much shipping to Adelaide? Only for the squatters on the lower river.
453. How much wool do you receive from up the river? No river-borne wool at all.
454. Is there much wheat grown in this district, round the borders of the lake? Yes, a good deal.

Wells.

455. Have you any experience as to the depth of the wells sunk around Lake Alexandrina? Yes.
456. What depth do they go? Down to 120 feet.
457. What is the quality of the water? Good fresh water.
458. Is that all the way down? No; you go through salt water and have to shut it out.
459. Does that hold good from Point Pomonda round till you come to Point Sturt? There is good water at Mulgundawa; further than that I do not know.
460. When the lakes are too brackish for stock they have to fall back on the wells? Yes; the stock will not drink the water at the present time.

461.

W. P. Dunk. 28 May, 1902.

461. Do you think there is sufficient water obtainable from the wells to keep the stock entirely? No.
462. What quantity of stock do you think there is grazing for a distance of, say, 3 miles back from the lake? About 50,000 sheep.
463. Would it be double that number if the strip were 6 miles wide? No; it might be half as much again.
464. How many cattle? About 2,000.
465. Have you ever known any coast disease? No; it is not known here.

Value of land.

466. Is it good country for stud purposes? Yes; some of the land is worth £20 per acre.
467. And what is the value of the best grazing land round here? £4 to £6 per acre.

Nature of bottom of lake.

468. Do you know the nature of the bottom of the lake at all, say, in a line from Point Sturt to Pomonda? Sandy and limestone.

Depth of water

469. Have you any knowledge of the depth of water 2 miles out from Milang? Seven feet.
470. And 4 miles out? Eight feet. I think all we require is 2 feet more fresh water in our lakes. Water should not be taken out for irrigation when it is below that depth.
471. Have you experienced any difficulty with regard to water supply? Yes, with regard to drinking water.
472. You kept gaugings of the salt and fresh water and supplied them to the Engineer-in-Chief's Department, did you not? Yes.
473. For how long? Since 1888. [*See Exhibit* 43.]
474. When you sent those gaugings in, did you test them for saltness? I sent the water in to the Conservator of Water.
475. You did not test the water yourself? No.

Francis Edward Hyde, Manager of Lake Albert Station, sworn and examined:—

F. E. Hyde. 28 May, 1902.

476. *President.*] What is your name? Francis Edward Hyde.
477. What are you? Manager of the Lake Albert station.
478. What is the area of the station? 21,000 acres of freehold, 60,000 of leasehold.
479. What is the stock? 18,000 sheep, 500 head of cattle, and 200 horses.
480. Have you known the station many years? Nearly thirty-seven.
481. Have you had any experience of irrigation? Only in a small garden.
482. Have you experienced any difficulty in regard to water supply? Yes, with regard to drinking water for the stock.
483. The use to which you put the water is, practically, confined to stock? Yes.

Brackish water.

484. Do you find the stock injuriously affected by the quality of the water? Yes. At the same time when they require it more than any other it becomes brackish, that is, from January to March.

Soakage.

485. Have you any other water supply besides the lake? Only small supplies of soakage water immediately under the sand-hills, and as the level of the lake recedes the supply in these water-holes sinks, and you, of course, have less and less for stock. We could not, in the event of our lake becoming absolutely salt, get a sufficient supply of water for our stock.

Wells.

486. You heard what the previous witness said about boring? We have not tried it; but I have known wells sunk from 150 to 200 feet, and only get a very limited supply of water.
487. Practically, you depend wholly upon watering your stock from the lake? Yes.

Depreciation of water

488. How long has the water been depreciated? I have noticed it for the last ten years, and I have also noticed that, as the water shrinks, the land itself adjacent to it becomes absolutely salt. Within the last five years we have lost 2,000 acres of frontage, which have become absolutely barren, and this can only be attributed to the lowness of the fresh water which has got below a certain surface.

Water-holes dependent on lakes.

489. Do you agree with Mr. Bowman, that the salt water issues from the land into the lake? No. My opinion is that, as the lake recedes, so the fresh water falls in the water-holes, and this leads me to suppose that when the water comes up again these water-holes will recover to a certain extent. I think the water in the lakes dams the fresh water back on to the land.

Weirs.

490. Do you think the weirs suggested would cure the evils of which you complain? Yes, and I maintain that the matter of irrigation, or even navigation, is a small one in comparison with the loss of values for grazing and agriculture.
491. *Mr. Murray.*] You spoke of the difficulty of getting water in wells or bores? I have not done any great amount of sinking.
492. You have not sunk to any great depth? Only to 60 feet.

Reclamation of lakes.

493. What is your opinion as to the project for reclaiming the lake beds? I think that the land would not become fresh for thousands of years.
494. Do you know anything of reclaimed land of that character? No.
495. Do you know that Holland is almost entirely reclaimed from the sea? Yes; but I think the conditions are different.
496. *Mr. Burchell.*] With respect to raising the water 2 feet, would that flood any valuable land? Certainly not.

River level.

497. What do you consider the level at which the river should be maintained, so that it would not injuriously affect the land? We could stand 4 feet above the present level. Anything above that would affect the land temporarily, but when it receded might perhaps prove of some benefit.
498. *President.*] With sufficient water coming down to keep the lakes fresh, how much higher than at present could the level of the water be raised without damaging land? Two feet higher than the level of freshness of the lakes.

George Gordon Hackett, Manager of Narrung Station, near Point McLeay, sworn and examined:—

G. G. Hackett. 28 May, 1902.

499. *President.*] What is your name? George Gordon Hackett.
500. Are you a resident of Milang? No; of Point McLeay.
501. What are you? Manager of Narrung station, near Point McLeay.

Area.

502. What is the extent of the estate? 14,000 acres freehold, and 4,000 acres leasehold.

Stock.

503. What number of stock have you? It ranges from 10,000 to 12,000 sheep; 600 cattle; and 200 horses.

504.

G.G. Hackett. 28 May, 1902.

504. Have you been there long? About thirty-five or thirty-six years.
505. You know, therefore, the condition of the waters of the lakes;—what do you say about it? Recently, during the past five years, we have experienced a great deal of distress owing to the salt water encroaching.

Dependent on lake water.

506. Do you depend upon the lakes for watering stock? Yes; practically, though we have one or two wells.
507. Supposing it were impossible to use the water from the lakes, how would you water your stock? We could not water one quarter of them. We have no water on the run that would water more than 200 sheep at any one time.
508. From what you say, therefore, it would be impossible for the station to be carried on, on its present lines, if you could not use water from the lakes? That is so.

Saltness of lakes.

509. How long has the lake been getting salt? About ten years, but the last five or six years it has been more noticeable. Previous to that it fluctuated somewhat.

Stock affected.

510. Have your stock been affected seriously? Yes. This year alone we shall lose about £2,000 on the value of the fat stock held for the markets, which, through getting to the salt water, have fallen off in condition.

Weirs.

511. Do you think that the construction of weirs at the mouth of the river would overcome the difficulty? It might, but raising it 2 feet, as suggested, would inundate a lot of good land.

Levels.

512. How much do you say it should be raised? I should say not more than 1 foot. No land under occupation previously would then be flooded.

Salt draining from land.

513. Have you noticed water with saline properties draining from the land into the lake? No; not into the lake; but I have noticed it draining into the salt lagoons.
514. Do you think that, although you have not noticed it, the same thing might be going on into the lake? I cannot say, probably it might; but the result, as regards making the water salt, would be infinitesimal.
515. That is to say, the large quantity of water in the lakes would not be appreciably affected by the drainage from the land, whereas the small lagoons would be? Yes.

Effect of diversion.

516. Since the diversion works on the Upper Murray have been carried out, you think the summer flow has been appreciably affected, and that inasmuch as you depend upon it to keep Lake Albert fresh, Lake Albert has in that way been damaged? Yes; most materially.
517. Which of the diversion works on the Upper Murray do you consider most to blame? Mildura and Renmark.
518. *Mr. Murray.*] Do you know the quantity diverted by those settlements? No; it may be very slight; but it is taken away at the time when we require it most.
519. Suppose the diversion by both equals 150th part of the whole volume, would it sensibly affect this lake? Yes; I think so.
520. You suggested that the raising of the level of the water would improve it;—have you any idea what quantity 1 foot would amount to? No; but I know that a 6-inch rise will cover all the low lands, and that a 1-foot rise brings the water up to the level of the ordinary high-water mark.

Jabez Williams, sheep farmer and dairyman, Meningie, sworn and examined:—

J. Williams. 28 May, 1902.

521. *President.*] What is your name? Jabez Williams.
522. What are you? Dairyman and sheep farmer.
523. What amount of land do you hold? 700 acres.
524. What stock have you on it? Forty cows, 10 horses, and 150 sheep.
525. Do you depend upon the water of the lake for watering your stock? No; not entirely. I have some small watering-places.
526. Then the saltness or otherwise of the lake does not affect you materially? Well, at the end of the season when the lakes are low, my wells get low also; and, I think, if the lakes are drained, our wells would go dry.
527. Do you think your water-holes are connected with the waters of the lake? I think so.
528. Are you well acquainted with the conditions under which your neighbours water their stock? Yes.
529. Are they not so favourably situated as you are? No.
530. Do you think then, looking at the question from their point of view, there would be very serious consequences if the lakes were allowed to get salt? Yes.
531. Have you noticed the lakes salter of recent years than formerly? Yes; within the last five or six years; previously I heard no complaints that the stock would not drink the water, but latterly I have.
532. You know there has been an exceptional drought within the last few years? Yes.
533. Do you not think that would account for the whole thing? I would not care to say that.
534. You connect it with the condition of the lakes? It may have some influence; but I do not think it has all. I think the irrigation works up the river have more to do with it.

Albert Henry Landseer, proprietor of river boats, Milang, sworn and examined:—

A. H. Landseer. 28 May, 1902.

535. *President.*] What is your name? Albert Henry Landseer.
536. Are you a resident of Milang? Yes
537. How long have you been here? Forty years.
538. You are interested in the river traffic, are you not? Yes. I have two boats on the river.

Navigation facilities.

539. Can the navigation of the rivers above Milang and the lakes below be negotiated with the same facility as in former years? No.
540. Is that on account of the drought? On account of the falling off of the water for some reason.
541. We have it in evidence that the rivers are usually navigable for nine or ten months each year;—would you confirm that? No.

Condition of river.

542. Do you see any difference in the condition of the river, so far as navigation is concerned, compared with former years? Yes.
543. To what do you attribute it? Mainly to the irrigation carried on at Mildura and Renmark.

A. H. Landseer. 28 May, 1902.

544. Do you know what quantity they take out? No.
545. Dealing with the condition of the water in the lakes, have you noticed any difference in it of late years? Yes; it is very much salter now than formerly. Stock cannot drink it now.
546. How long has that been the case? It has been gradually getting worse this last three or four years.
547. How long is it that you have been unable to allow stock to use it? Two or three years.
548. How do you water them now? By wells.

Wells.

549. Then you are now doing without the lakes? You are bound to do so. You must make catchments, and when they are dry depend upon wells, which we sink to, say, 125 feet.
550. That refers to Milang, I presume? Yes.

Locks.

551. *Mr. Burchell.*] With respect to the seasons of the year during which navigation cannot be carried on up the river on account of the lowness of the water, do you believe in locks for navigation? Yes; but I should not go in for elaborate locking of the rivers—the cost would be too great. I was on a Committee which sat here many years ago, and we tried to get a conference with the engineers, but they would have nothing to do with it.
552. *Mr. Murray.*] Was that with respect to locking the mouth of the river? Yes; so as to keep the water about 2 feet above the present level.
553. *Mr. Burchell.*] Do you mean that it would not be worth the cost? You could not tax the people sufficiently to pay interest.
554. Still you say that, if the waters of the lake become salt, it will ruin all around its borders? Yes; it would do so.
555. With regard to locking for navigation, do you know that it has been suggested that the flood-waters should be utilised for irrigation? Yes.
556. Do you think when these flood-waters are utilised it will make a great difference to the period of navigation? Yes.
557. Then, in the face of that, what difference would it make, supposing the flood-waters were conserved for irrigation purposes? You would get that much less water for your vessels.

George Viney Rogers, master of river steamer, Milang, sworn and examined:—

G. V. Rogers. 28 May, 1902.

558. *President.*] What is your name? George Viney Rogers.
559. Are you a resident of Milang? Yes.
560. How many years have you resided here? Over forty years.
561. What is your business? Master of river steamer.

Navigation of Lake.

562. Have you experienced any difficulty lately in the navigation of the lake? I have been running the mail across to Meningie lately, but we never had the water so low as it is now.
563. Do you attribute that to the drought? No; to the irrigation above.
564. What makes you think the diversion of the water from the Murray has anything to do with the condition of the water down here? Well, of course, we used to get low water before; but it only remained low a short time. Now it is low all the year.

Increased saltness.

565. Do you think the saline properties of the lakes has increased of late years? Yes.
566. To any appreciable extent? Yes. Four or five years ago we could use the water for drinking purposes; now we cannot do so.
567. Not in any part of the lake? No.
568. Can you use it for stock? Yes; but it is getting bad for them.

Francis Garnett, Superintendent of Point McLeay Aboriginal Mission Station, sworn and examined:—

F. Garnett. 28 May, 1902.

569. *President.*] What is your name? Francis Garnett.
570. What are you? Superintendent of the Point McLeay Aboriginal Mission Station.
571. Have you been in charge long? Three years.

Mission station.

572. How many men, women, and children are there at the station? 225 on the Mission proper, but there are fully 300 over whom I have control.

Stock and domestic supply.

573. Is the station affected by the condition of the lake? Yes, in several ways. It affects our stock. We have 35 horses on the station, 70 head of cattle, and 800 sheep. We have one well for stock on the place, which keeps the horses in the stables going. The sheep and cattle depend upon the lake for water. Then there are the people themselves, and they are dependent upon the lake water for drinking and other domestic purposes. The only persons who have rain water are the officers of the Mission. During recent years we have had to put down little wells a dozen yards off the lake side, and that is where the natives get their drinking water from for six months out of the twelve, while the lake is brackish.

Wool-washing.

We have a wool-washing industry on the mission, and if it were not for this industry we should be in a much worse position financially than we are at the present time. The wool-washing is done for the squatters who own land around the lakes, and it keeps on an average twenty natives employed from, say, two to two and a half months in the year. Every year we find increasing trouble with the water, which must be fresh. Fortunately, our wool-washing comes in in November, and sometimes runs to the middle of January—two and a half months; then the lake water is at its best. But for the last few years we have had increasing trouble, and every time there is a west wind of any strength it brings the salt water up and stops the washing. If the lake becomes more salt, our wool-washing will have to go.

Depth of wells.

574. *Mr. Burchell.*] What depth are the wells you have on the station? Twenty-five to thirty feet.

Quality of water.

575. Is it good water? It is stock water; unfit for human consumption.
576. Have you tried other places? There is another place which the natives use for slop purposes; it is too brackish to use, except in emergency.

Irrigation.

577. What land do you irrigate? The garden for vegetables; also a plot of lucerne.
578. Supposing the water were fresh, you would increase your irrigation area? Yes. What we have done is merely experimental.

THURSDAY,

THURSDAY, 29 *MAY*, 1902.

[*The Commission met at Wellington Lodge, Lake Alexandrina, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Charles Oliver, river trader, Milang, South Australia, sworn and examined:—

C. Oliver. 29 May, 1902.

579. *President.*] What is your name? Charles Oliver.
580. Where do you reside? Milang.
581. Have you been trading on the river as master of these boats for any length of time? About twenty-five years.
582. Are you acquainted with the Murray and the Darling? I have not been up the Darling. All my experience has been on the Murray.

Period of navigability.

583. How many months in the year is the Murray navigable? As far as Wentworth, this last three years, it has only been navigable about six months.
584. Formerly, how long? Some time ago we would run for about four years in succession.
585. On an average? I should think four months.
586. Have you noticed any change in recent years as to the condition of things in this respect? It has been worse this last few years.
587. Do you think that is owing to the drought? It is owing to the want of rain, I suppose.
588. Do you attribute it to any other cause? More water has been taken out than before.
589. Do you know, of your own knowledge, whether that has affected matters or not? No.

Saltness of lakes.

590. Have you noticed any change in the saltness of the lakes? I have seen it as bad years ago as it is at the present time.
591. So far as you are aware, no change has occurred compared with former years? It might be a little worse now, but I have seen it bad in former years.
592. How far have you known it to be salt up stream? It is salt now as far as we can get up—as far as Blanchetown.
593. *Mr. Burchell.*] What is the nature of your trading? Like a general store.
594. Have you ever been on a boat that is not a trading boat? No; I have always been in that line of business.
595. How do the people get on higher up the river during the months that you are unable to travel? They have to provide a little when the river is coming to a close, or cart from Morgan, or the nearest port.

River freight.

596. I suppose they have to pay higher prices on account of that? Certainly. Take from Morgan to Overland Corner: if the boat was running up the river, we would get stuff up there for, say, 10s. per ton; at the present time they are paying £2 10s.
597. How do they get it up? By waggon.
598. Supposing it had to go to Renmark? It would be about £4 in lieu of 15s.
599. Have the people who are living above Blanchetown to pay more for the necessaries of life—flour, sugar, and so on—than if you were able to run all the year round? Yes. At Renmark, 5s. per bag is paid for chaff.
600. The producer has to pay that extra cost? Yes; about double the price.
601. Supposing you could take chaff up to Renmark at the present time, how much would you charge? 15s. from Murray Bridge, and 10s. from Morgan.

Road carriage.

602. And that is against £4 for road carriage? Yes.
603. Do you find that not being able to traverse the whole of the river makes any difference in your business? Certainly. We are only doing half now that we were before. Usually we run from Milang to the boundary of South Australia; at the present time we only run to Blanchetown.
604. Do the people up the river suffer as a consequence? Certainly.
605. Do you not think that settlement would be much easier for people in a small way if the river were permanently navigable, say, between Morgan and the boundary? Yes.
606. Would what you say as to reduced cost of carriage apply also to wool? Certainly, and they would get their supplies back.

Allan McFarlane, station owner, Wellington Lodge, Lake Alexandrina, sworn and examined:—

A. McFarlane. 29 May, 1902.

607. *President.*] What is your name? Allan McFarlane.
608. You are owner of Wellington Lodge Station? Yes; and Stony Creek, in New South Wales.
609. You have been resident here for a number of years? Yes, since 1845.
610. Have you experienced any difficulty, so far as the water in the lakes is concerned, for watering stock? None. It so happens that a sandspit in the channel casts the water towards this shore.
611. Do you use water for irrigation? Yes.
612. What area have you under irrigation? Nothing but a garden of a couple of acres or so.

Saltness of soil.

613. The water that you pump is used for domestic purposes, stock, and the garden? Yes. The country being naturally so salt, you could never get a drop of fresh water by sinking.
614. Have you tried to get water in that way? Five hundred times, I believe.
615. Have you always failed? I have found it useless.

Water supply.

616. You are dependent upon the supply from the lakes? Almost entirely—I believe absolutely, because, if the lake became salt, I think our wells would be salt also.
617. Have you wells? A number.
618. Are they fresh? Not at all; not one.
619. Are they such as stock can live on? Yes; but it is most extraordinary that they can do so.
620. Do you know that those nearer the mouth are suffering in some cases on account of the saline properties of the lake water? Yes.

Weir at Murray mouth.

621. There has been a proposal made to put weirs across the mouth of the Murray, so as to prevent the salt water getting up onto the lakes, and it has been suggested that the weirs should raise the water 2 feet;

2 feet;—what do you think the effect of that would be on your own land? Above the present level—that would be glorious, even 3 feet. A. McFarlane. 29 May, 1902.
622. It would not affect the land? Not 2 feet above the present level, nor 3 feet.

Area of station.

623. What is the area of your station? 43,000 acres of freehold.
624. *Mr. Burchell.*] You have extensive pumping appliances here? Yes.

Pumping plant.

625. What are they? One gas-engine, one steam-engine, and a number of windmills.
626. How much water do you pump per day with your gas-engine? It will pump 10,000 gallons per hour; but, of course, we only keep it going so long as we require it.
627. How far do you send that water out to your stock from the river? Five and three-quarter miles.
628. By pipes or channels? By pipes.—3 inch screw gas pipes.
629. You do that because you cannot get water good enough for your stock out there? Nothing like good enough.
630. Then you are dependent upon the freshness of the water in the river? Yes; most certainly. It would be a great benefit to have it always really fresh.

Bores.

631. Have you put any bores down? I tried once.
632. What depth? 179 feet.
633. What water did you get? 177 feet of pickle.

Reclamation embankments.

634. You have constructed embankments for reclaiming land? Yes, to prevent the Murray water coming in on it.
635. What extent of embankment have you made there? Four and a half miles.
636. What did it cost you? £10,000 or more.
637. What area? A little over 700 acres. It cost me £10,000, and I bought the land before that for £2 6s. per acre.

Carrying capacity.

638. How many sheep do you carry on that? About six sheep to the acre; but it will not carry that number all the year round—none in winter, if wet.
639. Have you ever let the river water in on that plot? Yes. I have got a great many culverts right through there, with valves, &c.
640. Would it be better if you could always have the river high enough to let water in? Yes.
641. Would it benefit you if the river was maintained at a certain level? Most certainly. I must admit that I have suffered no great inconvenience from the river.
642. Have you heard much of the lock at the mouth to prevent salt water coming in? Yes. It is a good many years since that was first proposed. I think it would be unwise to touch the Murray mouth. Far better to cut the canal from Goolwa to Port Victor, 9½ miles, and turn the Murray water, which would be much reduced by the large quantity that would be used all the way up the river. If the water was turned through the canal into Port Victor, the sea would soon close the present mouth with sand heaped up by the breakers. To touch the Murray mouth would be a terrible undertaking. But the canal would make the water manageable, and the trade with river steamers perfect.
643. Do you think it a good idea? I think it is an awfully foolish thing to allow a drop of the fresh water that reaches this land to flow to the sea.

Value of weir.

644. Do you think it is worth an expenditure of £60,000 to prevent the salt water coming in? Yes; I suppose it is. I was informed yesterday that the sea fish are up the river as far as Tailem Bend; the river is so low. The reason why the railway station was put there was because the Murray water was such splendid steaming water; but last year they had to get the water from Nairne; they could not use the Murray water.
645. *Mr. Murray.*] You pump a supply for the stock on your property? Yes; but not for all. I have some wells further out than these, and they keep the stock all right.
646. How long have you been using lake water for the stock? I have pumped it for about twenty or twenty-five years.
647. Going back twenty-five or thirty years ago, was the water fresh all the year round? I never saw it anything but fresh at that time. The drought is the cause of nine-tenths of the trouble, and if no water comes down to fill the lake, the salt water will force its way in.

THURSDAY, 29 *MAY*, 1902.

[*The Commission met on board the s.s. "Tarella," at Woods' Point, Murray River, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Hurtle Willoughby Morphett, sheep farmer, of Woods' Point, Murray River, sworn and examined:—

H. W. Morphett. 29 May, 1902.

648. *President.*] What is your name? Hurtle Willoughby Morphett.
649. What are you? Sheep farmer.
650. Do you own land at Woods' Point, Murray River? Yes.
651. What acreage have you? 7,000 acres of freehold, and about 23,000 acres of leasehold.
652. Do you use the waters of the river for watering your stock? Yes.
653. Wholly? Yes.

Irrigation.

654. Do you use the waters of the river for irrigation also? Yes.
655. To what extent? We recently embanked one swamp and kept the waters off that, and this we irrigate.
656. How many acres would there be in that? About 650.
657. I suppose you irrigate by gravitation when the level of the river admits it? It admits of it almost at any time, except when the river is exceptionally low.
658. Have you any idea what quantity you use for that purpose? I have not. We have only had the embankment up about twelve months.
659. Have you found it a success? Absolutely.

Yield.

660. What do you grow on it? We have tried many things. We grew 5 acres of onions; we got 30 tons to the acre yield.
661. What else? About 12 acres of potatoes. We got about 7 tons to the acre from them; but they were affected by the Rutherglen fly. We had 12 acres of English barley, from which we reaped about 42 bushels to the acre. We had about 20 acres of peas, which we stacked and did not thresh; we fed the pigs

H. W. Morphett. 29 May, 1902.

pigs on them. I do not know the quantity, but it was a remarkable crop. We also grew maize and pumpkins, of which I could not estimate the return, because we fed the pigs on them also. From 5 acres of lucerne the first year we took five cuttings that gave us 2 tons of dry hay. We also got 4 or 5 tons to the acre from 10 acres of hay.

662. Beyond that swamp, have you any ground that you irrigate? No; we have other swamps that we can control, and shall in the future irrigate.

663. Are those other swamps very large? Another 3,000 acres, I suppose.

Cost of embankment.

664. What did the bank cost you in this instance? About £10 per acre—about £6,000.

665. Have you kept any record of the volume of water passing down the river? No.

666. How many years have you been on this station? Since I was born, practically—that is, I used to come here for my holidays; personally, since 1888.

667. Have you noticed any difference in the water that passes down, compared with former years? Well, this last two years it has been less; but they have been very dry years.

Drought.

668. You think it is owing to drought? To a large extent. I have no doubt that naturally the flow must be altered by withdrawals up above; but I think it is mainly the drought at present. It certainly gets brackish at this time of the year.

669. That does not interfere with the purposes for which you are using it? Of course, we have not had experience of it sufficiently long enough to say whether using water at this time of year will damage the land.

670. It does not interfere with the stock? No; it has not up to the present time.

River swamps.

671. Have you any statement you wish to make to assist us in our inquiry? My idea was to call attention to the swamp, and to the large area of similar swamp land along the river between the mouth and Mannum. I think it can all be treated in the same way, and I feel confident that in the future it will carry a very large population.

672. The magnificent crops that you yourself have reaped from the swamp shows, I suppose you would say, that it must be very good? Yes; and one is practically as good as the other. This return from the onion crop is simply astounding; they will show us a net profit of £120 per acre.

673. Where do you send it? To Adelaide.

674. From Murray Bridge? Yes. That is the best way of getting the produce to my present market. Of course, if we wanted to export to the world's markets—London or elsewhere—we might avail ourselves of any increased facilities there might be the other way.

675. Do you think that the rate of carriage per ton, supposing facilities existed to get produce to Victor Harbour by water, would be cheaper than, under present conditions, by water to Murray Bridge, and then by rail to Port Adelaide? If anything in the nature of a canal was made, I think it would be considerably cheaper, but at present it is not; the rehandling at Victor Harbour would more than make up the cost down to Port Adelaide.

676. *Mr. Murray.*] You use the river water continuously for your stock? Yes.

Saltness of water.

677. Has there been any sensible increase in the saltness of late years? In May of last year it was the saltest we have ever experienced.

678. Did you know the river yourself twenty to twenty-five years ago? I only knew it as a holiday maker.

679. Your practical experience extends over the last fourteen or fifteen years? Yes.

680. During that time has there been a sensible increase in saltness? Last year was undoubtedly the saltest we have noticed.

681. Not this year? No; it is not as bad this year now as it was this time last year.

682. Have you any idea as to the quantity of salt in the water? Not the slightest.

683. You are not used to judging water by the taste? Not sufficient to give any estimate as to the quantity of salt.

684. The stock do not object to it? No.

685. And you use it yourself? We have rain water. We have large underground tanks.

686. There have been a great many statements made lower down the river that the saltness of the river has been increasing year by year of late years, and it has been ascribed to the withdrawal of the water from the river for irrigation? I can understand that, because, if it is only a few gallons, it must tell. If you take water from the river higher up, during the time of slackness, you naturally increase the amount of salt-water in the lakes, because our river never goes below its present level. We use the bulk of our water for irrigation in the summer time; we are using very little for irrigation now.

687. You have not any interest in the navigation question? Except as a means of getting our produce up the rivers in future.

688. *Mr. Burchell.*] The land you are dealing with has all been reclaimed? Yes.

689. Do you find the water rise under that embankment at all? No.

Flood level.

690. You say the present level of the river is about the lowest;—how much higher have you known it in flood? It was 6 feet higher in 1890.

Embankment.

691. What height is your embankment? 7 feet 10 inches from the present level of the water.

692. How much lower is your land than the present level of the water in the river? It tapers from the river gradually, and the difference between the river bank and the sandhills is about 2 feet.

693. It was all subject to inundation before you reclaimed it? Absolutely.

694. What is the nature of the soil? I can scarcely say. It is a clay subsoil. We have never had it tested analytically. You strike water at 4 feet down.

695. What is the width of your bank on top? About 18 inches.

696. What slopes? Three to 1, on the outside.

697. Steeper on the inside? Yes; just the natural fall.

698. Do you feed stock on lucerne land? We cut it, mostly.

699. Have you had any disease amongst your stock? Practically none; occasionally summer worm, but very slightly.

Dairying district.

700. Do you think that this would turn out a good dairying district in future? Yes; admirably so.

701. To what do you attribute the increasing saltness of the water? The salt-water coming from the sea.

702. You have heard of the scheme suggested for locking the mouth and preventing the salt-water coming in? Yes.

Flood waters.

703. In the event of there not being sufficient flood-waters to freshen the lakes, what would you suggest? I think it would be manifestly unfair to take all the flood-waters, or even the larger portion of them. If the damming of the mouth of the river will have the effect of preventing the salt-water coming in, then by all means use the flood-waters and do not waste them.

H. W. Morphett. 29 May, 1902.

704. Would you suggest putting weirs across the mouth to prevent the salt-water coming in? I should certainly say that some sufficient action should be taken to prevent salt-water coming in; but if a dam were made at the Murray mouth it should not be at a very high level, because the tendency of a dam at the mouth, if at a high level, in the event of flood-waters coming down, would be to make our flood higher than it is now and make our embankments more insecure than they are now. If a dam were built I think ample means should be taken to let the surplus flood-waters go.

FRIDAY, 30 MAY, 1902.

[*The Commission met on board the s.s. "Tarella," at Murray Bridge, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

John Jones, shipping agent, of Murray Bridge, sworn and examined:—

J. Jones. 30 May, 1902.

705. *President.*] What is your name? John Jones.

706. Are you a resident of Murray Bridge? Yes.

707. What are you? A shipping agent.

708. How long have you been resident here? Seventeen years.

709. Are you acquainted with the river and the traffic? Yes; for twenty-three years.

Trade diminution.

710. Have you noticed any diminution in trade on the river of late years? Yes; a marked diminution.

711. What do you think is the reason? Principally the want of water.

712. Due to the drought? Yes.

713. Do you think it is the lack of produce, too? The want of rain in Queensland and on the Upper Darling interferes most with our trade.

714. Do you think the fact of there being no rain not only causes a low river but no produce? Produce would, of course, be increased by more rain at the upper portions of the river.

Trade diversion.

715. Have you noticed any change as to the points where the river trade leaves the boats;—we have evidence to the effect that in former years the trade was principally discharged at Goolwa, but that now a good deal of it is discharged at Morgan and Murray Bridge? That is so; ever since the Morgan line was opened it has diverted the trade from Goolwa, but it has not affected Murray Bridge at all. Murray Bridge was opened a considerable time after the Morgan line. I have copied a return showing the traffic at the four principal ports—Goolwa, Milang, Murray Bridge, and Morgan—from 1890 to 1892 inclusive, while the river was continuously open, which I will put in. [*Exhibit* 50.]

River traffic.

716. Do you think that gives a criterion of what the traffic would be, supposing the river were navigable from year's end to year's end? Yes.

717. Have you any information showing what the traffic would be when the river is not navigable the whole year round? I have some rough figures for last year. The traffic inward amounted to 3,000 tons only; outward, it was 4,500 tons.

718. Do you attribute that to the conditions of the country, owing to the drought? That decidedly affects it.

719. Are you impressed with the importance of making the river navigable the whole year round by artificial means? Yes.

720. Therefore, I suppose, you advocate the locking of the river? Yes.

Effect of locking.

721. Supposing the trade done did not warrant the expenditure? Even though it did not show a present financial gain, the result would be to increase trade ultimately, I think.

722. *Mr. Murray.*] Do you think if the river were locked the trade would be carried further down towards the mouth? That would depend upon the facilities offered. I do not think that a canal would improve the facilities. It would be impossible to take the river steamers with full loads of wool alongside the ships at Victor Harbour.

723. You think the ocean vessels would have to come inside? Yes.

724. Have you ever looked at the possibilities of a canal cut through the sand hills, or the canalisation of the river mouth to allow vessels to come in? Yes, often. I may say that I was two years running in to the Murray mouth from Adelaide.

725. Have you been a shipmaster? No; an officer.

Murray mouth.

726. Do you think that vessels can safely approach the Murray mouth in rough weather? Not in all weathers. The only feasible scheme for bringing the river trade into touch with the ocean vessels is to run piers out through the sand hills.

727. You think that in all except heavy weather vessels could come into the lakes? Into the river proper.

728. And take in cargo there? Yes; at Goolwa.

729. You think that a work of that kind would be practicable? Yes; but expensive.

730. *Mr. Burchell.*] Have you been connected with the shipping trade long? Twenty-three years.

731. You know the trade at Morgan? Yes.

732. Who were you representing there? Messrs. McCulloch and Co.

733. How long were you there? Two years.

734. And how long have you been at Murray Bridge? Seventeen years.

735. Have you been at Milang? No.

736. At Goolwa? Yes.

737. How long? Three years.

738. What is the difference in the rates for wheat and wool delivered at Morgan, Murray Bridge, Milang, and Goolwa? No difference at all.

739. How do you account for that? It was the style initiated when this trade opened, and it has been kept up ever since.

740. Is there not a great deal of difference in the expense? Yes; no doubt.

741. Do they take wool from Wilcannia to Goolwa at the same rate as to Morgan? Sometimes they get 2s. 6d. more per ton, but very often the freights are the same.

742. Is it worth more than the difference charged? Yes; but most of the boat-owners used to live at Goolwa, and in order to be home they took freight at the same rate as to Morgan.

Shipping facilities.

743. Are not the shipping facilities at Morgan superior to those at other ports on the River? Yes, unfairly so.

J. Jones. 30 May, 1902.

744. Which port on the river in South Australia do you consider the most convenient for the producer, sending his produce away by the river? Murray Bridge, if the preferential rates are done away with.
745. Do you know the difference in mileage between Morgan to Adelaide, and Murray Bridge to Adelaide? Morgan is 106 miles, and Murray Bridge is 61.
746. Yet they take freight at the same rates? Yes; some.
747. Which is the quickest route for wool or wheat by rail? *Via* Morgan, if for Port Adelaide.
748. How long does it take to carry produce from Morgan to Port Adelaide by rail, and place it on board ocean going vessels? About a day.
749. How long will it take a steamer to travel the extra distance from Morgan to Goolwa and return? About three days.

Transfer charges.

750. What are your charges for taking goods out of steamers, and placing them on trucks at Morgan, Murray Bridge, Milang, and Goolwa, respectively? It is 1s. 6d. at Murray Bridge, and as far as I know the same at the other places.
751. Supposing the boats were able to run on the river at all times without interruption, do you think a better and fairer trade might be done with respect to all concerned? Yes.
752. Have people been forced to pay ruinous prices for the necessaries of life on account of the lowness of the rivers? Yes.

Encouragement of settlement.

753. If all risk in this respect were eliminated, would it not encourage people to start in a small way on the banks of the river? Yes. River settlement would increase very much if people could be sure of shipping their produce and receiving their goods.
754. Do you know of any wool clips having been delayed from one season to another on account of the river? Yes, one or two.
755. Is it not possible that in such cases the owner has lost a good market, and, consequently, only been able to dispose of his wool at a low rate? Yes.
756. If the river were permanently navigable, could the river country be worked to greater profit? Yes.
757. Is it correct that the river is very seldom navigable when the Renmark irrigationists have their most valuable crops ready for shipment? Yes, invariably.
758. Do you know that their most valuable crop—oranges—is now ready for the Adelaide market, but cannot be sent away for the next two months? Yes. Under present conditions the river is not likely to be navigable for another month or six weeks. The river generally comes down about the middle of June.
759. Do you know that road carriage is out of the question, as the fruits would not stand the carriage? Yes.

Road carriage.

760. Do you know the cost of road carriage from Morgan to Renmark? About £5 per ton.

River freight.

761. What is it by boat? Ten shillings.
762. Do you know that about 300 tons of fruit have been waiting at Renmark for months? Yes.
763. Do you know that the Renmark people have been trying to get some engines up the river this last month, but could not do so? Yes.
764. Do you know Mr. Morphett's settlement on the river, and that he has been very successful since reclaiming the flats? Yes.
765. Do you think the flats around Murray Bridge could be treated in the same way? Yes.

Andrew Leslie Martin, river-trader of the steamer "Victor," sworn and examined:—

A. L. Martin. 30 May, 1902.

766. *President.*] What is your name? Andrew Leslie Martin.
767. Are you a resident of Murray Bridge? No, I am a river trader; owner of one of the boats.
768. Where do you ply between? Between Murray Bridge and Menindie, a distance of 800 miles.

Navigability.

769. Under present conditions, how far can you get up the river? To Blanchetown.
770. How does the non-navigability of the river affect you? It means that we have all our plant and stock lying idle; it curtails our trade.
771. Do you trade as far as Blanchetown? We have no connection with Blanchetown. We trade higher up.
772. Would it be of material consequence to you if the river were navigable the whole year round? Yes. When the river is down we have to pay all our men off.

Effects of low river on prices.

773. Are the settlers inconvenienced by your not visiting them? Yes. The poorer people cannot lay in supplies. They, therefore, have to trust to chance, and pay big prices for what they get. They have to pay as much as £5 for a bag of flour when the river is down.
774. Can you tell us, in general terms, what increase in prices it would mean to the settlers when you cannot get to them? 300 or 400 per cent—in other words, a £ would only be worth about 5s. to them.
775. *Mr. Burchell.*] How does the low river affect the early fruit at Renmark? They have to dry their fruit, whereas, if they had a ready market, it would be much more profitable to sell it as fresh fruit. This applies particularly to oranges, peaches, and pears.
776. How many tons per week do you think they could send away? 50 tons, or perhaps more.
777. That is really a loss to Renmark? Yes.
778. With respect to the present condition of the river;—have you any idea of the quantity of chaff and hay that would be travelling up the river at the present time, if it were navigable higher up? 200 or 300 tons per week.
779. *Mr. Murray.*] You say that if the river were navigable the carriage for chaff alone would amount to 200 or 300 tons per week? On second thoughts, I should say more.
780. Does not the demand for feed arise from the fact that there has been so severe a drought? That may be so at the present time; but I have known feed to be plentiful on the river and the people unable to dispose of it on account of the low river.
781. Are not the low river and the demand for feed due to a common cause? It does not always follow. Sometimes there is a supply of chaff on the river when the river is low, and sometimes there is a high river and no chaff. They may have rain at the top end but none down here, or *vice versa*.
782. Is that a usual condition? No. As a rule the rain follows the course of the river.

John Cowan, grazier, of Glen Lossie Station, near Murray Bridge, sworn and examined:—

J. Cowan. 30 May, 1902.

783. *President.* What is your name? John Cowan.
784. Are you a resident of Murray Bridge? I reside at Glen Lossie Station, about 4 miles distant.
785. What are you? A settler.

Area.

786. What acreage have you? 10,000 acres of grazing and cultivation land.

787.

J. Cowan. 30 May, 1902.

787. What stock? Sheep and cattle.
788. Where do you send your wool? To Port Adelaide.
789. By rail? Yes.

Effects of high or low river.

790. In what way are you affected by the condition of the river? High floods would damage the land I have reclaimed. On the other hand, when the river is very low the water becomes brackish and unsuitable for stock; it also seems to have the effect of causing a poisonous green scum to form on the surface of the water.
791. Do you, then, advocate having the flood-waters under control? Yes; and that the river should be supplied with a regular quantity of water, so that it could be kept fresh and sweet all the year round, both for stock and human consumption.

Value of irrigation and navigation.

792. How do irrigation and navigation rank in your mind? I think navigation comes first, because if the people adjacent to the river had means of getting their necessaries by river—such as fodder for stock in times of drought—it would ensure them against the absolute loss of their stock; and when they have marketable produce, navigation would provide them with the quickest and cheapest transport to market. I believe they would all use the river for this purpose if it were navigable.

Land reclaimed. Cost.

793. What area of land have you reclaimed? 700 acres—by an embankment 3½ miles long.
794. What did the banks cost? Approximately, £5 per chain.
795. What is the average height? Four feet 6 inches.
796. Is the whole of that land under your control—so far as irrigation is concerned—when the river is at its present level? No; it must be higher than at present; and besides, in order to irrigate, I would not risk using the water in its present condition; it is too brackish.
797. What quantity of water do you use? I have not any idea. I have sluices which I open and use as required.

Crops.

798. What do you grow? Rape and such crops.
799. Is the whole of it under cultivation? Not all of it. I intend to put in 5 acres of onions, and 80 acres of oats. I have put in about 40 acres of rape.

Poisonous scum. Brackish water.

800. *Mr. Murray.*] You spoke of the river being poisonous for stock;—will you particularise? A green scum forms on the surface of the water, which poisoned a lot of stock at the entrance of the lake.
801. Does the water become salt at the time? Brackish.
802. Was it not the brackishness which was injurious? It was the scum which was the poisonous matter; and the salt condition of the lower river, and the lakes has made it necessary to put down wells for watering stock.
803. Do you irrigate a great deal yourself? Yes.
804. Have you any idea of the volume of water you use? No.
805. *Mr. Burchell.*] Have you done any dairy farming? A little.
806. Do you know if there is any being carried on on flats similar to those you have reclaimed? Yes.

Carrying capacity of land.

807. How many cattle per acre could be fed from such land under intense culture? I cannot say with any degree of accuracy; but without cultivation, my land has carried five sheep to the acre.
808. Do you run sheep on the land, or cut feed for them? I feed them on the ground.
809. Could you feed more by cutting it? Yes; more than double.
810. Were you here during the 1890 flood? Yes.

Flood level.

811. How does that compare with the present level of the water at Murray Bridge? In 1890 it was 6 ft. 8 in. higher than at present.
812. What effect would such a flood as that have now? I think it would considerably damage the line of embankments which exist at present.
813. Supposing you could get a regular supply of water, do you see any reason why such flood-waters should not be put to use for irrigation up the river instead of being allowed to run to waste? I think it would be very desirable.

Locks.

814. How do you think the floods could be controlled? By a series of locks.
815. Do you think that constructing locks from Blanchetown to Wentworth would be a profitable undertaking? Yes; provided always that a certain quantity of water is allowed to run in order to keep the stream pure.
816. Do you know that it would not require more than is allowed for moderate irrigation in this State to maintain navigation all the way down? Yes.

Alfred Overall, engine-driver, of Murray Bridge, sworn and examined:—

A. Overall. 30 May, 1902.

817. *President.*] What is your name? Alfred Overall.
818. You reside at Murray Bridge? Yes.
819. Are you engaged by the Railway Commissioner as engine-driver? Yes.
820. Have you to water your engine at Murray Bridge? Yes.

Water unsuitable for locomotives.

821. Is the water suitable for the purpose? At this time of the year, from May to June, we have difficulty with it, as it causes the engine to prime.
822. To what do you attribute that? To the brackishness of the water.
823. Have you had to get water elsewhere owing to the water being unfit for use? We had to do so twelve months ago for running fast trains. We got the water from Nairne.
824. How long have you had to use the water from Nairne? About five or six weeks.
825. Is that the only time that you have had to get water elsewhere? Yes.
826. *Mr. Murray.*] You say that the water in the river becomes brackish during May and June? Yes; they are the worst months.
827. How far back does your experience extend? About five years.
828. When did you first experience trouble in connection with the water? Four years ago; but last year was the worst.
829. How far is Nairne from Murray Bridge? Twenty-six miles.

William Moyle, Officer-in-charge of the Government Waterworks at Murray Bridge, sworn and examined:—

W. Moyle. 30 May, 1902.

830. *President.*] What is your name? William Moyle.
831. What are you? I am in charge of the waterworks at Murray Bridge.
832. Do you pump the water from the river? Yes.
833. Is the water used by the whole of the residents of Murray Bridge? Yes.

834.

W. Moyle. 30 May, 1902.

834. Have you received any complaints as to its quality? This year and last year, at about the same time, it was a little brackish.
835. Is that the only complaint? Yes.
836. For what period is the water affected in the way you have stated? Last year, about six weeks; this year, three weeks up till now.
837. Was it ever affected similarly before last year? A heavy storm will make the river salt.
838. Was it affected for any lengthened period the year before last? No; only about a week after a heavy storm.
839. Has there been no other complaint about the quality of the water? Sometimes the people complain that it is a little bit white when the river is high.
840. Do you pump the water for supplying the locomotive engines? We have done so for the past five years.
841. All the water they use? Yes.

FRIDAY, 30 *MAY*, 1902.

[*The Commission met on board the s.s. "Tarella," at Mannum, Murray River, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

John Woodburn Walker, miller, Mannum, South Australia, sworn and examined:—

J. W. Walker. 30 May, 1902.

842. *President.*] What is your name? John Woodburn Walker.
843. Are you a resident of Mannum? Yes.
844. How long have you been here? Twenty-seven years.
845. What are you? A miller.
846. Are you well acquainted with the district and river traffic? Yes.

Wheat, where produced.

847. Is the wheat you convert into flour produced in the district? Yes; along the river and at the back.
848. Is it conveyed by boat? Yes.
849. Do you send the flour to Murray Bridge? We try to send it up the river if we can.

How disposed of.

850. What proportion do you succeed in disposing of in that way? Only about half. When we first came here we used to send the whole of it.
851. Why can you not do so now? On account of the competition of other mills.
852. Which do you regard as your largest market now? The river. Any surplus we have to find a market for.

Markets.

853. Where do you find markets? Africa, Java, London, and elsewhere.
854. With regard to the navigation of the river, does the fact that it is not navigable above Blanchetown concern you? Yes.
855. In what way? We cannot get our stuff away.
856. So that it would be of considerable consequence to you if the river were locked and made navigable the whole year round? Yes.

Irrigation of river flats.

857. Is it your opinion that irrigation is of consequence in connection with the flats extending down the river below Mannum? Yes.
858. *Mr. Burchell.*] Has the river ever been so low that you could not get wheat down from higher up? This year, last year, and the year before.
859. I suppose that would mean a great loss to the producer? Yes.
860. How does the non-navigability of the river affect the prices to consumers higher up? They have to pay more for their flour. They have to pay from £3 to £4 per ton for carriage instead of 12s. 6d. or 15s. when the river is navigable.
861. Would there be more inducement for people in a small way to settle if this risk were done away with? Yes.
862. Do you know if there is any dairying done on the flats? Yes.
863. Where are the stock fed? Along the swamps.

Rainfall.

864. What is the average rainfall in the district? Somewhere about 9 to 12 inches.
865. Is that sufficient to ensure a wheat crop? It would be if it came at a suitable time.
866. Has the water ever been brackish near Mannum? Yes.
867. When was it brackish last? It is brackish now, and it was brackish last year, from February to June.
868. To what do you attribute that? To no fresh water coming down.

Salt-water fish in river.

869. Have you ever heard of fresh-water fish being killed by the salt water coming up here? No; but I have heard of salt-water fish being caught 18 miles below Mannum. There would be plenty of water for everyone if it were conserved in flood-time.

Docking facilities.

870. What facilities are there on the river for repairing the steamers? There is a dry dock at Mannum, and a slip at Goolwa.
871. Which is used most? They are both used pretty well; but the dock is more costly.
872. You consider there are facilities at Mannum and Goolwa for doing all repairs necessary to steamers? Yes; I think so, for some time to come.
873. *Mr. Murray.*] Did you say that salt-water fish had been caught 18 miles below Mannum? Fifteen to 18 miles—down near the stone quarries.
874. Is that a novel circumstance? I have never heard of it before.
875. Do you think the water was actually salter last year than at any time previously? I think so.

Increased saltness of river.

876. Is there any unquestionable evidence that the river is getting salter of later years? Only the evidence of our experience. I have never known it so brackish during the twenty-seven years I have been here, and I attribute it to the irrigation at Renmark and Mildura. There is such a small flow at the present time. The river used to come over the flats alongside this place, but has not done so lately.
877. Do you attribute that to the irrigation settlements entirely? No; but I think when the flow is diminished they affect it very considerably.
878. How much water do they divert at Renmark and Mildura? I do not know.

J. W. Walker. 30 May, 1902.

879. Then, why do you attribute the low river to those diversions? Because since they have been established we have had lower rivers than before.
880. What is the present flow? 100,000 cubic feet per minute at Overland Corner.

Flow of river.

881. *Mr. Burchell.*] On what authority do you say that? Mr. Gordon told me that that was the flow in the last week in March.

William John Bussell, Clerk in Holy Orders, sworn and examined:—

W. J. Bussell. 30 May, 1902.

882. *President.*] What is your name? William John Bussell.
883. How long have you been here? I have been in charge of the district from Point Sturt to the South Australian Boundary for eight and a quarter years.
884. Are you well acquainted with the district, and the condition of the people along the banks of the river? Yes.
885. How far back from the river does your district extend? From 10 to 40 miles.

Effect of non-navigability.

886. Are you able to speak as to the effect the non-navigability of the river has upon the residents? It would hinder their getting their goods, and also hinder them from sending their produce away.
887. We understand, from evidence received, that the river is not navigable above Blanchetown more than about three months in the year on an average, and that the people are very greatly inconvenienced thereby;—could you give us any information on the subject? So long as the country adjacent to the Murray was inhabited by men of capital, they were able to get over it; but the present population, not being people of capital, have great difficulty owing to cartage through heavy rough country for long distances—say, 70 to 90 miles of sand—in order to get goods. This makes it very difficult and expensive to live.

Condition of Renmark.

888. Do you know anything of the condition of things at the Renmark settlements? To some extent. At the time their fruits are ready to be brought away, the river is unnavigable, and they are practically shut out of the market for many months, thus they cannot make their full profits.
889. You consider it of great importance that the river above Blanchetown should be kept open for navigation? Yes.

Saltness of water.

890. Is there anything further you would like to add? I think, owing to the river being low for so long, we are increasingly in danger of losing the freshness of the water; year by year the salt water seems to come higher up.
891. Can you give us any proof of that? Last year, about this time, salt water fish, which do not generally come out of the lakes, were caught within about 14 miles from here, and for upwards of two months. They were caught just below Murray Bridge about a fortnight ago, and had it not been extremely fine weather would have been much further up by now. Then again, the water becomes brackish much further up the river than formerly, and it is at times almost undrinkable; last season it was so.

Lake Albert.

892. Do you gather from the residents that that has affected the use of the water for stock purposes? For domestic purposes; not for stock. It has affected stock in the lake districts; Lake Albert is almost too salt for stock.
893. *Mr. Murray.*] How far back does your experience extend? About twelve years.
894. Do you think the river has increased sensibly in saltness during that time? During low-water seasons I think it has.
895. Have you any tangible evidence as to the amount of salt contained in the water? No.
896. Were stock always able to use the water in the lakes twelve years ago? Yes.
897. And they are not able to do so now? No; this season especially.
898. Have you heard any discussion as to the possibility of retaining a supply of water in the lakes by artificial means? Yes; a good deal. It has been said that if water is taken from the upper reaches something should be done to prevent the inflow of salt water—that if this is not done the lakes will become practically useless.

Settlement.

899. *Mr. Burchell.*] Is the Murray settled between Goolwa and the boundary? Yes, practically.
900. There are several village settlements, are there not? Yes; between Morgan and the boundary there are seven.
901. Are there any private irrigation works on the river? Yes.
902. Have you ever known those settlers complain of not being able to get the necessaries of life owing to the river being unnavigable? Yes; they have been almost starving.
903. What other means have they of obtaining necessaries? Only by carting through heavy sand.
904. Do you think, if the river were permanently navigable, settlement would increase very much more quickly than under present conditions? Yes.
905. Do you think it would be a good thing to make the river permanently navigable by locking it? Yes.
906. Do you think if the proposals to divert large quantities of water at the sources are carried out, and the river is not locked, your season of navigation would be shortened? That is what we fear.

Benjamin Baseby, butcher, Mannum, sworn and examined:—

B. Baseby. 30 May, 1902.

907. *President.*] What is your name? Benjamin Baseby.
908. Are you a resident of Mannum? Yes.
909. What is your occupation? Butcher.
910. Are you well acquainted with the requirements of trade in this district? Yes; but my experience does not extend very far up or down the river.
911. How many years have you been here? Forty-seven.
912. Do you consider that the river is exceptionally low at the present time? Yes; though I have seen it as low in former years at the same time as now.
913. Then there is nothing novel about its present condition, so far as quantity is concerned? No.

Drought.

914. It is what you might expect from the droughty condition of the country above? Yes.
915. Do you consider that the water is salter now than previously. It was salter last year.
916. Could you give any proof that there is a difference in the quantity and quality of the water as compared with previous years under similar conditions? No.

B. Baseby, 30 May, 1902. Land values.

917. *Mr. Burchell.*] Do you grow any stock? I have done so during my residence here.
918. Where do you graze them? On the flats in summer, and on the hilly ground in winter.
919. Do you do any dairying here? I did in the early days, but have not for a long while.
920. What is the value per acre of the flats adjoining the river? From £2 to £2 10s. about here, but I believe they are more valuable in other parts.
921. Have you heard of what Mr. Morphett and others are doing on the flats? Yes; I have heard that they are getting enormous crops.
922. Have you seen any of the reclaimed land? No.
923. Have you a garden here of your own? Yes, on the hill; not on the flat.
924. How does it succeed? Very well.
925. Is that the case with other gardens in this locality? Yes; they all do very well if irrigated.
926. Do you think there is a possibility of increasing the area irrigated by the river for fruit-growing? Yes, I do.

SATURDAY, 31 *MAY*, 1902.

[*The Commission met on board the s.s. "Tarella," at Blanchetown, Murray River, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Michael Cochrane, ferryman, Blanchetown, sworn and examined:—

M. Cochrane, 31 May, 1902.

927. *President.*] What is your name? Michael Cochrane.
928. Are you a resident of Blanchetown? Yes; for the last nineteen years.
929. What is your calling? I am ferryman here.
930. You are acquainted pretty well, then, with the river at all seasons of the year? Yes.
931. Do you regard it as exceptionally low just now? I do.

Low river.

932. Lower than usual at this time of the year? I have never seen it so low at this time of the year.
933. How much lower than you usually expect it to be at this time of the year? I should think about 18 inches.

Saltness.

934. Have you noticed any *difference in the properties* of the water;—is it more salt? During my experience it has never been so brackish as it is this year.
935. What test have you as to that? The common use.
936. *Mr. Burchell.*] Have you known the river to be unnavigable at Blanchetown, or even further down? There is one boat, the "Saddler," that stops 3 miles down; but the "Queen" comes here every three weeks, and sometimes she can get 2 or 3 miles further up.

River bar.

937. Do you know of a bar 10 miles below Blanchetown? There is a bar; but the steamers can get across there.
938. How long has that bar been known to you? I have heard it spoken of for the last five or six years.
939. Was it known before that? I do not think so.
940. Where do the boats first experience any trouble below Blanchetown? At one part of the island, 2½ miles from here.
941. That is generally known as the first sandbar, is it not? Yes.
942. How far can those trading boats go up above Blanchetown? The "Queen" can go 5 miles. You cannot go further than that.
943. Do you know of any irrigation being carried on near Blanchetown? None this side of Morgan.
944. Is there any farming carried on? Yes; on the east or left side. The whole of the land from Morgan down on the left side of the river, and going a good way back, is taken up.
945. Is Blanchetown the port for the majority of those farmers to get their goods from? All of them come here, from 15 miles up the river.
946. Is it the port of export for their wheat? Yes.

Wheat shipped from Blanchetown.

947. What quantity of wheat do you think is shipped from here in a good season? In a good season we send away 6,000 bags of wheat from this side of the river, and I should think 10,000 bags from the left side of the river.
948. Do those people get their water supply from the river? Yes; for all purposes.
949. Are there no wells? There is one well, Mot's Well, 14 miles out.
950. Is that fit for domestic use? *No; only for stock.* There are other wells in the neighbourhood; but the water is of no use at all.
951. What is the difference between the level of the 1890 flood and the present level of the river? Over 16 feet.

MONDAY, 2 *JUNE*, 1902.

[*The Commission met at the "Terminus Hotel," Morgan, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Samuel McIntosh, Inspector of Settlements, and Assistant Inspector of Fisheries on the River Murray, sworn and examined:—

S. McIntosh, 2 June, 1902.

952. *President.*] What is your name? Samuel McIntosh.
953. Where do you reside? At Waikerie.
954. You are employed by the South Australian Government? Yes; as Inspector of Settlements, and Assistant Inspector of Fisheries on the Murray.
955. How long have you held that position? Since February, 1896.

956.

S. McIntosh, 2 June, 1902.

956. Are you acquainted with what has been done in regard to irrigation along the whole course of the Murray? Yes; I entered the employment of Messrs. Chaffey Bros. at Renmark in 1891, and after a few years became Superintendent of planting and general outdoor cultivation; I was with them until they closed in 1895.

New Era.

957. Could you tell us the condition of each of the village settlements? The first village settlement shown on the map [*Exhibit 44*] is New Era; it was started by the Government in 1894, and in 1896 it was closed as a settlement, as the situation was considered unsuitable for the class of men engaged there. It is now in the hands of a private firm.

Reason of failure.

958. What was the reason of the failure? In the first place, the men were altogether unpractical, and in the second place, the site was a difficult one to irrigate economically. In my opinion, the land is suitable for the growth of vines and cereals.
959. What is the present population? None at all.
960. What quantity of water was used? The pump has a capacity of 18,000 gallons per hour.

Pump.

961. How many days did it work last year? Not one, as far as I am aware.

Future requirements.

962. Do you anticipate that very much water will be required in the future at that station? *Yes*; I think 2 feet of water over 150 acres will be wanted.

Gillen.

963. The next village settlement shown on *Exhibit* 44 is Gillen;—will you give us its history? It was started by the Government in 1894, and closed in 1896, for the same reasons as New Era.
964. Is anything being done there now? I think not.
965. Do you regard the land as suitable for the same purposes as that at New Era? Yes; one of the heaviest cereal crops in the State was grown there, on Markaranke Lagoon.

Ramco and Waikerie.

966. The next settlement shown on *Exhibit* 44 is Ramco;—what is the area there? Over 3,000 acres. It was started in 1895 as an off-shoot of Waikerie, which has also over 3,000 acres. The settlement was started on communistic principles, but the single men complained that while they were doing an equal amount of work they were not getting equal benefits with the married men; they, therefore, asked the then Minister of Lands to allow them the portion known as Ramco, so that they might work under fairer conditions.
967. Are the two settlements still working? Yes.
968. Will you supply us with the total area, population, the area under cultivation, the capacity of the pumps, the amount of water likely to be required at each of the village settlements, and any other information you think will be of value to us? Yes, I can do that. [*Witness subsequently supplied the following*]:—

Details of settlement.

Settlement—(Village).	Area in acres.	Population.	Area under irrigation in acres.	Capacity of pumps and water raised per annum.		Further amount of water likely to be required for irrigation purposes.
				gal. per hour.	Actual amount raised—gal. (about).	
*Lyrup	14,000	105	500 (about)	144,000	308,140,000	
Pyap	9,145	69	210 „	32,000	114,500,000	24 in. per acre on 200 acres.
Moorook	3,200	52	160 „	40,000	85,000,000	24 „ „ „ 50 „
Kingston	3,625	56	180	40,000	95,000,000	24 „ „ „ 150 „
Holder	7,560	74	220	30,000	97,000,000	24 „ „ „ 100 „
Waikerie	"340	64	290	72,000	110,000,000	24 „ „ „ 50 „
Ramco	3,685	38	150	36,000	80,000,000	24 „ „ „ 50 „
Total	44,615	458	.....	.....	.....	

*It is proposed to reduce the area of Lyrup settlement to about 7,000 acres.

It is also possible that the greater portion of the area of each settlement may be irrigated at some future date, but provision has been for the areas shown as above only for the present.

The following is the only reliable information I have regarding the balance of the settlements from Morgan to the boundary of the South Australian State, viz.:—

Morgan	2 pumps.	About 10,000 gallons per hour.
New Era	1 pump.	120 acres irrigable; 18,000 gallons per hour.
Nor'-West Bend	1 „	Will irrigate about 10 to 15 acres.
Gillen	1 „	75 acres irrigable; 9,000 gallons per hour.
Qualeo	1 „	Will irrigate about 75 acres.
New Residence	1 „	*120 acres irrigable; 18,000 gallons per hour.*
W. Lewis, Gurra Gurra	1 „	25 acres irrigable.
Calperum Station	1 „	About 10 acres irrigated.
St. Clair's	1 „	Not working.
Murtho	1 „	*250 acres irrigable; 48,000 gallons per hour.*
Chowilla Station	1 „	About 4 or 5 inch centrifugal.
Stockels	1 „	3-inch centrifugal.
Renmark	3 pumping-stations.	

System of working.

The original plan was discontinued by an Act of Parliament in December, 1901, and the settlements are now worked on individualistic lines; every man has a lease of the block of land he occupies, and works it to a certain extent on the same lines as is done at Renmark. I may say that applies to the whole of the *existing settlements.*

Holder.

969. What is the history of Holder? It also was started by the State in 1894, on the same terms as the settlements referred to previously. It continued on those lines until 1901, when it was also altered under the new Act of Parliament, and the settlers are now working on the same conditions as those at Ramco and Waikerie.

Kingston.

970. As to Kingston? The same remarks apply to Kingston; it also was started in 1894 and continued under the communistic system until last year, when the Act was passed, and it applies to the settlers in the same way as elsewhere.

Moorook.

971. Does the same apply to Moorook? Yes.

New Residence.

972. The next settlement is New Residence? It was started either at the end of 1894 or the beginning of 1895, and was closed in 1897; *it has now been abandoned as a village settlement and taken up by a* private lessee.
973. Why was it abandoned? For the same reasons as the New Era and Gillen settlements. They could not bring it to a successful issue.

974.

S. McIntosh. 2 June, 1902.

974. The next settlement shown on Exhibit 44 is Pyap? The same remarks apply to Pyap as to the other settlements.

Lyrup.

975. Does the same apply to Lyrup? Yes; except that half of it has been resumed by the Crown, *i.e.*, the portion bordered yellow on Exhibit 44. This was the first village settlement started on the river, and the settlers have been more successful than any other, for the reason that they were close to Renmark and had the advantage of its experience.

Murthoo.

976. The next village settlement shown on Exhibit 44 is one past Renmark, called Murthoo? It was started on the same lines as the New Australia movement. The settlers each contributed a sum of not less than £60. The settlers dwindled down so that the Government closed it in 1899, and it has been taken over by a private lessee.

977. Was it started independently of the Government? Only to a certain extent; each settler contributed the sum stated above and then the Government gave them the same terms as were offered to the existing village settlements, *i.e.*, advanced 50 per cent. on all improvements, in the way of a loan.

978. At what interest? That I cannot state I may say that the new Act provides for a revaluation of the whole of the assets, and the various estates will then be offered on the new valuations, bearing interest at £5 14s. 6d. per annum.

Settlements only partial success.

979. Do you regard the village settlements as a success or as a failure? Not as a success, from a communistic point of view; but considering the settlers were, *almost without exception*, men without practical experience, I consider they have been, to a certain extent, a success, inasmuch as, at Lyrup alone, they have returned between £2,000 and £3,000 last year, whilst the expenditure was considerably less. Seventy-five per cent. of the settlers are content with the existing conditions, *i.e.*, perpetual lease of the land occupied, and revaluation of the improvements.

980. Will the leases you refer to be offered at the new valuation immediately the necessary formalities have been gone through? Yes.

New conditions.

981. Will the people be on their own resources then, without any assistance whatever from the Government? Yes; and under an Act which provides that the full value of the estates must be paid back to the Government in forty-two years, or any less time, at the option of the lessees.

Land suitable for village settlements.

982. Is there any more land suitable for village settlements between Morgan and the South Australian border? Yes; the whole of the land between Kingston settlement, for an average depth of at least 3 miles, right through to the Victorian Border, would, in my opinion, be suitable for the purpose.

983. On which side of the river? On the left side.

984. What about the right side? There are certain areas on the right-hand side on which irrigation could be carried out with advantage; at least 25 per cent. to the same depth as on the left side.

985. Taking the land above Overland Corner to the New South Wales Border;—*can you say* if there is any land suitable for the same purpose? Referring to the portion situated between Overland Corner and Spring-cart Gully; the whole of this land has already been surveyed and mapped out by the Government for the purpose of starting an irrigation colony known as the Lake Bonney Scheme, which contains an area of about 216 square miles, and the bulk of that country is, in my opinion, eminently suitable for intense culture.

Lake Bonney.

986. What is the condition of the land round Lake Bonney at the present time? Immediately round Lake Bonney on the east side, for a distance of 1½ to 2 miles back, it would be practically useless unless reclaimed, owing to rabbits and sheep having destroyed the herbage, which has allowed a wind scour to carry all surface soil away, and spoiled the country. From Spring-cart Gulley south to Cobdogla the land is of a slightly undulating nature, and the soil sandy, and very similar to that which exists on the settlements.

987. Take now the part of the river between Spring-cart Gully and the New South Wales Border? The same remarks apply to that as to the Lake Bonney Scheme.

Altitude no impediment.

988. You notice on the map [*Exhibit* 44] that a good deal of the land you have described as suitable for irrigation is, in some cases, as much as 120 feet above summer level:—do you regard that as an impediment? No.

989. Do you think the cost of pumping would be warranted? Yes.

Cost of pumping.

990. In making your answer that the major portion of the land described, is suitable for irrigation, you took that into consideration? Yes; my reason for saying so is that at a number of the settlements we have pumps which deliver water at over 120 feet, and we find that it costs less than 30s. per acre per annum to do so.

991. Then you say that this very high land would cost less than £2 per acre per annum to irrigate? Yes; and there are other lands, not so near the river, in fact extending in some cases to 15 miles back, which could also be profitably irrigated.

992. Can you show us these lands on the map [*Exhibit* 44]? No; they are not shown on it.

Low river saline.

993. Have you experienced difficulty in regard to irrigation *along the river above Morgan*, owing to the quality of the water? Yes. When the river gets below summer level, as the Government adviser, I strongly disapprove of the settlers using any water for irrigation unless absolutely necessary, because it contains too much saline matter.

994. Does that apply as far up as Renmark? Yes; and in this opinion I am borne out by the analyses made by Professor Lowrie, as shown in Exhibit 45 (Progress Report of the Royal Commission on the Renmark and Murray River settlements—*Appendix* G, page 6). And I might add that when those analyses were made the water was not particularly low; there was 3 to 4 feet of water in the river.

995. Have you noticed any diminution in the quantity of water coming down the river lately? Yes; particularly the last two or three years. This year is a record low river.

996. Do you attribute that to the drought higher up? Yes.

Produce.

997. *Mr. Burchell.*] What do you grow principally on the irrigation settlements? Gordo Blanco raisins, sultanas, currants, oranges, lemons, apricots, and peaches, besides cereals and root crops.

Market.

998. Do you find a good market for the products? Yes; *with the exception* that, during the past two or three years, we have had a difficulty in disposing of lemons at a satisfactory rate.

Transport.

999. How do you get them to market? We try, if possible, to get them by river.

1000. Which is the cheapest way? The river.

Low river.

1001. Have you suffered through not being able to get your products to market owing to the low river? Yes. Our raisin crops were dry in February, but we have not been able to get them to market yet.

1002.

S. McIntosh. 2 June, 1902.

1002. How much fruit have you up river now? *About 30 tons from the settlements*, or about 300 tons including Renmark.

1003. Have you any fresh fruits now which you could get away if the river were navigable? Yes; oranges and lemons.

1004. Then the question of the navigability affects you? Yes; to a very great extent.

1005. Is there any dairying done on the settlements? No. Two or three started, but they found they could not depend on getting their produce away, so discontinued it.

1006. If the river were navigable, could you always get the produce away? Yes.

1007. Does the present low state of the river affect the lift of your pumps? Yes; at Holder it has gone below our suction.

1008. You said just now that when the river is so low the water is not suitable for irrigation;—for what purposes do you require it? For domestic purposes; and, unfortunately, owing to the dry season a number of people have taken the risk, and are irrigating their trees and vines, although personally I do not agree with the principle.

1009. Where do you send your produce? To Adelaide.

1010. Have you a ready market for all you can grow? Yes.

Waterings.

1011. How many times do you irrigate? *From four to six times.*

Depth.

1012. To what depth each time? From 3 to 6 inches.

1013. Do you know what was suggested at the Corowa Conference in the way of diversion of water? Yes.

1014. Do you know the quantity *proposed to be taken off*? Yes.

Effect of suggested diversions.

1015. How will it affect the irrigation colonies down here? I think it will affect them very seriously if we have a continuation of low rivers; it will limit navigation still further, and spoil the quality of the water.

1016. Do you know that a large quantity of the flood-water goes out to the sea and is wasted now? Yes.

Locks.

1017. *Have you any idea how that could be overcome?* The only solution I know of is by a series of locks, extending from the Murray mouth to the head waters.

Land value.

1018. What is the value of the land per acre which you have been describing, without irrigation? Practically valueless.

1019. With irrigation? It is worth an average rental of about 10s. per annum.

Gravitation.

1020. With respect to the locks you mention, do you think a good deal of the lower flats could be irrigated by gravitation? Undoubtedly.

1021. Which do you consider more important, navigation or irrigation? Both are very important, but perhaps irrigation comes first.

Fish affected by low river.

1022. How does the low river affect the fish? It becomes so salt as to kill them. In some of the back-waters, in the Pike River, the Ral Ral Creek, and several other creeks, I have seen tons of dead fish from time to time.

1023. Would it be of any benefit from this point of view if the river were locked? It would be the *making of our inland fisheries*, as the locks would impound sufficient water for the fish to breed in.

Private irrigation.

1024. Are there any other irrigation works on the river in addition to those you have described? There are a number of wind-mills and small private pumps.

1025. Could you say how many? Twenty-three steam-pumps between here and the border, including the two at Morgan, and twelve wind-mills.

1026. Are they all dependent on the river for their water supply? Yes.

Wells.

1027. Are there any wells sunk off the river? Yes; but on the North side I do not know of any well having anything but salt water. On the South side we have a number of wells with fair stock water, but one or two of these wells have become salt during the past two or three years, though they are from 25 to 30 miles from the river.

1028. Do you think the low river affects wells at such a distance? I can only explain it in that way.

1029. Do they rise and fall with the river? *When the river was particularly low* the water in the wells got so salt that we had to remove the stock.

Necessaries of life.

1030. How do you get on with regard to the necessaries of life when the river is low? We have to cart them.

Cartage.

1031. What is the cost of cartage? £2 10s. per ton to Ramco.

1032. How far is that from Morgan? Twenty-seven miles on the other side of the river. At Lyrup we had to pay £4 a ton.

1033. How far is that from Morgan? Sixty or 63 miles.

River freight.

1034. Do you know the cost of cartage from Morgan to Renmark? The same as to Lyrup one way, but if they can get a return load they reduce the price to £3.

1035. What does it cost by steamer? 10s. to 15s. *per ton.*

Water right.

1036. *President.*] Do I understand from your evidence that you consider the value of the land to be 10s. per acre per annum, including all improvements? I consider the actual value of the water-right to be not less than 10s. per acre per annum.

1037. *Mr. Burchell.*] Were you at Renmark at the commencement of the settlement? Not until 1891.

1038. What did they pay per acre for the ground? £20 to £25, including a share in the pumping plant, roads, bridges, &c.

MONDAY, 2 JUNE, 1902.

[*The Commission met at the "Terminus Hotel," Morgan, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Hugh King, owner of river steamers, Morgan, sworn and examined:—

H. King. 2 June, 1902.

1039. *President.*] What is your name? Hugh King.

1040. You are a master mariner? Yes.

1041. And owner of river steamers, are you not? Yes.

1042. How long has your experience of the river extended? A little over forty years.

1043.

H. King. 2 June, 1902.

1043. During what months, under present conditions, is the river navigable? Generally from May to December from Blanchetown through to Albury. Sometimes from end of July to December. The average is about six months' navigation per year.
1044. Can we take it that the seasons for navigation extend between those two months? Yes.
1045. What would the boats draw that you refer to? From 5 to 6 feet.

Fluctuation of trade.

1046. Has the trade in the river increased or decreased of late years? It has increased from Morgan as far as Wentworth and Mildura, and has decreased higher up on the Darling.

Morgan.

1047. Do you think that Morgan is a good point at which to intercept the trade of the river? It is the best we have in South Australia.
1048. Do you think that the South Australian Government should make up its mind to make Morgan the point of discharge and despatch for all the up-river trade? It is the cheapest and quickest.
1049. Your idea, therefore, is that, if the river were made navigable from Morgan upward, it would be sufficient? I believe that it would take the whole of the trade quicker than any other place.

Saltness of river.

1050. Have you observed any difference in the nature of the water so far as saltness is concerned? If the water is down a long time, as it is this year, it gets brackish. We had a little rise down a month ago, and had we not had that the water would not have been fit for use.
1051. What do you think that is due to? The drainage from the banks of the river.
1052. *Mr. Burchell.*] You say you have been on the river for over forty years;—how long have you been trading on the river? Most of that time.
1053. To Morgan, Murray Bridge, Milang, and Goolwa? Yes.

River freights.

1054. What is the difference in river freights, say, from Wentworth to Morgan, Goolwa, or Murray Bridge? They are all the same price.
1055. What distance is it from Morgan to Goolwa? Over 200 miles.
1056. Does it not seem strange that the same rate should be charged to each place? Yes; but they cannot help themselves.
1057. From a river-steamer owner's point of view, do you consider Morgan the best port for export *via* Port Adelaide? Yes; much the quickest.
1058. What do you reckon it is worth to convey wool or wheat from Morgan to Goolwa? Wool, 7s. 6d. per ton; wheat, 6d. per bag.
1059. That 7s. 6d. you get no consideration for? Not at the present time.
1060. What would be the loss of time? About five days.
1061. How many men do you employ on one of your river steamers *fully equipped*? Twelve altogether.
1062. Does that include a barge? No.
1063. How many additional men would be required for a barge? Three.
1064. On account of the non-navigability of the river for several months, and people not being able to get their regular supplies by boat, have they been compelled to pay higher prices for the necessaries of life? Yes.

River unnavigable.

1065. Where do you find the river unnavigable in such a year as the present? At Morgan.
1066. Does that apply the whole way up? You can get into a waterhole, but then you are stopped again.

Locks.

1067. You think locks would have to be continuous? Yes, to be of any good to you.
1068. Do you know of any wool-clips up the river that have been detained owing to the river not being navigable? On the Darling—never on the Murray.
1069. In such cases, is it not possible that the wool might lose a good market? I have known wool to be about twelve months behind.
1070. If the river were permanently navigable, could the country along the banks and adjacent to the river be worked with greater prosperity? Yes. Not only that, it would induce settlement.

Renmark.

1071. How does the river not being navigable affect the produce of Renmark? At the present time, with the exception of very little, it is all at Renmark.
1072. Have you any idea of the quantity? I estimate about 200 tons of dried fruit. Of course, the only way they get the fresh fruit down is by road.
1073. Have they any fresh fruits now ready for market? Oranges and lemons.
1074. Are they getting them away? I could not say.
1075. What is your charge from Renmark to Morgan? Ten shillings.
1076. Have you anything to take up now—that is, waiting for the river to rise? Yes; a full load.
1077. When the river is falling, and it is necessary for produce to be taken up—for instance, more than you can carry—is there any difference in the freights? Not until the river goes down—until the passenger boat knocks off. We have to take smaller boats for passengers, and then we charge double rates.
1078. Where do you trade *from* first? From Murray Bridge to Morgan, Renmark, Wentworth, and Mildura.

Passenger traffic.

1079. How many passengers do you carry in the year? We carried over 2,030 last year.
1080. Have you ever known of produce being sent up by road or waggon while the river was navigable? No.
1081. When did your steamer cease running last year? The first week in January.
1082. How many boats do you run? Three regularly—the "Corowa," "Ruby," and "Gem." When these boats cannot go, we run smaller boats in their place.
1083. Did you take a lot of chaff up last year? Yes; I should think, 500 tons.
1084. Where did it go to? Mildura principally.
1085. Do you bring any wheat down? I brought 10,000 bags last year.
1086. Where from? All long the river; from above Overland Corner to the boundary.
1087. Was last year a good or bad season? Bad.
1088. Have you any idea what you would bring down in a good season? 30,000 bags.
1089. Where would that be from? All above Morgan.
1090. Do you carry any from below Morgan? No. We bring a little up to Morgan sometimes.
1091. What do you carry the wheat for? Sixpence from the boundary to Morgan, and 9d. to The Bridge.
1092. Have you any idea what it would cost to bring it by road? It is impossible to say.
1093. The 9d. runs out at 6s. per ton? Yes
1094. How many miles is it from the border to Murray Bridge? Nearly 400 miles.
1095. Do you carry any seed wheat backwards and forwards? I carry a little; but nothing to speak of.

H. King. 2 June, 1902.

1096. With regard to the village settlements;—do you carry most of their produce? I carry it all.
1097. Has it much increased the trade? Yes.
1098. Have you heard about the Corowa conference? Yes.
1099. Do you know what they propose to do? I have read of it.

Effect of proposed schemes.

1100. What effect do you think the proposed schemes will have on the river? I think it will depopulate this part altogether. Unless there is sufficient water coming down, we could not live on the river.
1101. Do you think some of the flood-waters could be utilised for irrigation purposes? Yes; that is, when the river is at a certain height.
1102. Do you think it takes any more to maintain navigation than what you think will be a fair quantity for this State for irrigation? I think it will take the whole of the water to keep the proposed locks full, with the present flow in the river.
1103. Your fleet represents a large capital lying idle? It represents over £20,000.

Navigation of lakes.

1104. *Mr. Murray.*] You spoke of the navigation of the lake—I presume Lake Alexandrina—being difficult in stormy weather? That is for loaded vessels.
1105. Do wind storms raise waves on the lake? Yes.
1106. I suppose navigation would be dangerous for the boats themselves? If too deeply loaded. People will not travel until the weather gets quieter.
1107. How long do the storms last? Sometimes for a day; the last time I was there I had to wait two days.

Murray mouth.

1108. You have heard of the projects to make a sea harbour at the Murray mouth and to bring vessels into the lake, and also to cut a canal from Goolwa to Victor Harbour;—what do you think of them? I do not think you will bring ships inside.
1109. The coast is too difficult? I think so. I think this the quickest and cheapest route after all, as compared with the canal from Goolwa to Victor Harbour. There is another thing, when you go down that way you have to pay increased insurance and other charges.

Lake Harbour.

1110. Do you think the proposal to make an inner harbour in the lake, for sea-going ships to come in, would be practicable? I do not.

Albert Landseer Dunk, agent for A. H. Landseer, Morgan, sworn and examined:—

A. L. Dunk. 2 June, 1902.

1111. *President.*] What is your name? Albert Landseer Dunk.
1112. You are a resident of Morgan? Yes.
1113. And agent for whom? A. H. Landseer.
1114. Do you do most of the shipping here? I do a great portion of it, but not the whole.
1115. Do you agree with what Captain King has said with regard to the navigability of the river? Yes.

Morgan trade.

1116. Is there any outward trade from Morgan during the months when the river is closed? Certainly.
1117. A very great deal? No. It means that when the merchants up the river see that the river is closing, they order a good quantity of stuff in order to catch the water.
1118. Supposing the river were navigable the whole year round, would the outward trade be greater? Certainly.
1119. But is it not a fact that the whole of the requirements are met during the months the river is navigable? No.
1120. In what way are they not met? We have had teams carting to Renmark for the last three months.

Carriage.

1121. Could you give us any information as to what you have carted since the river has been closed? I should think pretty well 7 tons per week going up to Renmark alone since March.
1122. So that the river boats have met the requirements so far as the upward trade is concerned, with the exception of those teams that you speak of as having conveyed 7 tons per week since the river has been closed? Yes.

Fruit awaiting shipment.

1123. *Mr. Burchell.*] Do you know the exact quantity of fruit at Renmark waiting to come down? I should think between 300 and 400 tons.
1124. That cannot very well be carried by road? No.
1125. Have you any machinery and goods, &c., waiting to go up the river? Yes.
1126. Is there any chaff that you think you could have disposed of within the last two or three months if your boats had been running? If we could get chaff and produce up the Darling, we could certainly sell it to advantage.
1127. Could you not get it up by road? No; not very well.
1128. How long have you been on the river? Twenty years.
1129. How does the rail carriage compare between Morgan and Murray Bridge to Adelaide? It is the same.
1130. Does that apply to river-borne goods only? Yes.
1131. Is the distance the same? Murray Bridge is 61 miles from Adelaide, and Morgan 105.
1132. Which do you reckon the quickest route? Morgan.

Transit, Morgan to Port Adelaide.

1133. By the quickest methods you know of, how long does it take to tranship wool from river boats from Morgan to Port Adelaide? It we started discharging wool here, say, at 6·30 in the morning, by dinner-time we could have 1,000 bales ready to leave by train at 2 o'clock. You could discharge 100 bales per hour at each crane.
1134. How long does it take to go to Adelaide by rail? Six hours.
1135. How does the cost of handling—agency, wharfage, charges, &c.—compare between Morgan and Port Adelaide and Murray Bridge and Port Adelaide? I think Murray Bridge and Morgan are the same.
1136. Do you know the difference in cost of transhipping wool from Morgan to Port Adelaide and from any of the other ports to Port Adelaide? From Morgan to f.o.b. ocean vessel, for greasy wool, the cost would be 22s. 6d. per ton; for scoured wool, about 30s. per ton.

Wool detained.

1137. Do you know of any wool clips that have been detained up the river? I know that they have often been detained, especially on the Darling.
1138. Do you think that if the river were permanently navigable the adjacent land to the river could be worked with greater prosperity? Yes.
1139. That applies to small settlers, as well as wool-growers? Yes.
1140. Do any stock travel down the river? Yes.
1141. In dry seasons? Yes.

A. L. Dunk. 2 June, 1902.

1142. How do they get on? I had an experience of that lately with 6,500 sheep from Lake Victoria down to Morgan, and we had to send feed along the road for them.
1143. Where to? Overland Corner and Boggy Flat.
1144. What quantity? Six tons to Overland Corner and 6 tons to Boggy Flat.
1145. It could not go by river? No.
1146. What would it have cost by river? Ten shillings to Overland Corner, and 7s. 6d. to Boggy Flat.
1147. What did it cost by road? Sixty-five shillings to Overland Corner, and 25s. to Boggy Flat.
1148. Have you ever heard of goods being carried by road when the river is navigable? No.

River steamers.

1149. Have you any knowledge of the number of steamers that are plying on the river under commission? About ninety registered steamers.

Barges.

1150. Does that include barges? No; there are about the same number of barges.
1151. What is the tonnage of the largest barge you know of on the river? Some of the Echuca barges are as high as 300 tons.
1152. Do you ever send large quantities of flour away? All kinds of produce.
1153. What is the cost per ton by river as far as Wentworth? Twenty shillings.
1154. What would it be to Bourke with a good river? About 50s.
1155. What is the greatest number of steamers you have known here in a good season? In the 1882 rush there were about thirty steamers with their barges here at the one time.
1156. What were they waiting for? To discharge wool and ship goods.
1157. Would there be enough produce in a year like that for them to take back? We had loading for all of them.
1158. You agree with Captain King as regards the facilities of Morgan in preference to other towns? Certainly.
1159. *President.*] Will you tell us how the supplies reach the settlers on the river, and how the produce is brought from the settlers to the various ports where the ships are discharged? By river.
1160. Wholly? As far as the settlers are concerned, when the river is not navigable, by teams.
1161. Anything not conveyed by river is represented by the 7 tons per week which you speak of between Morgan and Renmark? Certainly. That is the average of what I have sent on.
1162. How many weeks would those teams be plying? The teams started to cart in March, and have been carting ever since.
1163. Have you any idea as to how long they will continue? In all probability there will be teams on the road now until July.

Cartage.

1164. May we take your answer as this: that for four months—sixteen weeks—you cart on an average 7 to 10 tons per week? Yes.
1165. That represents, taking it at 10 tons per week, 160 tons by team in addition to what is conveyed to and from the settlers by steamer;—is that right? Yes. [*Witness subsequently informed the Commission that, from the 20th March up to the end of June, the quantity carted to and from Renmark and intermediate settlements from Morgan would probably amount to 250 tons.*]
1166. Does any produce leave the settlers, or are any supplies taken to the settlers, other than by the two sources that you speak of? Not that I know of.
1167. So that must represent the present requirements of the settlers? Yes.
1168. *Mr. Burchell.*] That simply represents the least they can manage on;—is there not a block at present in the trade? If the river was navigable now, there would be boat-loads of stuff to go up.

Thomas Scott, shipping agent, of Morgan, representing George Ferguson & Company, Adelaide, sworn and examined:—

T. Scott. 2 June, 1902.

1169. *President.*] What is your name? Thomas Scott. I am a resident of Morgan, and a shipping agent, representing George Ferguson & Company, of Adelaide.
1170. You are, therefore, acquainted with the river trade? Yes.
1171. Relating to the particular point that you have in your mind, the trade during the time the river is closed, what have you to say? What I wanted to add to what Captain King and Mr. Dunk have said is, that when the river gets, say, below 4 feet, and the large boats have to leave off and the small boats commence running, there is a considerable rush of cargo up the river, which goes up at double the ordinary cost to the consignee. That rush is owing to the fact that the river is closing. Whereas, if the river did not close, the rate of freight would remain normal, say, 10s. or £1, there would not be that great rush, and the trade would be spread over two or three more months.

Increased cost of freight.

1172. What I understand you to say is: the amount that is paid for the extra freight during the time the rush is on, for the outgoing goods to the settlers along the Murray, would be saved to those settlers? Half of it would be saved. For instance, a man gets 100 tons and pays £100 freight; but if the river is falling, and he has to get the stuff through somehow, if it goes up in a small boat he will have to pay the same price for 50 tons.
1173. *Mr. Burchell.*] The consumer up the river is the sufferer? Yes.
1174. You heard what Captain King and Mr. Dunk said with respect to the shipping facilities and methods of getting the produce from Morgan to Port Adelaide by rail;—do you agree with them in all details? Yes; in everything they said.

WEDNESDAY, 4 JUNE, 1902.

[*The Commission met at the Renmark Club, Renmark, South Australia.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Joseph Mighell Smith, Chairman of the Irrigation Trust, Renmark, sworn and examined:—

J. M. Smith. 4 June, 1902.

1175. *President.*] What is your name? Joseph Mighell Smith.
1176. You are an owner of land in Renmark? Yes.
1177. How long have you been here? Thirteen years.
1178. From the inception of the settlement? From January, 1889—a few months after its inception.
1179. Are you acquainted with its history from its beginning? Yes.

1180.

J. M. Smith. 4 June, 1902.

1180. You are also Chairman of the Trust for diverting, pumping, and distributing the water, are you not? Yes.
1181. Have you prepared statistics relating to the quantity of water pumped? I have no written statement; but could make one *viva voce*.
1182. Will you do so, please? At present we are irrigating 3,000 acres of ratable land. We have 3,300 acres; but 300 of these are not at present under actual irrigation. We are supplying water to the irrigated area at the rate of £1 per acre per annum. We raise water from the river at our No. 1 pumping station, with two 20-inch centrifugal pumps, which we estimate to throw 700,000 gallons per hour. These pumps supply what we call the reservoir, and from this reservoir, which is a natural storage, the No. 2 pumping station, which has an 18-inch centrifugal pump, supplies about 700 acres. The water is lifted to a height of about 30 feet (*i.e.*, from the datum set out by Chaffey Brothers when they first came here, which is 6 feet lower than zero, or summer level, on the Government gauge.) No. 3 pumping station consists of two 20-inch centrifugal pumps, which supply water to the balance of the settlement, lifting the water to a height of 34 feet, and irrigating all the land below that level, and also supplying water for No. 4 pumping station, which consists of one 20-inch centrifugal pump, which supplies water to all the land below the 60-foot level and the 42-foot level. During last year our pump at Ral Ral, No. 1 pumping station, upon which all the other pumps have to depend, was working 3,000 hours from the 1st July last (that is, practically the whole year's pumping), which gives something over 2,100,000,000 gallons in the course of the year. In seasons when the river rises sufficiently high for the water to run into our reservoir without pumping, we, of course, save the expense of pumping at the No. 1 pumping station. The height at which it runs in is about 11 feet above summer level. In the area controlled by the Trust (*i.e.*, No. 1 district) there are about 12,000 acres of irrigable land. With each acre of land granted in fee simple by the Government there is a water right attached, *i.e.*, a right to take a certain quantity of water from the river, which quantity is set out in the Chaffey Brothers' license—a license granted to them by the Government on the 30th May, 1888, setting out the exact quantity of water they were allowed to take each month during the year. [*See Exhibit* 45, Progress Report of the Commission on the Utilisation of the River Murray Waters, Appendix E, page 32.] These quantities are in respect of the whole area set apart for irrigation in this district, *i.e.*, 250,000 acres. The population at the present time is between 900 and 1,000. The last Census was over 900, and I think the population has increased since then. I can hand in a plan of the district at present controlled by the Trust, which also shows the pumping stations and channels; the town is excluded from our district. We have also a fifth pumping station on the river bank which waters 47 acres, exclusive of the 3,000 before mentioned. This pumping station consists of one 6-inch centrifugal pump, which is required to lift the water 32 feet. I am unable to give the exact quantities of water raised for this particular area, but probably the same proportion of water has been lifted for this as for the larger area. I may say that the cost of raising and distributing the water amounts to less than the £1 per acre per annum charged for water rights. At the present time we are spending a loan of £16,000 in improvements on the irrigation works and channels, money loaned to us by the South Australian Government in 1900, in addition to £3,000 loaned on the same account in 1896. With this money we hope to put our works into an efficient state, and be able to water a larger area. We have at the present time applications to supply water to land, which we are unable to accept, partly because we have not completed the improvements to our irrigation machinery, but principally because the river is so exceedingly low that we cannot rely upon supplying any more water than we are doing at present. If, however, the river were dealt with so that we could depend upon having the water from 5 to 6 feet above summer level at all times, we should be able with our present plant to extend our operations considerably.

Area irrigated. No. 1 pump. No. 2 pump. No. 3 pump. No. 4 pump. Pumping hours. Irrigable area. Water right. Population. No. 5 pump. Improvements. Future extensions.

1183. *President.*] Will you tell us what is included in the £1 per acre per annum you spoke of;—is there any interest on capital expended? No; because we spent no money of our own until we borrowed this money. The £20 or more which the settlers paid for their land included a share in the irrigation works erected by Messrs. Chaffey Bros. Every settler who bought an acre of land here bought also one share in the irrigation works, and in the present district there are 12,000 acres, so that every acre carries one 12,000th share in the irrigation works.
1184. Have you legal possession of the plant and channels? Yes; they are vested in the Trust by Act of Parliament.
1185. So that you are only paying for irrigation and maintenance at present? Yes.
1186. In future, when you have expended this £19,000, you will have to pay interest in addition? Yes, and probably shall find it necessary to rate ourselves somewhat higher in consequence, unless the improvement we hope for from the more efficient works enables us to save money on the present cost of pumping.

Future rating.

1187. Have you suffered inconvenience owing to the fact that you have been unable to get your fruit to market as readily as you would have liked to? Yes; great inconvenience and loss.
1188. In what way has it been a loss? Owing to our not being able to realise on the fruit and having to borrow money on it while it is here, for which, of course, we have to pay interest; whereas, if we had been able to send it away, it would probably have been sold, and we could get the money for it.
1189. We understand that the river is navigable for about seven or eight months in the year? About that.

Period of navigability.

1190. And for the balance of the year you have no communication by river? No. We might avail ourselves of communication by road, but only at great expense, and it would not pay to do it.
1191. I suppose you know it would be a costly matter to lock the river? I understand that there are many different estimates. Some think it would not be very expensive.
1192. I suppose you have seen enough of the value of irrigation to realise that the water you take from the river for that purpose is very well used? Yes.
1193. And you would say that what is good for you is good for your own State in other parts, and for the other States also? Yes; I think every drop should be utilised after first providing for navigation.
1194. Supposing a railway could be given as cheaply as the river could be locked, what would you say, bearing in mind the importance of the water for irrigation purposes? I think that without locking the river, the whole of the water could not be utilised. There would still be the open mouth to the sea, and vast quantities would go to waste.

Locks necessary.

1195. Assuming that, by putting weirs across the river, the whole of the water could be utilised, what do you say, putting the railway side by side with locks and weirs? I say that it would be infinitely to the

Navigation and rail carriage.

 advantage

J. M. Smith. 4 June, 1902.

advantage of the settlers on the river to be able to avail themselves of the cheap water carriage in preference to the railways.

1196. Assuming the cost of locking will be at the rate of £2,000 per mile, and that the cost of the railway would also be £2,000 per mile to extend it *from Morgan to Renmark*;—assuming, also, that you will get all the water you want by putting weirs across the river, what do you say as to the railway *versus the locking of the river*? I think I must be governed by the experience of other countries, and decide for the locking of the river in preference to the railway.

Ratepayers.

1197. *Mr. Murray.*] You gave the population of Renmark as between 900 and 1,000;—what is the number of holders of irrigable land, *i.e.*, land-owners paying rates? There are 280 ratepayers in the assessment book; but in several cases the *same settler is rated* on different assessments, *i.e.*, say a settler started with 10 acres, and acquired another 10, he would appear twice in the assessment book.

Land-holders.

1198. Could you give us any idea of the actual number of holdings in the 3,000 acres cultivated and irrigated? 200 holders.

1199. That is an average area of 15 acres per land-holder? Yes.

1200 Have most of the settlers families? Yes; but there are a large number of residents in Renmark who are *not* land-owners.

Labour employed.

1201. Do they employ much labour outside their own families? The necessities of the 200 land-owners support a population of nearly 1,000 people.

1202. Do they employ much labour in cultivating the land? Yes. If you take the 200 families to represent 600 persons, that would leave *over 300 people who certainly get their living by working* for the settlers.

1203. *But* there are storekeepers and *others*? Their number would not be very great.

1204. What about the men employed at the pumps? They are mostly land-owners.

1205. You say the quantity of water pumped over the main portion of the settlement was 2,100,000,000 gallons for last year, equal to 336,000,000 cubic feet; 1 inch per acre is 3,630 cubic feet exactly;—taking it at 4,000, an allowance of 10 *per cent.*, would that percentage cover the losses by percolation and evaporation in the channels? Most of the sandy channels are lined now; but this has been done since the 1st July last year. We started the work in May of last year, and since then have been going on with it, but the loss before the channels were lined was, of course, much greater than it is now. I think the

Soakage and evaporation.

total loss by soakage and evaporation would exceed 10 per cent.; but we *have no means* of knowing accurately. We have made measurements in the channel that is supplied by the No. 1 pump, and these measurements support me in saying what I have said about our pumping 700,000 gallons per hour.

1206. Could you state the losses? No.

Irrigation.

1207. The quantity you have given amounts to 28 inches with the allowance of 10 per cent.;—how many irrigations per year do you give? Five, and in some cases six.

Depth.

1208. What depth each time? I have estimated the depth at *5 inches on* an average; but I do not know absolutely.

1209. Are you not required by the terms of your agreement with the Government to measure the quantity of water taken from the river? I do not think so. We have no agreement with the Government. Of course, we are the assigns of Chaffey Bros. (Ltd.); but I do not think that we are taking anything like the quantity of water allowed for the whole area, and the allowance made in the license is computed on the whole 250,000 *acres*, I believe.

Water allowed by license.

1210. The license to Messrs. Chaffey Bros. reads: "The quantity of water to be from time to time diverted and taken by the licensees, their executors, administrators, and assigns, shall be regulated by the number of acres under irrigated culture upon the scale and in the manner following, that is to say, during the month of January in any year, not more than 1 cubic foot per minute for every 8 acres; during the month of February in any year, not more than 1 cubic foot per minute for every 10 acres; during the month of *March in any* year, not more than 1 cubic foot per minute for every 12 acres; during the month of April in any year, not more than 1 cubic foot per minute for every 10 acres; during the month of May in any year, not more than 1 cubic foot per minute for every 8 acres; during the month of June in any year, not more than 1 cubic foot per minute for every 6 acres; during the month of July in any year, not more than 1 cubic foot per minute for every 5 acres; during the month of August in any year, not more than 1 cubic foot per minute for every 5 acres; during the month of September in any year, not more than 1 cubic foot per minute for every 4 acres; during the month of October in any year, not more than 1 cubic foot *per minute for* every 4 acres; during the month of November in any year, not more than 1 cubic foot per minute for every 4 acres; during the month of December *in any year*, not more than 1 cubic foot per minute for every 6 acres";—have you ever compared the quantity pumped with the *quantity allowed* by the license? I have never compared it, and I do not think it has ever been compared officially.

1211. I suppose you would be surprised to find that the quantity allowed by license has been exceeded? Yes.

1212. None of the water pumped is wasted? No.

1213. Can you say which crops take most water? I do not think there is so much difference in the crops as in the land. There is a considerable area in lucerne.

1214. Does lucerne take more or less water than fruit? I could not say. It is a question of the quality of the soil.

1215. Does sandy soil take most water? Yes; I think so.

1216. From which do you get the most profitable results, the sandy or the more retentive soils? I think the more retentive soil is equal to the sandy soil except for lucerne.

Produce.

1217. What fruits do you grow besides vines and citrus? Apricots, peaches, and in smaller quantities apples, pears, and plums.

1218. Do they take as much water? I do not think there is any difference.

1219. You say the raising and distribution of water cost less than 20s. per acre per annum? Yes.

1220. In regard to the locking of the river, as far as carriage is concerned, would not a railway answer as well? It would not be as cheap. We can get produce carried from here to Murray Bridge for 7s. 6d. to 10s. per ton, and from here to Adelaide at, say, £1.

1221. Do you consider that the saving in freight would warrant your asking for the locking of the river? Yes; from our point of view.

1222. *President.*] Are you aware that the Mildura people have entered into an engagement with the Government of Victoria to give the Commissioner for Railways in that State the whole of their custom for three years, and to be rated to the extent of 1s. in the £ if the Government will construct a line connecting Mildura with the railway? Yes.

1223. And they have the same facilities as you have in regard to water carriage? I think not. The river is navigable weeks longer to Renmark than to Mildura. J. M. Smith. 4 June, 1902.

1224. Knowing all that, you have answered in the way you did to Mr. Murray? Yes.

1225. *Mr. Burchell.*] Do you know the total amount expended on the settlement since its inception up to the time that Chaffey Bros. went insolvent? From vouchers furnished by Chaffey Bros. and the settlers, Chaffey Bros. had spent £100,000, *and the settlers* £80,000—I am speaking from memory. Expenditure.

1226. What do you estimate has been expended since? I have not given sufficient thought to that to *enable me to* make an estimate.

1227. Referring to No. 1 pump, do you find any difficulty in using it at present owing to the low river? Yes.

1228. Is the water suitable for irrigation at the present time? When the river gets low, the water becomes contaminated to a certain extent by minerals of some kind—probably salts. Water contaminated.

1229. It becomes brackish? *Slightly.*

1230. What do the settlers do for water for domestic use? Most of them get what rain-water they can, and when that fails they use the channel water. Domestic supply.

1231. What is your rainfall here? Six inches, I believe. Rain-water is used principally for drinking, *and the channel water for other purposes.* Rainfall.

1232. You were one of the first settlers, were you not? Yes.

1233. Had you any experience of irrigation before you came here? No.

1234. Would that apply to the majority of the settlers? Yes.

1235. Did you find any difficulty *when you came here* in regard to the selection of trees, &c.? I found I was very inexperienced, and we all laboured under many disadvantages. One was that the *nurserymen* we bought our trees and vines from supplied us with what we asked for irrespective of whether they were suitable or not—that is, they professed to do so, but when they came to bear we found they were not true to name.

1236. That meant a loss of two or three years to you? Yes; in some cases the fruit was worthless.

1237. Did you plant the trees in right positions the first time? Sometimes we planted wisely and well, but in other cases we found it necessary to root up the original plantations and plant other things, which we found, by experience, would answer better.

1238. Have *not trees* been taken up within the last twelve months in some cases? Yes; peaches, apricots, and lemons.

1239. You reckon that the settlers here had to pay a *great deal for their experience*? Yes.

1240. *But* you still think that *Renmark* has done well? Yes.

1241. Referring to the question of water carriage, you said it cost 7s. 6d per ton from here to Morgan;—do you get it upwards for the same price? 10s. is the ordinary freight, but in the case of large concerns a contract is entered into with the carriers, and the price is less. Water carriage.

1242. How does that compare with waggon carriage? Waggon carriage costs £4 per ton. Rail carriage.

1243. Is there much being done now? The necessary supplies to keep the settlement going, *i.e.*, absolute necessaries, are coming up.

1244. *Do you think* the settlers all along the river are suffering from the same cause? I suppose they must be.

1245. Do you think it frightens small settlers from coming on the river? I think that is undoubtedly the case.

1246. Concerning water carriage *versus* rail carriage, do you think the water carriage has the advantage of accessibility? The railway could not touch every centre.

1247. Have you ever had fresh fruit to take to market and been prevented from doing so by the low river? Yes; we could sell large quantities of peaches and pears, both of which are fit for market, when the river is low, if it were possible to get them to market; but as it is many people are rooting up those trees because the crops will be wasted, *as they will not carry* by road. Low river.

1248. What is your opinion as to the possibility of extension of irrigation adjacent to Renmark and up the river? I think there is an almost unlimited quantity of land available, *more than there is water to* irrigate with. Extension.

1249. Do you know of the diversions *proposed* at *Gorowa*? I have an idea of them.

1250. Have you any idea of what the result would be if those diversions took place without the river being locked? I know that the present *amount of water* passing Renmark would not be sufficient to fill more than one of the off-takes from the Bungowannah weir. Result of proposed diversions.

1251. Without storage reservoirs being provided, and the river being unlocked, how would you fare under present conditions of the river? I think the river would be practically dry, except for what came down the Murrumbidgee and the Darling.

1252. How long could you afford to be without water in a dry season? Not more than two months. Longer than that would injure the year's crop, and would mean serious disaster to some of us.

Frank William Cutlack, Secretary to the Renmark Fruit Packing Union, Renmark, sworn and examined:—

1253. *President.*] What is your name? Frank William Cutlack. F. W. Cutlack. 4 June, 1902.

1254. You are a resident of Renmark and Secretary to the Renmark Fruit Packing Union, are you not? Yes.

1255. Have you prepared a statement, giving the volume *of trade done* in the settlement? Yes. [*Mr. Cutlack then handed in the following statement*]:—

Renmark Settlement, South Australia.

SCHEDULE OF PRODUCE RETURNS FOR THE YEARS 1895 TO 1901. Schedule of produce.

A.—*Dried Fruits sold through the Renmark Fruit Packing Union (Limited).*

Year.	Apricots.		Peaches and Nectarines.		Currants and Sultanas.		Figs, Prunes, &c.		Raisins.		Total
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	£
1895	9·2	608	.....	.....	·43	23	.....	...	93·	3,581	4,213
1896	18·03	1,124	·14	10	2·92	177	.....	...	117·5	3,022	4,335
1897	35·38	1,546	·32	24	8·17	496	.....	...	130·4	3,992	6,060
1898	58·4	2,294	2·95	171	2·16	124	1·22	44	92·8	3,566	6,203
1899	44·	2,200	5·2	260	3·91	244	·75	37	112·	5,072	7,814
1900	61·	3,777	22·	1,107	9·	479	·33	16	100·	4,182	9,561
1901	140·	6,307	15·5	703	15·	954	.....	...	163·	6,520	14,484

In 1899, 50 per cent. apricots lost by hailstorm.

B.—

F.W.Cutlack. 4 June, 1902.

B.—*Dried fruits sold apart from the Union.*

	£		£
1895	160	1899	4,323
1896	320	1900	3,841
1897	3,000	1901	5,790
1898	1,930		

C.—*Fresh fruit, jam, citrus fruits, and olive oil.*

Year.	Fresh Fruit.	Jams	Lemons.		Oranges.		Olive Oil.		Total.
	£	£	cases.	£	cases.	£	galls.	£	£
1895	.....	.....	200	75	100	50	200	80	205
1896	.....	400	700	262	200	100	200	80	843
1897	100	3,000	2,500	938	400	200	800	320	4,559
1898	100	100	2,000	750	250	125	150	60	1,135
1899	300	100	6,000	2,250	600	300	1,200	480	3,430
1900	300	.....	4,000	1,650	1,200	480	1,000	400	2,830
1901	300	.....	6,000	2,250	2,500	1,200	1,000	400	4,150

D.—*Fodder Crops, Milk, Butter, and Vegetables.*

Year.	Fodder.	Milk and Butter.	Vegetables.	Total.	Year.	Fodder.	Milk and Butter.	Vegetables.	Total.
	£	£	£	£		£	£	£	£
1895	2,000	200	100	2,300	1899	2,000	400	200	2,600
1896	1,600	200	100	1,900	1900	4,000	500	200	4,700
1897	2,800	300	150	3,250	1901	4,000	750	300	5,050
1898	2,100	400	200	2,700					

E.—*Summary.*

Year.	A.	B.	C.	D.	Total.	Year.	A.	B.	C.	D.	Total.
	£	£	£	£	£		£	£	£	£	£
1895	4,213	160	205	2,300	6,878	1899	7,814	4,323	3,430	2,600	18,167
1896	4,335	320	843	1,900	7,398	1900	9,561	3,841	2,830	4,700	20,932
1897	6,060	3,000	4,559	3,250	16,869	1901	14,484	5,790	4,150	5,050	29,474
1898	6,203	1,930	1,135	2,700	11,968						

Produce for 1902. For the year 1902, the figures are:—Apricots, 56 tons; peaches and nectarines, 25 tons; sultanas, 13 tons; currants, 5 tons; and raisins, 130 tons, passing through the Union. It is impossible yet to give the figures; but a reasonable estimate gives a reduced summary total of about £3,000 or £4,000. An increasing area is being planted in sultanas (in some cases to replace apricots), and returns will rapidly mount under this head.

Increase during 1901. 1256. How do you account for the large increase for the year 1901 over the year 1900;—the figures stand at £29,474, against £20,932, and yet you estimate that there will be a reduction for 1902, amounting to £3,000 or £4,000? The increase in 1901 was largely made up under the head of apricots and raisins. It was an abnormal crop in 1901 in regard to both raisins and apricots; but we had last year to accept a considerably less price for our products than we shall get this year. We sold practically all our fruit in the colonies by parting with it at a low figure. Mildura held for a higher price; but we were enabled to clear ours by selling at a lower rate. This year we have come to an understanding with Mildura to maintain prices, which will be more satisfactory; but owing to the reduction in the quantity produced the total will be as stated in the schedule above.

Transport. 1257. Have you found any difficulty in getting your produce to market? Yes; particularly last year and this year. Last year we held something like 350 to 400 tons of fruit. This year there must be at the present time 250 to 300 tons river-bound.

1258. Owing to the river being unnavigable, you have experienced considerable difficulty in disposing of your produce;—would it not be of considerable advantage if it could be arranged for you to get your produce to market with facility by railway instead of by boat? Yes.

1259. Even though it cost a little more? Yes.

Railway versus locking. 1260. Supposing the railway could be brought to Renmark from Morgan, which would you prefer—the river locked, or the railway extended? The river locked, because in all probability it would be cheaper. I understand that the water carriage is always more economical than rail carriage. The inconvenience is not confined simply to having the fruit left on our hands here; but the storage is not what it should be in a climate like this, and the fruit is attacked by weevil and other diseases. There is also the question of the carriage of fresh fruit. I know of one case where a man here was offered £150 for his pears, which were just on the point of ripening, and he had to lose absolutely the whole of that sum, because, owing to the lowness of the river, he could not get them to market. This has happened two or three years to my knowledge with that particular crop.

1261. *Mr. Murray.*] Referring to your reply to the Chairman, as to your preference for a locked river over a railway;—you said it would be a great advantage to get the fruit promptly to market;—is not railway carriage better from that point of view? Yes; in point of time.

1262. Is not railway carriage less damaging to green fruit;—would not fruit carriage by railway be worth more than by boat? It might be so.

1263. When you spoke of locking, did you refer to navigation only? I referred to both irrigation and navigation.

1264. Was the irrigation question a factor in determining your answer? Yes; I think so.

F.W.Cutlack. 4 June, 1902.

1265. *Mr. Burchell.*] Do you think that a railway would be of as great assistance as locking the river, that is in regard to increasing settlement? No.

1266. Are you aware that if the river were locked it would maintain a fixed level for pumping and supplying the settlements, whereas now it gets so low as to jeopardise settlement? I assumed that was the case.

1267. Which is your best railway station for export purposes? Murray Bridge.

1268. Which is the quickest? Morgan; slightly.

1269. Which is the dearer? Morgan, I believe.

C. F. Chaffey. 4 June, 1902.

Charles Francis Chaffey, landowner, of Renmark, sworn and examined:—

1270. *President.*] What is your name? Charles Francis Chaffey.

1271. You are a resident of Renmark, as well as an owner of land? Yes.

1272. How many acres have you? 137.

1273. Are you irrigating and growing fruit and other produce on the whole area? Yes.

1274. Have you been connected with the settlement from the beginning? Yes; since 1888.

1275. Are you satisfied with the result? Yes.

1276. Do you regard it as an unqualified success? We have made mistakes; but, altogether, the result is good.

Estimate of pumping discharge excessive.

1277. Did you hear the evidence given as to the quantity of water put on the land after allowing for evaporation and leakage—viz., 28 inches per annum? Yes.

1278. Do you consider that estimate too high? I do not think the pumps discharge so much.

1279. You are aware that the license granted to your firm only allowed 15 inches to 18 inches? I think it was 24 inches.

1280. And that, according to the evidence of the Chairman of the Trust, you are using 28 inches? Yes.

1281. Do you not regard that as excessive? I think, without having the figures, that the pumps have not discharged that amount of water.

Railway versus locking.

1282. What is the amount required, do you think? I could not give an estimate.

1283. Have you thought about the question of railway extension from Morgan *versus* the locking of the river? Yes.

1284. Do you know that the people of Mildura have entered into a kind of contract with the Victorian Government to give them the concession of carrying all their produce, and, furthermore, have agreed to be taxed if the railway does not pay? I believe there is some such arrangement.

1285. Do you think that would be an advantage? Not under the conditions you mention.

1286. At the present time you get no green fruit to market, I believe? Very little.

1287. If you had a railway you would be able to send in all you had;—would not that be an advantage? Yes.

1288. Is there any river at the time the fresh fruit comes in? No.

1289. When do apricots and peaches come in? From the 18th to the 30th December.

1290. We have it in evidence that the river is open for use to the middle of January? Yes; and there are a good many sent down at that time.

1291. *Mr. Burchell.*] Are you not suffering at the present time through not being able to get oranges away? Yes.

1292. How many could you send away now if the river were navigable? 500 cases per week.

1293. Your early fruits bring the best prices, do they not? Yes; the early and the late ones.

1294. What would be about the price per case at the present time? I was informed yesterday the price was 10s., or 17s. for navels.

1295. How long do you expect it to be before the river enables you to get that fruit away? About the beginning of August.

1296. Do you think the prices will be as good then? No.

1297. So that you will experience a loss? Yes.

1298. Which do you think would be the best—the railway from Morgan or to have the river locked? To have the river locked.

1299. What quantity of water do you think would be wasted in passing a river boat through a lock? The amount required to fill the lock.

1300. Supposing a sufficient number of locks and sufficient storage to keep those locks going, do you think there would be a serious waste of water? I do not think the amount of water going through the locks would be a large proportion of the whole.

J. W. Clark. 4 June, 1902.

James William Clark, of Renmark, sworn and examined:—

1301. *President.*] What is your name? James William Clark.

1302. You are one of the lessees of the town water supply? Yes.

Pumping.

1303. *Mr. Burchell.*] Is the water of first-class quality? No; it is a bit hard, owing to the low state of the river.

1304. Have you had any difficulty in connection with the supply? We have had some difficulty in pumping.

1305. Is it below the suction-pipe? No; but the pump is working one-third longer than it should in order to keep up the supply.

1306. What quantity of water is used per week? I cannot say; but the pumps are capable of lifting 10,000 gallons per hour, and we pump ten hours per week in the winter and fifteen hours per week in the Summer.

FRIDAY,

FRIDAY, 6 *JUNE*, 1902.

[*The Commission met at Lake Victoria Station, Murray River, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

G. A. Sharman. 6 June, 1902.

George Andrew Sharman, Manager of Lake Victoria Station, Murray River, sworn and examined:—

1307. *President.*] What is your name? George Andrew Sharman.

1308. What are you? Manager of Lake Victoria station.

Area. 1309. What is the area of the station? Leasehold area 701,712 acres; freehold, 12,650 acres.

Stock. 1310. What is the stock? At present about 50,000 sheep, 100 head of cattle, and 150 horses.

1311. Is that the normal condition of things, or is it low at the present time? It is below the carrying capacity of the station.

Carrying capacity. 1312. To what extent can you increase it? That depends upon the seasons. Given fair seasons, we could increase the carrying capacity to 75,000 sheep.

Water supply. 1313. Have you experienced any difficulty in getting water for the stock back on the run? At the present time there is no water on the run but the natural water on the frontages.

Boring. 1314. Have you tried to get it by boring? Yes; three years ago we spent £600 in boring, but it was a failure.

1315. To what depth did you go? 350 feet was the greatest depth; several other tests were made in various parts of the holding.

Great Ana-branch. 1316. You know the great Ana-branch of the Darling; Messrs. Cudmore did something in the way of conserving water there;—did they not? Yes. They erected a series of dams on the ana-branch to conserve the water, which was thrown back by these dams into the Lakes adjoining, and was locked there until such time as it was required down below.

Diversions at Ana-branch. 1317. I would like your opinion in connection with the diversion there;—perhaps you know that surveys have been made, and will be continued with a view of diverting the water from the Darling down the great Ana-branch by the erection of a weir on the lower side of the off-take;—what do you think as to the utility of that, first of all, for stock purposes? I think it would be of immense benefit to the settlers on the Ana-branch and the back country from the Murray.

1318. Would not the waters that would be diverted into the lakes be of *sufficient height to command* certain areas of country below? Yes.

1319. Could not the water be used for irrigation purposes? Not on any extensive scale.

1320. Your opinion is, that anything done would be for stock purposes? *Stock purposes, and the benefit* of the individuals living on the land there.

1321. The waters that would thus be diverted would eventually find their way into Lake Victoria? They would find their way into the river Murray.

1322. Not *via* Lake Victoria? No.

Transport. 1323. Have you experienced any difficulty in getting your wool to market, or your supplies from the centres where you purchase them to the station? I have experienced great difficulty this year; we are paying exhorbitant prices now. Owing to their being no navigable river, the increase in the working expenses of Lake Victoria Station at the present moment is from 20 to 30 per cent.

1324. You have had no difficulty in getting the wool to market? Not as yet.

1325. You say that you are at considerable loss, owing to the non-navigability of the river during certain seasons of the year? Yes; we are at the present time under very heavy expenditure.

1326. From your knowledge of the squatters in the district, are they affected in the same way or not? Yes; we are all affected in the same way—every squatter on the River Murray.

Locking. 1327. Supposing the river can be locked at a reasonable cost, do you think that that is the proper course to adopt? I think it is necessary that the river should be locked for the benefit of the States as a whole. Although the natural terminus of the produce is Adelaide, given a navigable river here, it will increase the value of every acre of land on Lake Victoria, and New South Wales will benefit accordingly, and also settlers on the Victorian side of the Murray.

1328. Could you give to us in monetary value what the locking of the Murray would mean to you as a station? No; I can only say that it would increase the rental value of Lake Victoria.

1329. To what extent? I consider the rental value of all frontage lands on Lake Victoria, equally applying to each State with river frontages, would be increased 20 per cent., given a permanent river.

Lake Victoria. 1330. What is the area of Lake Victoria? I estimate it at 40,000 acres at summer level.

1331. The area would increase as the river rises? Yes.

1332. Usually, does the level of the water in the lake correspond with the level of the water in the river? Yes.

1333. *Mr. Murray.*] Always? Not always; to a certain point only.

1334. At what depth is it locked in? It locks an average of 10 feet of water.

Summer level. 1335. *President.*] What would be the depth of the lake at summer level approximately? At summer level here all navigation is stopped; that would be an average of 10 feet.

1336. *Mr. Murray.*] That is the depth of water below the bar at the mouth? Yes; and at that time all navigation is stopped.

Flood level. 1337. *President.*] How high have you seen the lake rise above that level? From 8 feet to 9 feet.

1338. How high have you seen the river above the same level? I should say 10 feet or 11 feet—a difference of 2 feet or 3 feet. I have seen the flow of water from the lake keep navigation open from here down to South Australia for some four weeks after the river has been closed above the Rufus.

1339. As the water in the river recedes, it falls more rapidly than the water in the lake, and, consequently, the water in the lake assists navigation? Yes.

Navigation assisted. 1340. What do you think as to regulating the withdrawal of the water from the lake, and in that way assisting navigation for a longer period than it otherwise would be possible on the Lower Murray below the Rufus? It would make the river navigable for four to six weeks after it had been closed to Wentworth—that is, by conserving the water until it is required. 1341.

G. A. Sharman. 6 June, 1902.

1341. I suppose it is quite practicable to put regulators in? I should say quite practicable, and they could be put in at a nominal expense. The banks of the Rufus are very high and deep, and excellent places could be found there where it never overflows.

1342. Do you use water for irrigation purposes? No; only for domestic and garden purposes.

Effects of locking. 1343. *Mr. Murray.*] You said if the river were locked it would be an advantage to all the States;—will you explain in what way? It would be an advantage to South Australia, because our produce must go to the natural market. It would be of advantage to New South Wales, inasmuch as it would increase the rental value and thereby give a bigger revenue to that State, and put more people on the land. And the same thing applies to Victoria as far as their land on the banks of the Murray is concerned.

1344. You refer to the locking the river;—how high up? I am speaking of this district; that is, from the Balranald line to Swan Hill.

1345. It would benefit the settlers for navigation purposes? Yes.

Water carriage versus railway. 1346. Would it not compete with the Victorian railways? It must compete with the Victorian railways, Water carriage is always cheaper than rail, and in the natural course a man will take the cheaper carriage. Water carriage on the River Murray is going to do more for this division of New South Wales than ever rail carriage will do.

Navigation essential. 1347. You look upon navigation as the prime object? As far as the settlers on both sides of the Murray are concerned, it is absolutely essential to their welfare.

1348. You look upon navigation as the important object to be achieved? Yes; and, given navigation, a lot of us will get natural irrigation.

1349. You mean that it would back the water over this low-lying country? Yes.

Port. 1350. *Mr. Burchell.*] Where do you send your wool;—which is your place of export? Port Adelaide.

1351. Do you send the whole of your wool from Lake Victoria to Port Adelaide? Yes.

1352. Has that been the practice in the past? Yes; for a great number of years.

1353. Do you know what it costs per ton? Twelve shillings and sixpence per ton to Morgan.

1354. You could not send it by road? Impossible.

Cartage. 1355. What would be the cost? It would cost me at least £10 a ton.

1356. When do you commence shearing? The third week in August. We cannot start shearing unless the river becomes navigable between now and then.

Wool clip. 1357. That will mean a serious loss to you? Yes. It means that the value of the clip will be reduced by some percentage and heavily increased working expenses. The same holds good all through this district at the present time.

J. Wilkinson. 6 June, 1902.

James Wilkinson, settler, Lindsay Cliffs, Murray River, sworn and examined:—

1358. *President.*] What is your name? James Wilkinson.

1359. Where do you reside? At Lindsay Cliffs, on the Murray River.

1360. Are you a farmer? Yes.

Area. 1361. What area do you farm? About 1,000 acres.

1362. You cultivate? 800 acres.

1363. What do you graze? We have about 4,000 acres altogether.

Stock. 1364. What number of stock? 500 sheep, and thirty cattle and horses.

Produce. 1365. What do you grow on the portion that you cultivate? Wheat and hay.

Market. 1366. What market do you send it to? Hay, chiefly to the Darling; and wheat down the river.

1367. Do you dispose of any of it to Mr. Walker, at Mannum? No; I have not done so yet.

1368. Where do you send *it* to? Morgan, Eudunda, and Murray Bridge.

Transport. 1369. Have you experienced any difficulty in getting your produce to market? A great deal. We cannot get our wheat away now on account of the low state of the river.

1370. So that you are affected by the river not being navigable during certain months of the year? Yes.

1371. Would it be of great moment to you if the river were made navigable the whole year? Very great.

1372. Tell us in what way you have lost;—how much wheat have you been unable to send to market? 400 bags.

1373. You have it in stock now? Yes.

1374. Have you experienced any difficulty in getting your supplies? Yes.

1375. But the principal inconvenience and loss is by reason of your being unable to get your produce to market? Yes. We have got to lay in a six month's supply on account of the low state of the river; that is a monetary loss too.

1376. *Mr. Burchell.*] Have you any idea when you will get your wheat to market? No. We generally look for the river to rise in June, but there is not the slightest sign, so far, of its doing so this year.

1377. The price of wheat just now is very good, is it not? Yes; that is why I am anxious to get it away.

1378. That is to say, by the time you get your wheat to market the price may be down? Yes.

SATURDAY, 7 *JUNE*, 1902.

[*The Commission met at the Court-house, Wentworth, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

A. F. Cudmore. 7 June, 1902.

Arthur Frederick Cudmore, grazier, of Avoca Station, on the Darling River, sworn and examined:—

1379. *President.*] What is your name? Arthur Frederick Cudmore.

1380. You are one of the owners of the Avoca Station, abutting on the Ana-branch of the Darling, the Darling, and the Murray? Yes.

1381. You have a great deal to do with the Ana-branch? Yes.

1382. And the management of the water diverted from the Murray for some years? Yes.

Ana-branch diversions. 1383. Have you increased the amount of water which flows down the Ana-branch to any considerable extent by the works you have carried out? Yes; the original cutting was made before we (Cudmore Brothers)

A. F. Cudmore. 7 June, 1902.

Brothers) became the holders of the Avoca Station. The orignal lessees had an Act of Parliament which enabled them to make a cutting from the Darling for 10 or 12 miles in order to bring in the flood-water from that river at a lower level. This cutting was completed by D. H. Cudmore.

1384. Has the work which was done had a marked effect in increasing the volume of water flowing into the Ana-branch? Yes.

1385. To what extent? To the extent of several feet, I should say.

1386. What means have you taken to conserve the water? We have made cuttings and thrown dams across the Ana-branch in a great many cases at a cost of thousands of pounds.

Water conserved.

1387. Could you give us any idea of the amount of water conserved in that way? The lakes into which the water is backed over, approximately, 180 square miles, and vary from 6 to 14 feet in depth, with an average of (say) 10 feet.

1388. I presume you have found the storage of this water of immense value to yourselves and to your neighbours? Yes.

1389. Who have been benefited besides yourselves? The proprietors of Moorna, Lake Victoria, Cuthero, and Polia Stations.

1390. Has the water been used for anything but stock purposes? For stock and garden purposes only.

1391. Has the water served you throughout this present drought? No.

1392. When was it exhausted? Some five to six years ago.

Lakes when filled.

1393. When were the lakes filled last? They were filled to the brim by the 1890 flood, and the water remained in the deepest and best holding ground for about five years; but it would not last so long in a natural state. There is a certain amount of water backed up in the lakes over and above what would remain there in a natural condition.

1394. Retained by the works you have carried out? Yes.

1395. Did any water which you diverted into the lakes escape and get into the Murray, or did you impound the whole? A great quantity got away; we had practically no control over it; the water went all over the country. It was the highest flood ever known by white men on the Darling.

1396. The Darling has ceased running now, has it not? I understand it has stopped higher up, but not altogether with us.

1397. What do you use your pumps for? The irrigation of about 100 acres for hay and lucerne.

1398. I understand that the bed of the Darling is being cultivated near your station,—is that so? I have heard of it, but think it must be a very small piece.

Irrigation essential.

1399. I suppose, from your large experience of the district, you have formed some opinion as to the relative importance of irrigation and navigation;—how do they range themselves in your mind? I think we must have irrigation—that is the future of this country without doubt.

Pumping.

1400. Do you find that irrigation pays when a large expenditure is incurred in raising water from one level to another? I have had no experience on a large scale, but from calculations made it certainly would not pay to grow wool.

Gravitation.

1401. Suppose you could get irrigation by gravitation? That is another matter; I think it would then.

1402. May we take it then that your experience goes to show that, if irrigation cannot be secured other than by pumping, it will not pay for wool-growing? I have had no experience on a large scale, but judge that to be the case.

1403. Will you give us your opinion in regard to the relative value of irrigation and navigation? If we get the railway here from Victoria we should look at the question in quite a different light.

1404. You gave evidence before the Railway Standing Committee I understand? Yes.

1405. Was not your evidence in favour of the railway as against locking the river? Nothing was said about locking, so far as I remember. It was the railway *versus* water carriage, and there is a great deal to be taken into consideration in addition to the cost of transit.

1406. What else? We might have a better market, say, 1d. per lb. more in Melbourne than in Adelaide; in such a case it would, of course, pay to send to Melbourne. There is also the question of insurance—insurance by water is very high.

Navigation necessary.

1407. In view of the importance of irrigation in this country, do you advocate a portion of the water being devoted to navigation? Yes, I do. I think navigation as necessary as irrigation.

1408. In view of the importance of irrigation, would you say that as little water as possible should be devoted to navigation? Yes; but, of course, I should not like to see the river un-navigable for three months of the year. It should be kept permanently navigable.

1409. *Mr. Murray.*] How long back does your experience of the Darling extend? Thirty years.

1410. Is the present drought an unprecedented one in point of duration? Yes.

1411. It has largely depleted the country of stock? Yes.

1412. Do you think that any possible scheme of water conservation would have materially mitigated the effect of the drought? I am very doubtful about it, unless irrigation could have been carried on at a paying price.

1413. Has there been insufficient water in the river to provide for navigation during some portion of each year? I think so.

1414. Navigation fails altogether at times? Yes.

1415. Then the flow at such times is very small, indeed? It actually runs dry in the Darling.

Storage.

1416. In order to remedy that would it not be necessary to conserve the water of one year against another? Yes.

Natural storages.

1417. Do you know of any natural sites which are available for storage? I have heard of such at Menindie Lake and Tundou Lake.

1418. *Mr. Burchell.*] Have you ever known those lakes to run dry? Yes; they are dry now, and I have known them dry on other occasions.

1419. How many times during the thirty years of your experience? Half a dozen times, perhaps more.

1420. How often have you known them to contain water? Say twenty years, approximately.

1421. How many sheep do you water from these lakes? None at present.

1422. What is the average number when there is water there? I could not say, but it is put down by the appraisers at one sheep to 10 acres.

1423. Referring to the question of irrigation;—how could you get the water on to the ground? By pumping.

1424. If you had to pump water would it pay to grow stock? No.

1425.

A. F. Cudmore. 7 June, 1903.

1425. Where have you sent your wool in the past? To Melbourne.

1426. By what means? By steamer to Echuca, thence by rail.

1427. Have you ever sent it to the London market? Yes; for the last three or four years we have sold half of it in Melbourne and sent the other half to London.

1428. Supposing the river were navigable, and you desired to send your wool to London, which would be the cheaper way? To Adelaide, I think.

Weir below Ana-branch

1429. Supposing a weir were put across the Murray River below the Ana-branch junction, how far would that back the water with a 15 feet rise? 40 or 50 miles up the Ana-branch.

1430. Would that not be of great benefit to you? Yes; and if the level of the water in the Murray were raised that water would not run off.

1431. Would that be of great advantage to you? Yes; and to the other settlers on the Ana-branch also.

High river.

1432. Then you depend upon a high Murray for getting the water back? Yes; the water in the Murray backs that water, and makes the Ana-branch navigable for 33 miles. The same remark applies to the Darling when the Murray is high.

1433. What is the greatest distance you have known a very high river back the water? Twenty feet at Wentworth would back it 80 miles by the river up the Darling and Ana-branch.

Soakage and evaporation.

1434. *President.*] Is there anything else that you wish to add? I should like to say that we consider the effect of soakage and evaporation is equal to 7 feet in the year.

John Leary, Alderman, representing the Mayor of Wentworth, sworn and examined:—

J. Leary. 7 June, 1902.

1435. *President.*] What is your name? John Leary.

1436. You are representing the Mayor of Wentworth? Yes.

1437. You are an alderman, I presume? Yes.

Locking.

1438. Has the question of locking the rivers been before your municipal body? Yes; for years, in different phases.

1439. What is their view of the question? We consider it absolutely necessary that we should have constant water in the rivers. What presents itself more particularly at this time is that on the Darling and the Ana-branch the settlers have nothing for their stock, and if they lose their stock entirely the place must be deserted.

Effects of drought.

1440. Have you prepared a statement giving the acreage and the number of families affected by the want of water on the Ana-branch? I have a list showing some of them, which I will hand in, but that list could be considerably added to (*Exhibit* 53).

1441. You estimate that 564,780 acres, and thirty-three families, comprising 184 persons, are affected? Yes.

1442. You heard the evidence given by Mr. Cudmore relative to the good work done by settlers and squatters affected by the Ana-branch? Yes; and those people could not have been on the Ana-branch except for the water thus conserved.

1443. Do you think that if the quantity of water diverted were increased settlement would also increase? Yes; and in equal proportions.

Navigation and irrigation.

1444. Have you, as a Council, considered the relative values of navigation and irrigation? Yes.

1445. Which do you place first? Irrigation.

1446. What is your reason for so doing? The first necessity is production, and regular production. I do not know the value of permanent navigation; but we have to produce first before the other is wanted. If we produce we will manage to get that produce away somehow.

Yelta railway.

1447. Do you think that the extension of the Victorian railway to Yelta will serve the district in such a way that navigation will not be of the same pressing importance as otherwise? I do.

1448. Have you had any experience of irrigation? I have seen it.

1449. I suppose your opinion is, that if it could be managed navigation should be secured the whole year round? Yes, but always second to irrigation; and if it were found that there was not sufficient water for both, the water should be devoted to irrigation even at the risk of navigation ceasing.

1450. Do you favour the locking of the Upper Murray alone? No; it would not be fair.

1451. Why? We consider that we are as much entitled to the water of the Murray as the people higher up.

1452. Would you favour the locking of the Upper Murray in conjunction with the Lower? Yes.

1453. Do you know the country pretty well, and the settlers on the land? Yes.

1454. Do you consider that the settlers have proved the land is suitable for occupation? Yes, to a certain extent; but the first result of permanent water would be that each would have a pumping plant so that they could raise fodder for stock and other necessaries of life.

1455. *Mr. Burchell.*] How does the river affect small pumping plants at the present time? It is too low for them. I think the water should be kept at a higher level if possible, by locking the river.

1456. Do you place irrigation before navigation? Yes.

1457. How would you suggest that the settlers below Wentworth should get their produce to the market if the river is not made navigable? I put irrigation first, and, if there is sufficient water, would like to have navigation too; but if we cannot have both, I prefer irrigation.

1458. How is the bulk of the goods brought to Wentworth now? A good deal comes from South Australia when the river is navigable.

1459. Have you found any disadvantage owing to the river not being navigable? Yes; we have to lay in large stocks.

1460. How does that affect trade? We have to go to the Banks and pay interest on the money they advance.

1461. Have you any idea of what the rates would be when the Mildura line is completed? The present rates are £2 5s. from Adelaide, and £2 10s. from Melbourne.

1462. What river ports do you send to? Morgan for South Australia, and Echuca for Melbourne.

1463. The South Australian rates are cheaper? Yes.

1464. Is there any wheat grown in the district? Only for seed and local consumption.

1465. Where do you get your flour from? South Australia chiefly, but also from Echuca.

1466. Are the prices fair and reasonable? Yes; but South Australia has the advantage of the river.

John

John Henry Price, storekeeper, of Wentworth, sworn and examined:—

J. H. Price. 7 June, 1902.

1467. *President.*] What is your name? John Henry Price.
1468. What are you? A storekeeper.
1469. Are you a resident of Wentworth? Yes.
1470. How long have you been here? Twenty-two years.
1471. Are you acquainted with the trade of the Murray and the Darling? Yes.
1472. Have you a statement showing the volume and the value of the trade? Yes.
1473. Will you read it?

Trade of Wentworth.

As a river trader, I have been attached to the rivers Murray and Darling for the past twenty-two years. Fully 75 per cent. of our firm's business is dependent on a navigable Darling and Murray. For the past seven years we have had exceedingly low rivers, caused, I think, through drought and the enormous quantity of water pumped out of the rivers for irrigation purposes. Our trading steamer "Emma" has only had ten months' running on the Darling out of the past thirty months, and, should rain fall to-day at the head of the Darling, it would be fully two months before navigation would be in full swing from Wentworth, and weeks longer from Morgan, which is a severe blow to anyone dependent on the river business.

Merchants get goods carried on a navigable river at 5s. per ton; to-day, if they require the same goods, they are compelled to pay £10 per ton land carriage, and the teamster is making none too much out of the transaction, owing to he high price he is paying at present for horse-feed.

The following figures, supplied by the Collector of Customs in Wentworth, show the imports and exports for the past twelve years; also the shipping, giving the number of steamers and barges inwards and outwards, together with the registered tonnage:—

IMPORTS AND EXPORTS.

Year.	Imports.	Exports.	Year.	Imports.	Exports.	Year.	Imports.	Exports.
	£	£		£	£		£	£
1890	237,021	638,151	1894	89,198	609,299	1898	47,019	170,195
1891	271,902	655,325	1895	48,646	228,236	1899	47,663	280,996
1892	167,805	409,738	1896	73,501	529,484	1900	63,352	295,415
1893	133,555	521,285	1897	55,412	380,428	1901	54,492	181,694

SHIPPING.

Year.	Number of vessels inwards.	Registered tonnage.	Number of vessels outwards.	Tonnage.	Year.	Number of vessels inward.	Registered tonnage.	Number of vessels outwards.	Tonnage.
1890.....	420	44,009	375	38,434	1896	394	46,078	411	48,909
1891.....	440	49,446	427	47,612	1897.....	290	31,446	285	30,553
1892.....	397	40,510	406	41,175	1898.....	292	28,606	282	27,712
1893.....	398	47,627	403	48,390	1899.....	296	29,722	316	30,416
1894.....	483	54,475	485	55,265	1900	254	29,453	250	30,233
1895.....	385	45,221	371	44,391	1901.....	236	25,310	222	23,501

The shrinkage under the heading of Imports is accounted for by the fact that up to 30th June, 1894, the import values for Wilcannia and Bourke were included in the Wentworth statistical returns; but since the above date Wilcannia and Bourke have kept their own returns separately.

It is impossible to estimate the loss to business people of this town owing to continuous low rivers, as many stations, homestead lessees, &c., on the Darling at the present are carting supplies from Broken Hill, that town in many instances being very much nearer for land carriage than Wentworth; but with the rivers locked, stations and settlers could be supplied by steamers at fully 75 per cent. less than transit charges.

Locking.

I am fully convinced that the locking of the rivers would not only secure navigation, but would also be of great advantage to the settlers on their banks for irrigation. To my knowledge, 2,000 acres on the banks of the Darling was sown with wheat last year, but little or no return was the result through drought; while, as a result of irrigation, a farmer a few miles from here—Mr. D. R. McLeod—cultivated 150 acres, with a return of 240 tons of hay for his last season's work; but owing to the ana-branch, which is fed from the river Darling, being so low, Mr. McLeod will be unable to irrigate his land for the coming season, and in consequence will be a heavy loser, together with all the other settlers on the ana-branch, which, I think, fully demonstrates the necessity for impounding the water in the rivers for navigation and irrigation.

Wool delayed.

1474. *Mr. Burchell.*] Do you know of any wool clips which have been prevented from coming down owing to the lowness of the river? Yes; on several occasions two clips have come down in one season.
1475. Does the statement you put in show the direction in which the steamers were going? No.
1476. *President.*] Could you supply that information? Yes. [*The following information was afterwards supplied.*]

DESTINATION, VESSELS OUTWARDS.

Year.	To Victoria.	Registered tonnage.	To South Australia.	Registered tonnage.	Year.	To Victoria.	Registered tonnage.	To South Australia.	Registered tonnage.
1890	160	17,097	260	21,337	1896	120	16,230	274	32,670
1891.....	207	24,214	233	23,339	1897.....	129	14,575	161	15,978
1892.....	189	20,777	208	20,398	1898.....	122	13,075	170	14,637
1893.....	171	20,875	227	27,515	1899.....	136	14,312	160	16,104
1894.....	219	26,806	264	38,339	1900.....	130	15,917	124	14,318
1895.....	161	20,800	224	23,591	1901.....	119	12,218	117	11,583

William James Holding, Appraiser and Government Valuator, of Wentworth, sworn and examined:—

W. J. Holding. 7 June, 1902.

1477. *President.*] What is your name? William James Holding.
1478. What is your vocation? An appraiser, and Government Valuator.
1479. Have you been a resident of Wentworth for many years? Yes, nearly forty.
1480. You come into contact with most of the people of the district, and are acquainted with the requirements of the land and the people? Yes.
1481. I understand you have taken an interest in the locking of the Darling, and in conjunction with other residents you are proposing to approach the Federal Parliament in regard thereto? Yes.

1482.

W. J. Holding. 7 June, 1902.

1482. You have prepared a petition, but it has not yet been presented? It is hardly prepared.
1483. You believe that the locking of the Darling affects the other States? Yes; very materially.
1484. Supposing the Darling were locked, what would be the effect on the back country? The surplus water would be conserved in natural reservoirs to a very large extent, enhancing the value of the holding in a very remarkable way.

Effect of locking.

1485. To what distance would the flood-waters be forced back? In many instances 70 miles due east.

Condition of off-takes.

1486. Have you examined the natural off-takes from the river from time to time? I have.
1487. What condition have you found them in? Blocked with drift-sand in many instances.
1488. What have you to say about that? That a survey and a small expenditure would open up these water ways.
1489. Are you of opinion that the forcing of the water into the back country in the way you have indicated would have the effect of developing the resources of the country? It would.

Land values.

1490. What would be the effect on the value of the land and the revenue? It would increase the grazing capacity of the country, and thus swell the revenue.
1491. Do you refer to leasehold land? Yes.
1492. In your opinion the Crown would thus be able to impose a larger rental than at present? Decidedly.

Navigation and irrigation.

1493. Are you impressed with the importance of the navigation of the Darling and the Murray to a greater degree than you are with irrigation? I think both navigation and irrigation should have the attention of the powers that be.

Pumping.

1494. Have you found in any case that irrigation by means of pumping has been a success when applied to wool-growing? No.

Gravitation.

1495. Have you found it a success where the level of the water allowed it to be run on to the ground by gravitation? In this district you could rarely if ever irrigate in that way.
1496. May we take it, then, that so far as your experience goes, it would not pay to irrigate by pumping for pastoral purposes? No, nor for cultivation; the grading and other incidental expenses are so heavy.
1497. Your remarks do not apply to intense cultivation, such as at Mildura, I presume? No; to grazing and farming exclusively.
1498. Do you know the Ana-branch of the Darling? Yes.
1499. Are you aware that for some years past permanent water has been available for some hundred miles back? Yes; and at one time it was looked upon as absolutely permanent, and a large number of people settled on the Ana-branch as a result, but the river has not come down lately, consequently there is no surface water, and the wells have failed.
1500. Do you mean that the people on the Ana-branch have been left almost without water? Yes.

Cutting at Ana-branch.

1501. What remedy would you propose? Locking the Darling; it is quite possible to make the Ana-branch permanent water, but when the river does not come down, a pumping station will be required. The question was raised previously as to what was the depth of the first cutting to allow the water from the river to run into the ana-branch. The depth was 4 feet, and the water would just flow in when the river was 12 feet above zero on the gauge. The depth was afterwards increased, but to what extent I cannot now remember.
1502. *Mr. Burchell.*] What height above the bed of the river was that cutting? Twelve feet above flowing level.
1503. What width was it at the bottom? About 12 feet, as far as my memory serves me.

Darling Lakes.

1504. You heard what Mr. Cudmore said as to the area of the lakes filled being 180 square miles;—do you agree with that? I do not know the area, but the following are the lakes:—Pammeroo, Tundower, Nettlego, Menindie, Candla, Spectacle, Red Bank and Yeltow. The Menindie Lake has an immense area, and the out-flow from that lake when the Darling goes down has kept navigation to Wentworth open for over two months.

William Claude Wilson, Engineer in the Public Works Department, of Wentworth, sworn and examined:—

W. C. Wilson. 7 June, 1902.

1505. *President.*] What is your name? William Claude Wilson.
1506. What are you? Engineer in the Works Department.
1507. Do you reside at Wentworth? Yes.
1508. How long have you been here? Four and a half years.
1509. You have charge of the plant at the Wentworth Irrigation Settlement, and the making of surveys and other projects for water conservation? Yes.

Area.

1510. What is the area of the irrigation plot? 10,000 acres in the whole; 1,200 in the part we are dealing with, of which 550 acres have been subdivided, and 130 acres are in occupation at the present time.
1511. Is that all irrigated? Yes.

Pump.

1512. What is the size of the pump? Eighteen-inch centrifugal.

Water allowance.

1513. What quantity of water do you lift from the river? I have no record. We do not pump for any prescribed time, but just as it suits the settlers.
1514. Have you any idea of the number of inches you put on? They are allowed 30 inches; but I do not think we use half that quantity.
1515. When was the irrigation trust dissolved? In 1896.

Management.

1516. Since then it has been managed under the Public Works Department? Yes.
1517. Do you consider the settlement has been a success? It has not been a financial success so far; but the men who are working on it (there are only two actually living there and irrigating blocks) are making a living and are satisfied. I do not think the settlement has had a fair trial.
1518. To what do you attribute the failure? I think that the experience at Mildura has put the people off this class of land.
1519. The land is not so good as the Mildura land? It is not so good as their best land.

Settlement stopped.

1520. You think that is the reason? I think, not that the land would not pay well, but a prejudice has stopped settlement. There is a class of land at Mildura comparatively shallow, and the settlers only get water there at very long intervals, consequently that class of ground dries up and the crops suffer. People think the land here is of the same class; but they forget that they can have water here every fortnight

W. C. Wilson. June, 1902.

fortnight—*i.e.*, the land here is classed as the Mildura shallow land, and people do not take other circumstances into consideration.

Gaugings.

1521. Have you records of the quantity of water passing down the Murray? I have gaugings for four years, taken at the time of minimum flow at a point 8 miles above here. They are as follows:—

February, 1898	764	cubic feet	per second.
April, 1899	1,453	„	„
March, 1900	673	„	„
March, 1902	753	„	„

1522. Has the volume increased or decreased since the last date? It has increased slightly; the river is now 2 or 3 inches higher.

1523. When did the river increase? There was a slight rise immediately I finished gauging, then it dropped, and has increased again. I could not give the exact dates.

1524. How long has it been constant? Only a few weeks.

Volume.

1525. What is the volume passing down now? I estimate about 800 or 900 cubic feet per second.

Irrigation and navigation.

1526. In going about the district, I suppose you have had opportunity of judging the relative values of irrigation and navigation;—how do they arrange themselves in your mind? In order to provide for navigation, we should, of course, have to hold the water up in the Darling, and when doing that we should open the way for irrigation; but in the case of a season like the present, when it becomes a question whether irrigation or navigation should prevail, I think irrigation should have first call on the water.

Irrigation, how affected.

1527. How would irrigation be affected, so far as the Darling is concerned? To irrigate the great bulk of the frontage of the Darling country the water would have to be pumped, but in one or two cases we could irrigate quite 15,000 or 20,000 acres by gravitation—that is, by taking in the beds of the lakes, but the ordinary land outside could not be irrigated by gravitation, and the water must be pumped.

1528. You have had opportunities of seeing whether irrigation has proved a success for stock purposes? Pumping for fodder, except in extremely favourable cases, I take it, would not pay, but for what might be called insurance purposes it would.

1529. Have you made an examination of the Ana-branch? Yes.

1530. Are you prepared to lay before the Commission any of the particulars you have obtained during the investigation? In view of the condition of the information, I think it would be best for it to be collated at the head office and put in there.

Method of gauging.

1531. *Mr. Burchell.*] What methods did you use in gauging the flow of the river? I used floats.

1532. Surface floats? I had to use floats 18 inches deep, so that they would cross the sand-bars.

1533. Were there any bars in the river? A couple.

1534. The velocity would be irregular? Yes; I waded in order to carry out the work.

1535. Was any water coming down the Darling when you were doing that? No. Of course, at times the Darling does affect the Murray; but the quantities as given tally fairly well with the recorded gaugings.

1536. Was it a fairly wide section? Yes; 500 feet.

1537. What depth? It varied from 20 inches to 5 ft. 6 in.

1538. Do you consider those gaugings accurate? Not absolutely; I would allow a margin of 15 or 20 per cent., perhaps.

MONDAY, 9 JUNE, 1902.

[The Commission met at the Coffee Palace, Mildura, Victoria.]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Charles James Grant, Engineer to the Mildura Irrigation Trust, sworn and examined:—

C. J. Grant. 9 June, 1902.

1539. *President.*] What is your name? Charles James Grant.

1540. You are Engineer to the Mildura Irrigation Trust? Yes.

1541. How long have you been in that position? Three years.

1542. You have prepared a plan showing the position of the different pumping stations on the settlement? Yes. [*Exhibit* 55.]

1543. You have prepared a statement showing the estimated amount of water pumped from the river and the estimated amount actually used on the land at Mildura for the season 1901–1902? Yes. [*Mr. Grant then handed in the following statement*]:—

Estimated Amount of Water pumped from the Murray, and the Estimated Amount actually used on the land at Mildura.—Season 1901-2.

	cubic feet.
Billabong Pumping Station—	
3,185 hours run, 4 pumps, 5,000 cubic feet per minute	= 955,500,000
567 „ 2 „ 2,500 „ „	= 85,050,000
Total	1,040,550,000
Number of water acres supplied = 29,159; gives the amount lifted from King's billabong equivalent to a depth of ·82 feet per watering.	
Average number of waterings on planted land = 3·4; gives an amount of 33·45 inches pumped at the billabong.	inches.
Estimated amount of water lifted from the river	= 35·20
Estimated loss from the billabong, say 5 per cent. on 35·20 inches	= 1·75
Estimated amount lifted from the billabong	33·45
Estimated loss in distributing 27 per cent. on 35·20 inches	= 9·45
Estimated amount of water actually supplied to planted land	= 24·00

Total estimated loss, 32 per cent. of the amount lifted from the river at Psyche Bend.

1544. You have no means of supplying us with the actual quantity that has been put on to the land? No; only an estimate.

1545.

C. J. Grant. 9 June, 1902.

1545. These quantities have been arrived at by the estimated quantity raised by the pumps? The estimate of the amount put on the land has been arrived at from a few measurements which were made in actual cases.

1546. And you have assumed the pumps have done that duty the whole year through? The total amount of water lifted has been on the assumption that the pumps have been kept to the same duty all the year through.

Basis of estimate of water used.

1547. That is to say, first of all, you have assumed that the pumps are doing the same duty as you found they were doing on two or three occasions;—then again you have taken certain quantities that you knew on certain occasions were supplied to the land, and you have assumed that that has been the case all the year round;—and then the balance is what you put down as the loss? That is the way it was arrived at.

1548. *Mr. Murray.*] You give the quantity of water lifted from King's Billabong as 33.45 inches over the whole of the land irrigated? Yes.

Area.

1549. What is the area irrigated? 29,000 water acres. The land under cultivation is about 8,000 acres.

1550. That means that the water lifted is 33.45 inches over 8,000 acres? No; it is arrived at by dividing the number of water acres by the average number of waterings. Some of the land received one watering only.

1551. But the water used is 33.45 inches over 8,000 acres, is it not;—that 33.45 inches must be over some area;—what is the area referred to? It is 29,000 odd water acres divided by 3.4, the number of waterings.

Loss from channels.

1552. You give an estimate of 27 per cent. here as the volume of water lost;—from the channels, I suppose? Yes.

1553. By evaporation and percolation? Yes.

1554. Have you any check on that at all? No.

Measurement.

1555. Have you any checks on any portions of the channels? No reliable ones at all. We have never measured anything accurately enough to find out errors of that amount. The methods of measurement might be 10 per cent. out themselves.

Lined channels.

1556. Can you give any comparison between the losses in the channels now and the losses prior to the improvements? We have no definite figures to go on; but the losses in channels that are lined now are very small compared with what they were.

1557. Are the channels of the same dimensions? They are generally reduced in size.

1558. They are practically the same capacity? Yes. We used to allow two heads of water to run down a certain channel, and one head now by estimation does the same work that the two used to do.

Cost of lining.

1559. About how much has been spent on channel lining? About £29,000.

1560. Are they in a good state now, or is anything further required? The loss is still considerable, and if further money was expended it would be reduced.

Further expenditure.

1561. How much money do you think it would be wise to expend so as to reduce the loss in the channels? Another amount of £29,000 would place the channels in a very good condition.

1562. Do you think it would take all that? Less than that would improve them considerably; but the larger sum would place them in very good condition.

1563. Do you know the terms of the Act relating to the Mildura Trust in reference to the 20 per cent. loss;—you say it is still 27 per cent.? Yes; on an estimate.

1564. What expenditure do you think it would take to reduce the loss from 27 per cent. to 20 per cent.? An expenditure equivalent to what we have already spent—£29,000—would probably reduce it to less than 20 per cent.

1565. How much less? I could not say with certainty. Evaporation represents a fairly large proportion of that loss.

Diagrams of waterings.

1566. *President.*] You made two careful measurements of waterings on Messrs. Chaffey Brothers' vineyard, and you have prepared diagrams showing the quantity of water that was put on, have you not? Yes. [*Exhibit* 57.]

1567. The diagram for January this year gives the area watered as 150 acres; the time taken, 10 days, 23 hours, 41 minutes; volume of water, 3,817,034 cubic feet; depth of water, 7·01 inches; and average stream, 241·27 cubic feet per minute? Yes.

1568. The diagram for March, this year, gives area watered, 17 acres; time taken, 90 hours; volume of water, 487,114 cubic feet; depth of water, 7·9 inches; and average stream, 90·2 cubic feet per minute? Yes.

1569. Is that a good criterion as to the quantity that is put on per acre? Yes; on that class of land.

1570. That is 7·01 in one case, and 7·9 inches in the other? It is the same land in both cases.

Depth of watering.

1571. May we take it then that each watering will range between 7 and 8 inches? On that class of land.

1572. Would that be the maximum or minimum quantity of water used? It is more likely to be the maximum.

Billabong.

1573. *Mr. Burchell.*] Do you ever pay any attention to the amount of water that is allowed in connection with the license under the Act? Yes; the other statement shows what we have drawn from the river.

1574. Has the river flowed into the Billabong at all this season? No.

1575. You will have to pump into the Billabong before you can take any more out? There would only be a few days' storage in the Billabong at present.

1576. When do you expect to irrigate next? On the 1st July.

1577. Do you know that last month when you were pumping, you were only entitled to 1 inch per acre? Yes.

1578. And still you are pumping 7 and 8 inches? Yes.

1579. *President.*] You took another careful measurement when 8 acres of citrus on pine soil were irrigated in February? Yes.

1580. What quantity went on to the land then? 6·9 inches.

1581. You will prepare a statement giving the quantity of water pumped from Billabong from 1896 to the present date? Yes [*Mr. Grant subsequently furnished the following statement.*]

First

C. J. Grant. 9 June, 1902.

FIRST MILDURA IRRIGATION TRUST.

RETURN, showing approximate quantity of water pumped from Billabong, from 1st January, 1896, to 12th April, 1902.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total cubic feet for year.
	cubic feet.	cubic feet.	cubic feet.	cub. feet.	cub. feet.	cubic feet.	cub. feet.	cubic feet.	cubic feet.	cubic feet.	cubic feet.	cubic feet.	
1896..	142,762,500	88,312,500	76,481,250	30,600,000	.....	16,750,000	69,243,750	98,662,500	81,056,250	122,850,000	72,506,250	98,606,250	897,831,250
1897..	145,068,750	45,225,000	101,700,030	.....	58,387,500	122,175,000	15,525,000	107,100,000	101,587,500	118,575,000	81,225,000	141,525,000	1,038,093,750
1898..	123,750,000	917,25,000	50,850,000	78,637,500	.....	.....	.....	.....	154,050,000	137,400,000	209,550,000	86,550,000	935,512,500
1899..	71,850,000	49,800,000	63,450,000	.....	.....	.....	.....	.....	132,600,000	154,087,500	145,950,000	92,400,000	710,137,500
1900..	222,450,000	56,400,000	92,175,000	.....	.....	.....	.....	.....	26,025,000	215,775,000	144,150,000	167,175,000	924,150,000
1901..	195,300,000	31,500,000	120,900,000	.....	.....	.....	21,600,000	160,275,000	65,475,000	25,275,000	216,000,000	108,750,000	945,075,000
1902..	218,100,000	32,400,000	169,792,500	43,200,000	.....	.....	.....	.....	.....	.....	.....	.....	463,492,500
												Total cubic feet pumped.....	5,915,192,500

King's Billabong.

1582. You have prepared particulars as regards King's Billabong? Yes. [*Mr. Grant then handed in the following statement*]:—

PARTICULARS AS REGARDS KING'S BILLABONG.

Zero on Mildura Town river gauge = 96·00 Railway datum.
Floor of Psyche flood-gate = R.L. 17·25 (Mildura town gauge).
Top of Billabong dom = R.L. 23·50 ,, ,,
Approximate area of Billabong = 325 acres.
Approximate storage capacity between R.L.'s 17·25 and 23·50 = 1,275 acre feet = approximate seven days' run for the Billabong pumps.
Fall in the river surface from Psyche Bend to the Mildura gauge = 4·27 feet
The river begins to flow into King's Billabong when water level at Mildura gauge is 13 feet.

Table showing (1) amount of compensation water required to be allowed to pass Mildura, taken from Appendix B, p. 35, Mr. Stuart Murray's Report to the Minister of Water Supply, 30/5/02; (2) minimum flow of the river for various months taken from page 16, River Gaugings for 1900:—

	Compensation water in cubic feet per minute.	Minimum flow of river in cubic feet per minute.		Compensation water in cubic feet per minute.	Minimum flow of river in cubic feet per minute.
January.....	30,000	42,400	July.....	60,000	166,000
February	24,000	36,000	August	100,000	319,300
March	20,000	28,300	September	200,000	328,700
April	24,000	40,000	October	240,000	395,000
May	30,000	56,000	November	150,000	356,700
June	60,000	61,400	December	60,000	160,000

1583. How frequently does the water find its way into King's Billabong by gravitation? I should say on an average once in five years.
1584. That has been the experience on the settlement? It has been the experience for the last five years.
1585. You have known it once in five years? Yes.
1586. *Mr. Murray.*] Only once during the last five years—they have been exceptionally low? Yes.
1587. You expect it more frequently in the ordinary course of things? It would occur more frequently if we got a series of high rivers.
1588. How long does it last when it does flow in by gravitation? It may run in for three pumpings with a high flood.
1589. For one year they had not to pump any water at all into King's Billabong? I believe that is a fact.
1590. What is the effective capacity of King's Billabong? It is about six days' pumping for the Billabong pumps—43,200,000 cubic feet.
1591. It was increased lately, was it not? Yes.
1592. How much? Practically by the 43,000,000.
1593. The effective capacity is about 1-24th part of a year's pumping? Yes.
1594. That is upon the assumption that you pump 5,000 cubic feet per minute? Yes.
1595. Have you sections? We have not complete levels.
1596. What is the total depth? From 17 up to 22 feet.
1597. That is, 5 feet depth? Yes; it was taken at an average depth of 5 feet over the deep part of the Billabong, and 2 ft. 6 in. deep over the shallow part.
1598. That is a rough way, surely? It may be rough. A part of the Billabong covers a flat that is all crab-holed and undulating, and it would involve far more levels than two contours to get the actual capacity.
1599. *Mr. Burchell.*] Was the water flowing into the Billabong in 1889 and 1890? It flowed in over the top of the Billabong dams during the 1889 and 1890 season.
1600. Have you the gauge readings from 1889 to 1890 up to 1894? Yes; for the last twelve years.

Length of channels.

1601. *President.*] You have prepared a statement giving the lengths of channels in actual use? Yes.
1602. It shows that the main channels are: Lined, 11 miles; unlined, 58 miles; total, 69 miles. Laterals, lined, 40 miles; unlined, 60 miles; total, 100 miles; making a grand total of 169 miles? Yes.

Lining.

1603. *Mr. Murray.*] Lined with lime concrete? Yes.
1604. Faced with hydraulic lime? Some hydraulic lime wash, but only a small proportion.
1605. Do you find it of any advantage? Some of it was good, and some was not.
1606. Was the lime bad? Yes.

Thickness of lining.

1607. *Mr. Burchell.*] What was the thickness of lime concrete? On the main channels, 3 inches; on the laterals, 2 inches.
1608. Did you find that sufficient? We found it fairly satisfactory.
1609. Is it watertight? Not absolutely.

1610.

C. J. Grant. 9 June, 1902

1610. What length of time have you had it down? Some of it has been down twelve years.
1611. Does not the water get through it at all and crack it? Cracks do occur.
1612. What proportion of material do you use? Four, two, and one.
1613. Was that what you first used, or what you have arrived at now? We have used the same all through.
1614. *Mr. Murray.*] Four of broken stone, two of sand, and one of slaked lime? Yes.

Cost of lining.

1615. Have you any statement as to the cost per yard? It costs 20s. per cubic yard laid, or 1s. 8d. per square yard for the 3-inch thick, and 1s. 1½d. for the 2-inch.
1616. Does that include formation? No.

Formation and excavation.

1617. What is the cost of formation and excavation in moderately large channels? For old main channels it varies from 15s. to £2, and in some cases £3, per chain, depending on the state of the channel.
1618. Do you render any of the channels? No.
1619. Do you not find it necessary? A good lime-wash is all that we do.
1620. The 20s. per cubic yard includes the lime-wash? Yes.
1621. *President.*] You have prepared a statement of the occupied area for 1900–1901? Yes. [*Mr. Grant then handed in the following statement*]:—

Occupied area.

FIRST MILDURA IRRIGATION TRUST.—COMPARISON OF OCCUPIED AREA, 1900–1901.

	October, 1900.	October, 1901.	1901. Increase.	1901. Decrease.		October, 1900.	October, 1901.	1901. Increase.	1901. Decrease.
Gordos	1,931¼	2,374¼	443	... ..	Lucerne	285¼	373¼	88	.....
Sultanas	869½	1,288¼	418½	.....	Crop.....	441½	332½	... ..	109
Currants	148¼	190¼	42	.....	House and garden	135½	165¾	30¼	.....
Wine grapes.....	261½	146¼	.....	115¼	Not included elsewhere.	499	530	.....	.....
Oranges.....	439	424½	.....	14½					
Lemons	684¾	659¾	.....	23½					
Apricots	1,223½	1,075½	.....	148¼		7,797¾	8,310½	.....	.....
Peaches	511¼	413¼	.....	98	Crop (special).....	132	266	134	.....
Figs	95½	89¾	.....	5¾					
Unenumerated.....	270½	246½	.....	24	Total	7,929¾	8,576½	.....	.....

1622. The total for October, 1900, is 7,929¾ acres? Yes.
1623. The total for October, 1901, is 8,576½ acres? Yes. That is horticultural land only—excluding the township area.
1624. *Mr. Burchell.*] Has the planted area ever been greater than that;—has it fallen off at all? I could not say from memory.

Irrigable area.

1625. *President.*] You have also prepared a statement giving the approximate area of irrigable land within the Trust district under direct mortgage to the debenture holders of Chaffey Brothers (Limited), in liquidation? Yes. [*Mr. Grant then handed in the following statement*]:—

APPROXIMATE AREA OF IRRIGABLE LAND WITHIN THE TRUST DISTRICT UNDER DIRECT MORTGAGE TO THE DEBENTURE HOLDERS OF CHAFFEY BROTHERS (LTD.), IN LIQUIDATION.

Channel level.	Inside Dow Av.	Outside Dow Av.	Total.
	acres.	acres.	acres.
50 feet channel.....	67	.....	67
70 ,, ...	1,483	2,116	3,599
85 ,, ...	117	.....	117
92 ,, ...	95	.....	95
90 ,, ...	1,692	620	2,312
	3,454	2,736	6,190

1626. That, shows a total of 6,190 acres? Yes.

Crown grants.

1627. *Mr. Burchell.*] That, added to the area of 8,000 odd acres you gave us just now, would represent all the land for which grants have been issued by the Government? The approximate total area of Crown grants issued to Chaffey Brothers (Limited), within the Trust district, is 31,976 acres 2 roods 30·4 perches.

Cost of pumping.

1628. *President.*] You have prepared a statement giving the actual cost of the pumping to the various levels on the settlement since 1899? Yes. [*Mr. Grant then handed in the following statement.*]

COST OF IRRIGATION, &c., PUMPING ONLY.

Supply-level.	Season 1899–00. Water acres supplied.	Season 1899–00. Average cost.	Season 1900–1. Water acres supplied.	Season 1900–1. Average cost.	Season 1901–2. Water acres supplied.	Season 1901–2. Average cost.
50-foot channel main.....	1,762	2/11·62	1,856	3/0·54	2,064	2/11·56
70-foot ,, ,, ...	13,810	4/10·57	14,242	4/10·94	17,008	4/8·04
No. 2. 70-foot channel main	114	5/5·62	149	5/4·49	267	5/2·16
90-foot ,, ,, ...	4,162	8/1·86	3,726	8/0·39	4,731	7/3·64
85-foot ,, ,, ...	2,663	6/5·36	2,634	6/6·79	3,445	5/10·62
Deakin Avenue main.....	1,261	8/1·90	1,475	7/10·23	1,645	8/0·81
	acres.	average.	acres.	average.	acres.	average.
Total.....	23,772	*5/7·98	24,082	*5/7·39	29,160	*5/3·86

* Average cost per acre of distribution about 3d.

1629. The average cost of pumping, per acre, for the seasons 1899–1900, 1900–1901, and 1901–1902 are 5/7·98, 5/7·39, and 5/3·86 respectively? Yes.

1630.

C. J. Grant, 9 June, 1902.

1630. *Mr. Murray.*] You say the average cost of distribution per water acre, is 3d.? Yes.
1631. The annual net cost of pumping and distribution is slightly over 20·4/ per acre? Yes.
1632. *President.*] Will you prepare a statement giving the actual cost, including all expenses, per acre per annum? Yes. [*Mr. Grant subsequently furnished the Commission with the following statement.*]

Total cost per annum.

First Mildura Irrigation Trust.—Expenditure for Year 1900-1901, divided per acre occupied excluding the Townships.

Level of Supply.	Area occupied, acres.	Water acres supplied, excluding crops and E.W.S.	Average No. per acre watered.	Cost per water acre supplied.	Total cost per acre of pumping and distribution.	General expenses divided among rate production acreage (8,900).*	Total per acre served.	Government Interest—Share of.	Total cost per acre.
35-feet channel.....	131	443	3·38	5/2·27	17/6·45	8/2·43	25/8·89	4/-	29/8·89
50 ,, ...	609	1,850	3·03	3/3·87	10/0·79	8/2·13	18/3·22	4/-	22/3·22
70 ,, ...	4,261	13,494	3·16	5/2·27	16/4·77	8/2·43	24/7·20	4/-	28/7·20
No. 2 70-ft. channel	51	149	2·9	5/7·82	16/4·67	8/2·43	24/7·10	4/-	28/7·10
90-feet channel	1,396	3,726	2·66	8/3·72	22/1·24	8/2·43	30/3·67	4/-	34/3·67
85 ,, ...	944	2,614	2·76	6/10·12	18/10·65	8/2·43	27/1·08	4/-	31/1·08
Deakin Av. main..	406	1,475	3·63	8/1·56	29/6·13	8/2·43	37/8·56	4/-	41/8·56
Totals and General Averages.....	7,798	23,751	3·04	5/10·72	17/10·98	8/2·42	26/1·41	4/-	30/1·41

* The township share is calculated at four times its acreage proportion, *i.e.*, 200 × 4 = 1,160, making the divisor 8,900 ÷ 1,160 or 10,060.

	£	s.	d.
Town Service—Total cost, including £150, share of office and general expenses	798	13	10
Share of interest, as above	232	0	0
Total	£1,030	13	10

In the same period about 264 water acres were supplied to crop at 10/- per water acre, and about 67 water acres were supplied as E.W.S. at 6/- or 7/- per water acre.

Expenditure on Works by the First Mildura Irrigation Trust.

Total expenditure on Loan Works	£39,511
Revenue ,, New Works	380*
	£39,891

* A number of minor improvements charged to Channel Repairs have not been included in this amount.

Area. Area sold.

1633. The total area of the Trust, I find, from the statement you have prepared, is 45,070 acres? Yes.
1634. And the total area sold is 15,127 acres? Yes.
1635. Also that the Billabong pumps are required to work to their full capacity to supply the 8,000 acres at present watered? Yes.
1636. And that if the whole 15,127 acres sold were planted and irrigated the Billabong pumping plant would have to be duplicated, while the plant at Psyche Bend (three pumps only), would be ample? Yes.
1637. You put in three reports by Mr. Stuart Murray, dated 1st August, 1893, 20th March, 1895, and 22nd December, 1897? Yes. (*Exhibit* 63.)

Cost of scheme.

1638. Have you prepared the cost of the whole scheme before the establishment of the Trust? No; it will be found in the evidence given before the Royal Commission on the Mildura settlement, 1896, pages 129 to 144, questions 3533 to 3541.
1639. Have you the cost of the scheme since the establishment of the Trust? I will supply that information to the Commission.

Navigation and irrigation.

1640. Have you thought over the question of navigation in its relation to irrigation, from the Mildura point of view? The only opinion I have formed is that it would be a certain advantage to have a navigable river all the year round; but, with railway communication to Mildura, it is not such an important matter.
1641. Then you would put irrigation first? Certainly.
1642. If it were a question as to which way the water should be used, you should say for irrigation? Certainly.
1643. *Mr. Burchell.*] I suppose that answer would only apply so far as Mildura is concerned? Yes.
1644. How about the other people lower down the river? I have not considered them.
1645. Do you not think that they would like to have the river navigable, so as to get their produce down to market? Yes.
1646. You are not opposed to navigation? Certainly not.

Navigable river.

1647. If it could be carried out at a fair cost, do you not think it would be of considerable advantage to have the river navigable (say) from below Morgan up to Echuca? Yes.
1648. Would it not be better for you if you had the water raised permanently by a weir, so that you could do away with your Psyche Bend pumping-station altogether? It would be a great advantage. If the two schemes can be worked together, then by all means have them both.
1649. How much water do you think would be wasted in order to carry out navigation, if the river were locked? I do not see where the waste would come in.
1650. Then, by impounding the water in the river, it would be available for irrigation without any detriment to navigation? Yes.

Thomas Kelly, mechanical engineer to the Mildura Irrigation Trust, sworn and examined:—

T. Kelly, 9 June, 1902.

1651. *President.*] What is your name? Thomas Kelly.
1652. You are mechanical engineer to the Mildura Irrigation Trust, in charge of all the pumping machinery? Yes.
1653. How long have you been in that position? Five years last April.
1654. You have prepared a statement giving particulars of the pumping machinery at each station? Yes,

Particulars of Pumping Plant at Mildura.—1st Mildura Irrigation Trust.

Psyche Bend plant.

Psyche Pend Boilers.—Two pairs multitubular and one single multitubular boiler; total heating surface 3,140 square feet; working pressure, 150 lb. to the square inch; boiler feed pumps, two direct-acting steam plunger pumps. Engines, triple expansion; diameter of cylinders 16½-24½ inches, and two low-pressure cylinders, each 31 inches diameter; stroke, 18 inches; revolutions vary from 160 to 180 per minute.

Pumps, Centrifugal.—Three in number, driven direct from the engine shaft; diameter of each suction inlet at centre of disc, 23½ inches; diameter of each delivery-pipe, 40 inches. Each pump discharges separately into an elevated water basin. The

T. Kelly, 9 June, 1902.

The approximate maximum quantity of water lifted by these three pumps combined is 13,000 cubic feet per minute when the river is about 8 feet above summer level. Total number of hours pumped during last season—July, 1901, to April, 1902—1,979½. Firewood consumed, 2,948¾ tons, at 7s. per ton of 80 cubic feet. Engine oils consumed, 356 gallons at an average of 2s. per gallon.

This plant is situated on the bank of the River Murray, and lifts direct from the river into King's Billabong reservoir, which also acts as a storage, and is about 22 feet above summer level. The plant does not work continuously during the irrigating season; the working hours average from six to fifteen per day, according to the height of the river.

Billabong plant.

Billabong Engines.—Situated on King's Billabong, about 25 feet above summer level of the Murray. The boilers comprise three pairs of multitubular and one single multitubular boiler; total heating surface, 4,103 square feet; working pressure, 150 lb. to the square inch. Engines, triple expansion; diameter of cylinders, high pressure, 16½ inches, intermediate 24½ inches, and two low-pressure cylinders, each 31 inches diameter; stroke, 18 inches; ordinary speed, 166 revolutions per minute. These engines are coupled direct to four centrifugal pumps; diameter of pump discs, 6 feet; width of inlet at centre of pumps, 20 inches; diameter of suction and delivery pipes 22 inches and 25 inches respectively average indicated horse-power, at 166 revolutions, 640 I.H.-P. Average quantity of water raised from Billabong to the 50-foot channel by four pumps, at 166 revolutions, approximately 5,200 cubic feet per minute; total quantity of firewood consumed during season—July, 1901, to April, 1902—4,804¼ tons; total hours worked by four pumps, 3,256, with two pumps, 567; approximate quantity lifted from Billabong during last season, 1,061,850,000 cubic feet; average cost of firewood, 8s. per ton of 80 cubic feet; engine oils consumed, 660 gallons, at an average of 2s. per gallon.

Nichols' Point.

Nichols' Point Pumping Station.—On the 50-foot channel, about 3 miles from the Billabong, engines (centrifugal pumps) discharges into the main 70-foot channel. Two multitubular boilers; engines, triple expansion; two centrifugal pumps; diameter of pump discs, 6 feet; diameter at inlet of pump discs, 20 inches; delivery pipes, 20 inches; lift about 23 feet; average indicated horse-power, at 168 revolutions per minute, 340 I.H.P.; the maximum quantity these pumps can raise at this lift, and at 168 revolutions per minute, is 3,200 cubic feet per minute; number of pumping hours during last season (centrifugal pumps only), 3,652; firewood consumed, 2,876½ tons, at 8s. per ton; oil consumed, 373 gallons.

Also at this station, one duplex direct-acting plunger pump, driven direct by two sets of triple expansion engines, and discharging 600 cubic feet per minute into the 80-foot channel; lift, 35 feet; total number of hours worked last season, 3,192¼; firewood consumed, 676 tons, at 8s.; consumption of oils, 93 gallons.

No. 9 pumping station.

No. 9 pumping station, at Billabong, on 50-foot channel, discharges into No. 2, 70-foot channel; lift, 21½ feet; one pair of multitubular boilers, working pressure 120 lb. per square inch: two single cylinder verticle engines, connected to work as a high-pressure compound engine; high-pressure cylinder, 12 inch diameter; low pressure cylinder. 24 inch diameter, 18-inch stroke; 20-inch centrifugal pump, driven at 225 revolutions per minute; maximum quantity of water lifted, 1,200 cubic feet per minute; number of hours worked during last season, 3,237; firewood consumed, 1,103 tons, at 6s.

No. 10 pumping station.

No. 10 pump supplies the 90-foot channel from the No. 2, 70 feet; lift, 22 feet; maximum quantity of water lifted at 225 revolutions per minute, 954 cubic feet per minute. One compound engine coupled direct to the pump shaft; firewood consumed, 893 tons, at 6s.; season's pumping, 3,226½ hours; oils consumed, 163 gallons.

Deakin Avenue pump.

The pump situated on Deakin Avenue lifts from the 70-foot channel, and discharges approximately 300 cubic feet per minute; diameter of suction-pipe, 10 inches; firewood consumed in an ordinary pumping season, 289 tons, at 7s.; oils consumed, 94 gallons.

Town supply pump.

Town Supply Pump.—These pumps consist of a pair of Blake's double acting piston pumps, 12 inches diameter, and 24-inch stroke, driven by gearing from an under-type portable engine of 40 horse-power; maximum quantity of water delivered per minute at full speed is 120 cubic feet, against a head of about 80 feet; average quantity lifted, about 100 cubic feet per minute; quantity lifted, 26,388,000 cubic feet per year; number of working hours, 4,398; firewood consumed, 556 tons, at 7s.; oil consumed, 109 gallons.

Pumps specially designed.

1655. These pumps at Psyche Bend and Billabong have been especially designed for this work? Yes.
1656. Do you think the design could be improved upon? I think we could improve upon the pumps ourselves. The discs are rather small for the lift.

Power insufficient.

1657. How does the power of the engines compare with the size of the pumps? The power is barely half of what would be required to use all the four pumps. It is impossible to get sufficient power to work the four pumps from the present engine.

Duplex pump.

1658. Do you regard the duplex direct-acting pump in use at Nichols' Point a success? It has not been a great success so far. We have not got the efficiency out of it that was anticipated, but still we get a higher percentage than we get from the centrifugal on the one lift.
1659. You are satisfied that the quantities you have given regarding the water pumped are correct? Nearly correct.

Pumps not worked continuously.

1660. In respect to the Psyche Bend, you say that the approximate maximum quantity of water lifted by the three pumps combined is 13,000 cubic feet per minute? We only work them one shift per day. I mentioned in my statement that they do not work continuously like the other pumps.
1661. Have you any means of ascertaining the percentage of the water pumped and put on to the land? I purposely left that out for Mr. Grant to deal with. I estimate that they get about 22 or 23 inches out of what we lift up.

Estimated loss of water.

1662. Have you formed an opinion as to the proportion of loss between the water pumped and the water put on to the land? I am under the impression that there is a loss of about 35 to 38 per cent.
1663. Give your reasons? By the quantity lifted, and the area watered, about 8,000 acres. I arrived at it by the 22 inches.
1664. How do you arrive at the 22 inches? From a series of tests that Mr. Grant made by meter.
1665. Do you think there is any way of reducing that 38 per cent. loss? I think part of it could be reduced.

Loss could be reduced.

1666. In what way? By much stricter supervision. In the first place a lot depends upon the irrigators themselves. In many instances the water is allowed to run off the blocks back again into the channel, and also back into the Billabong; that to a very large extent could be avoided. Besides it is my impression that if the settler would put a larger number of furrows in his block nearer together, he would not want nearly so much water, and there would be a big saving effected in that way. During the five years I have been here I have seen, at every irrigation, furrows 5 and 6 feet apart; if they were brought nearer together, and systematised, there would be less water required, and the pumping would be finished much sooner.
1667. *Mr. Murray.*] You mentioned six plants working in connection with irrigation;—the Psyche Bend, Billabong, No. 9, No. 10, Nichols' Point, and Deakin Avenue? Yes.
1668. The homestead plant is not used now? No.

Economics possible.

1669. Could not Nos. 9 and 10 be amalgamated? Yes.
1670. Could not one plant do the work more efficiently? Yes.
1671. Could a driver be saved in the first place, and a good deal of cost of supervision, &c., by having one plant to do the work of Nos. 9 and 10 at No. 9? If the Trust get the loan of £10,000 they propose to pump direct from King's Billabong.
1672. And do away with Nos. 9 and 10 altogether? Yes.
1673. What has become of the Homestead plant? We are waiting instructions to re-erect it.

T. Kelly. 9 June, 1902.

1674. How much firewood do you use per heat unit? I have an idea it ranges from 4,000 to 6,000, as against 14,500 for coal. It depends entirely upon the class of wood used; it varies 100 per cent.
1675. What is the best? The best results we have ever obtained have been from dry box.
1676. Have you any yellow or red box here? A little. I allow that approximately 2¾ lb. of the ordinary wood that we get is equal to 1 lb. of coal.
1677. Where do you get your fuel now? Thirty miles up the river.

Cost of firewood.

1678. What does it cost? The average cost is about 7s. 11d.
1679. It is nearly 8s. per ton weight? Roughly.
1680. Is firewood getting scarce? It is in the immediate vicinity here, but not on the higher reaches of the river, 20 to 30 miles above Mildura.
1681. How long will the supply of fuel last here? I have no anticipation that it will wear out in my time.
1682. Are there any steps being taken to reserve any land for firewood purposes? Steps have been taken; but I doubt as to there being any chance of getting land reserved.

Liquid fuel.

1683. Would it be possible to plant freehold land with timber? It is quite possible that in the future something might be done in the way of burning liquid fuel. In the event of the Government not allowing the Trust this £10,000 loan, I intend to put before the Commissioners a scheme to drive the present Nos. 9 and 10 by oil engines.

Navigation and irrigation.

1684. *President.*] I suppose you have formed an opinion as to the relative values of navigation and irrigation, as far as Mildura is concerned? I am of the opinion that any curtailment of the water would wipe Mildura out entirely.
1685. I want your opinion as to whether you are impressed with irrigation to such an extent that, supposing it were necessary to sacrifice navigation, it should be done in view of the great importance of irrigation? I emphatically say yes. So long as we get the railway, I consider we can dispense with navigation altogether.

Cost of working pumps.

1686. *Mr. Burchell.*] With regard to the Psyche Bend pumping-station, you say that 2,918 tons of wood were consumed last season at a cost of 7s. per ton; that comes to £1,031;—how many men does it take to run those pumps? There are four firemen at 7s. a day, two wood-wheelers, one engineer at 10s. a day, and one engineer at 8s. a day.

Weir.

1687. You recognise that if a weir were put across the river, below that pumping-station, and by that means the water reached the level required to be pumped to by the Billabong pumps, it would be all that money saved to Mildura? If we could have the Murray running in—it would, certainly. I did suggest to the Chairman of the Trust having punts across, as I was of the opinion that it would be a saving.
1688. That would be similar to constructing a weir;—would the saving be £1,500 or £2,000 a year? Quite. If the river were continually high, we could work with one shift; if it was 17 feet above summer level, we could pump all the water with a very few men. We could do away with the Psyche Bend pump altogether by cutting a small channel there.
1689. The capital cost of the pumping-plant is considerable? I believe it cost about £20,000 or £30,000.

Locking.

1690. Then locking the river in that manner would be of great benefit to Mildura? It would be of very great benefit indeed.

Frederick William Pickering, agent for Lord Ranfurly on his Mildura Estate, sworn and examined:—

F. W. Pickering. 9 June, 1902.

1691. *President.*] What is your name? Frederick William Pickering.
1692. You are agent for Lord Ranfurly on his Mildura Estate? Yes.
1693. How many acres are there in the estate? 250 acres.
1694. What area is planted? Pretty nearly the whole of the land is under cultivation, and 160 acres are planted with fruit-trees and vines.

Irrigated area.

1695. What area do you irrigate? 160 acres of fruit-trees and vines, and the balance is utilised for lucerne paddocks and crop-growing.

Waterings.

1696. How many waterings do you give the land that is planted per year? It all depends on the season.
1697. Say last year? Last year we gave it six waterings. The low-lying land requires six, whereas the sandy country does with three or four, depending upon the quality of the soil.

Depth of watering.

1698. How many inches did the land receive each watering? *That I am not prepared to say, but I could get it for you. [Mr. Pickering subsequently furnished information to the effect that the quantity of water lifted at Old Mildura from 31st May, 1901, to 1st June, 1902, was 22,000,000 cubic feet.]*

Pumps.

1699. What is the size of the pumps? One 8-inch and one 6-inch.

Pumping hours.

1700. What is the number of hours worked, and what do they throw? The 8-inch works about 100 days in the year, twenty-four hours to the day, and throws 600 gallons a minute. The other pump has not been used for the last three years. It was put up as an auxiliary pump to be used in case of necessity.

Losses.

1701. Have you any information as to the loss between the quantity of water pumped and the quantity put on the land? There is very little loss in my case, because all my channels are cemented, and the distance the water has to travel is very small.
1702. Have you the rights that you acquired from Chaffey Brothers at the time you took over the estate? The Old Mildura Estate was bought from Chaffey Brothers with the water rights that were given to the other settlers. For the convenience of the estate, and for the convenience of the promoters, a separate pumping plant was placed at Old Mildura, and Old Mildura was excised from the old company.
1703. Are you using more than you have the right to, or less? I should imagine less.
1704. *Mr. Murray.*] You keep the accounts of the estate? Yes.

Financial condition.

1705. Speaking generally, does it pay expenses? It has not done so until the last two or three years. Last year I paid a dividend. Of course, it very much depends upon the season. One can grow the crops, but we cannot get them away, and after you do get them away you might strike a bad market.

Capital.

1706. Considerable capital is invested in the property? About £25,000.
1707. Does it leave a fair margin of interest? No.
1708. Do you think it is likely to do so in time? Well, we hope so, otherwise the place would not be going on at all.

Low river.

1709. *Mr. Burchell.*] Do you find any difficulty in pumping owing to the low state of the river? I had to stop my pumping altogether for a certain period. In May, 1898, I could not pump. Last year there was

F. W. Pickering. 9 June, 1902.

was a difficulty, but I put in an ordinary taper joint, and by that means I was able to go 6 inches below the surface of the water, otherwise I would have had to stop pumping.
1710. It would be an advantage to have the water higher, or at a regular level? Yes.

Edmund Semmens, Secretary to the Shire of Mildura, sworn and examined:—

E. Semmens. 9 June, 1902.

1711. *President.*] What is your name? Edmund Semmens.
1712. You are Secretary to the Shire of Mildura? Yes.
1713. How long have you been resident here? Twelve years.
1714. How long have you occupied your present position? Four years; and I was in the office as collector two years previously.

Values increasing.

1715. Is the ratable value of the property in the Shire increasing? It has increased yearly for the last four years.
1716. Will you give us the rate of increase? It increased from £18,000 odd in 1896 to £25,000 odd last year. That is the annual value.

Population

1717. Can you give us the increase in population for the same period? From 2,600 in 1896, to 3,600 at the present time.

Revenue.

1718. How does the revenue stand now, as compared with four years ago? It is increasing proportionately with the valuation in rating.

Capital value.

1719. Will you give us the ratable value of the land apart from the settlement, and then the settlement apart from the land? The ratable capital value of the land outside of the 56,000 acres, for which Crown grants have been issued, is between £45,000 and £50,000. The capital value of the settlement is nearly £475,000.

Irrigation.

1720. Have you been impressed with the importance of irrigation since you have been on the settlement? Yes. The last statement I made, I think, expresses it more than any personal opinion could do, because irrigation has added nearly £500,000 to the value of the land within the settlement, as without irrigation the land would be valueless.

Railway guarantee.

1721. You are aware that the people of Mildura have entered into an agreement with the Victorian Government to give the railway all the custom for three years, and in addition to that to allow the property, the value of which you have given us, to be rated to the extent of 1s. in the £? The Mildura Railway Bill embodies a clause containing the Shire guarantee of a shilling rate on the actual value of the property; but there is no agreement with the Government in regard to the traffic on the railway for three years. That was a recommendation of the Railway Standing Committee; but it was not put into the Railway Bill.
1722. So that the settlers in the Mildura area are at liberty to send away their produce in any way they think proper? They are at liberty to do so; but if they do so they will increase their liability under this guarantee of a shilling rate.
1723. It will be to their interest to make the railway pay? Yes.
1724. *And for that reason they will give it their custom?* Yes.

Effect of railway.

1725. Will the effect of the construction of the railway be to deprive the river of the custom that formerly went that way from the settlement? Certainly; firstly, because of the saving of time in getting the produce to market; and, secondly, because the river is never open for navigation when our fruits are ready for market.

Navigable river.

1726. Then you think that, supposing the river were navigable the whole year, it would not quite meet your case? No; it would not quite meet our case, as, although the river could take away our fruits weekly, the time occupied in transit would be greater than by rail.

Produce must travel by rail.

1727. The river freight, combined with the railway freight, would be cheaper than the railway freight alone, would it not? I do not see how that could be, unless a cut-throat policy is adopted by the railways either above or below us. Whichever way our produce goes, it must, to reach Adelaide or Melbourne, eventually find its way by rail.

Mildura not interested in navigation.

1728. The railway being assured to Mildura direct from Melbourne, can you say, as representing the shire, whether the people of Mildura regard the navigation of the river the whole year round as of prime importance? The railway being assured, the people of Mildura feel little interest in the navigation of the river. Their chief interest is in the conservation of the water for irrigation purposes.
1729. *Mr. Burchell.*] Of course, your remarks apply to Mildura only;—you do not refer to any part of the river that might be settled on, say, between here and Renmark, or above Mildura towards Echuca? With regard to future settlement, I imagine that any settlement will be near the railway, if possible.
1730. But they have not got a railway at Renmark? Seventy miles would connect them by rail; they would then have carriage all the year round. If the river were made navigable, in years like the present and 1897 there would not be sufficient water in the Murray to keep navigation open.

Export of fruit.

1731. Supposing it is possible in future to produce more fruit on this river valley than can be consumed in the States, in the event of that larger quantity, or any portion of it, being exported, is not the cost of carriage an item to be taken into consideration in connection with this large production? Yes; but by the time we overtake the consumption of the States and seek markets outside, the bulk of the settlements will be close alongside the railway, and the water-carriage would be a question that would not be considered.

Future settlement.

1732. Supposing the railway ran to Lake Victoria from Melbourne, and then proceeded along the course of the river to Mildura, would you be as well off at this end as if you were at Lake Victoria? Not if they were 100 miles closer to market; but I take it that settlement for irrigation purposes would be up-stream rather than down, consequently they would be nearer Swan Hill, Echuca, and other railway stations.
1733. You know that, in addition to Mildura, there is only one settlement at Renmark? Of course, those nearer the railway would have a better advantage than those at a distance; that is self-evident.

Cartage.

1734. But by having the river navigable they could bring their produce to those places more cheaply than by road or rail? Yes. Say there was a settlement 50 miles up the river, and the river was navigable, I take it that they would cart across to the railway rather than send it down here by boat and put it on the railway here.

Value of irrigation.

1735. What quantity of water do you think would be used, to the detriment of irrigation, in order to carry on navigation? I have not gone into that. What I wanted to emphasise was the increased value to the State of the water used for irrigation purposes, by settling the population on the land, as compared to allowing it to run to waste to the sea, or merely using it for freight-carrying purposes.

E. Semmens. 9 June, 1902.

1736. Then you are not opposed to the river being made navigable as long as it does not take away water to the detriment of irrigation? As long as there is water to spare, no.
1737. You do not oppose having the river navigable on those grounds? I suggest locking for navigation and irrigation purposes—both, if it can be done,—but irrigation should have priority.
1738. Providing no water is wasted in maintaining navigation, then you agree with it on those grounds? Yes.

Frederick James Hawkes, Secretary to the Mildura Fruitgrowers' Association, Limited, sworn and examined:—

F. J. Hawkes. 9 June, 1902.

1739. *President.*] What is your full name? Frederick James Hawkes.
1740. You are secretary to the Mildura Fruitgrowers' Association, Limited? Yes.
1741. You have prepared a statement showing the value, &c., of the products for the last three years? Yes. [*Mr. Hawkes then handed in the following statement.*]:—

DRIED FRUIT OUTPUT.

Output.

	1900.	1901.	1902.
Raisins	860 tons	1,193 tons	950 tons
Sultanas	90 ,,	108 ,,	102 ,,
Currants	80 ,,	109 ,,	90 ,,
Apricots	112 ,,	196 ,,	92 ,,
Peaches	56 ,,	35 ,,	30 ,,
Figs	35 ,,	20 ,,	20 ,,
Almonds, plums, and sundries	60 ,,	30 ,,	40 ,,
	1,293 tons	1,691 tons	1,384 tons
Gross weight	1,482 ,,	1,933 ,,	1,582 ,,
CITRUS FRUITS.			
Oranges and lemons	80,000 cases	60,000 cases	.....
Gross weight	1,600 tons	1,200 tons	.....
Total approximate value dried fruits and citrus	£72,000	£89,000	.....
Canned fruit, jam, pulp, &c. (approximately)	1,000 tons	1,300 tons	.....
Approximate value all products	£104,330	£113,056	.....

	tons	cwt.	qrs.	lb.
Gross tonnage imported by Mildura Fruitgrowers' Association, Limited, for year ending 30th June, 1901	456	14	3	14
Gross tonnage exported by same firm for season 1901	1,240	0	0	0

Figures for present season not yet ascertainable.

1742. Can you let us have the particulars for the preceding years to 1900? I think I could get approximate figures for two or three years prior to that; but they would not be as accurate as those I have given. (*Mr. Hawkes subsequently furnished the following return.*)

MILDURA'S DRIED FRUIT OUTPUT.

Fruit.	Season 1896.	Season 1897.	Season 1898.	Season 1899.
Raisins	430 *tons*	781 tons	672 tons	837 tons
Sultanas	*No figures* available.	33 ,,	26 ,,	42 ,,
Currants	,,	32½ ,,	13 ,,	30 ,,
Apricots	,,	99 ,,	104 ,,	109 ,,
Peaches	,,	37 ,,	21½ ,,	29½ ,,
Figs	,,	21 ,,	14 ,,	18 ,,
Almonds, plums, and sundries	,,	5½ ,,	6½ ,,	9½ ,,
	430 tons	1,009 tons	857 ,,	1,075 ,,
Gross weight	492 ,,	1,253 ,,	979 ,,	1,229 ,,
Oranges and lemons	No figures available.	No figures available.	34,586 cases	49,748 cases
Gross weight	,,	,,	602 tons	936 tons

William Benjamin Chaffey, irrigationist, Mildura, sworn and examined:—

W. B. Chaffey. June, 1902.

1743. *President.*] What is your name? William Benjamin Chaffey.
1744. You are a resident of Mildura? Yes.
1745. For how many years? Thirteen.
1746. You are the owner of certain land? Yes.
1747. How many acres? About 160.
1748. You have been connected with the settlement from its inception? Yes; I was one of the promoters.
1749. As one of the promoters, you got certain rights granted to you by the Victorian Government? Yes. Those rights are contained in the indenture of May, 1887.

Indenture.

1750. That indenture is contained in the appendices to the minutes attached to the progress report of the Commission on the utilisation of the River Murray waters, dated 29th May, 1890, and given on page 33? Yes.
1751. You know the clauses relating to the quantity of water to be taken from the river during certain months of the year? Yes. I have forgotten what they are, but I was conversant with them.
1752. When the settlers purchased land from your company, was the land purchased with the rights that the Victorian Government granted to you, or not? Yes; it was purchased with the rights which we got from the Government.

1753.

W. B. Chaffey. 2 June, 1902.

1753. Any other rights, or any further promises? *Rights in the machinery* and channels which we constructed for the distribution of the water.
1754. Did you confer any rights or make any promises in respect to the quantity of water taken from the river? None other than set out in the indenture.

Rights of settlers.

1755. May we take it then that, so far as your firm is concerned, the settlers have no other rights than those conferred on you by the Victorian Government in the indenture referred to? That is the only right we could have given them.

Navigation.

1756. Have you thought of the question of navigation as it affects the Mildura settlement;—do you now, seeing that you are going to get the railway from Melbourne direct, regard it of very great moment to have the river navigable the whole year round? I certainly think there will not be the same advantage in having the river navigable as there was before we had the railway under construction; but I believe, when we produce the quantity of fruit which will be produced, that the river will be valuable to us as a means of carriage when we export our fruit.
1757. It has been given in evidence that it would be an advantage to Mildura if the surface of the water in the river were raised permanently by the construction of locks and weirs;—do you agree with that? Unquesitonably.

Rights, how conveyed.

1758. *Mr. Murray.*] I think you said that your firm conveyed to the purchasers of land from you the rights you obtained from the Government? That is so.
1759. Was that right conveyed in any specific terms in the deeds of grant? No. First there was an irrigation company formed, to which shares were attached, each share representing the right which appertained to an acre. Of course the company was formed because the Government of the day did not see their way clear to state just what the right was. That was the method by which we undertook in California to convey the water-right, and as they saw no better method—in fact, as they would suggest no method—they might do that, giving a bond that if that was not right we would do something which was. So that, in effect, we did transfer the water-right which we received from the Crown when we conveyed an acre of ground.
1760. What I asked was: was any specific reference made to that right in the titles you issued? Yes. [Mr. Chaffey subsequently handed in a blank copy of one of the transfer forms used by the Mildura Irrigation Company (Limited), in which the following words appear: "Together with a sufficient water-right to be held with and run with the said land as a perpetual easement within the intent of, and as required by the condition in that behalf contained in the Crown grant to George Chaffey and William Benjamin Chaffey . . . . . ."]
1761. You said that the Government of the day could not see its way to suggest any method with regard to the conveyance of the water-right? Yes; they could not see their way to suggest any method, and would take no responsibility as to the conveyance of the water-right to the purchaser of the land.
1762. Was not the real difficulty this: that the lawyers said there was no form known to English law whereby a right of property could be conveyed in natural water? I could not say. All I know is that Ministers told me they knew nothing about it, and we said we did; and they said, If that was a good form of transfer we were to take the responsibility of making the transfer in those terms.
1763. By giving those shares you conveyed a right equivalent to the right you got from the Government? Yes.
1764. And that was to take certain volumes of water from the river at certain specific times, subject to certain conditions in respect to each acre of land kept under irrigated culture? That is so.
1765. Did you ever ascertain whether the rights granted would be sufficient for the purpose of irrigation? Taking our Californian experiences into account, we though they would be. We had not ascertained by any practical means, because we had made no experiments on this land.

Irrigation in California.

1766. Do you know the actual amount of water used in irrigation in California? I only know that it varies very materially, and I can only tell you on the basis of miners' inches. In Southern California the best rate I knew of was one miners' inch to 5 acres; the lowest was one miner's inch to about 17 acres.

Miner's inch.

1767. What is a miners' inch? It is a quantity of water which would flow through a hole an inch square in an inch-board, under a 4-inch pressure from the centre of the aperture.
1768. Do you know how much the miners' inch is in volume? No.
1769. The right, according to your Californian practice, would be in the best cases 5 acres per cubic foot per minute, or thereabouts? That is only a very limited number of acres.
1770. Do you know what quantity the rate here amounts to? Not at the present time. Of course, I was conversant with all these figures, but they have passed out of my memory.
1771. How would the right here compare with the right of which you speak as being common in California? I should say it would be equal to the average, and we thought it at the time to be a little better.
1772. The average would be somewhere between 5 and 17 acres? I should say you could put the average down at one miner's inch to 8 or 9 acres.

Water right sufficient.

1773. What has been the actual experience of the right here—as to its sufficiency for irrigation? That I hardly know how to answer. I think our water-right here is quite good enough.
1774. *Do you not think it would be an advantage to the settlers if it were enlarged?* Some people think so, and I am told that on my land I use more water than I am entitled to under the indenture, but I have grave doubts about it.
1775. *Recognising the necessity for strictest economy in the use of water,* do you think the water-right is sufficient? I think it is—practically so.
1776. That is to say, if the water were economically used, both as to the taking from the river and the distribution and use, the right is sufficient? I think so.

Waste.

1777. Then there must be a good deal of waste now? There certainly is.
1778. In what way? In the channels in the first place.
1779. By percolation? Yes.
1780. Is there any waste besides percolation in the channels? There always is some waste. It is practically impossible to irrigate some land without waste, especially if the land has much fall.
1781. Assuming that the water-right is sufficient—that is to say, an average of about 7 acres to the cubic foot per minute, as against your Californian experience of 9 or 10,—do you not think it would be an advantage

W. B. Chaffey. 9 June, 1902.

advantage if the right could be increased in the drier part of the year? I think now that, if the right were increased during the months when we are only allowed to take the smaller quantity of water, it would be very much better for us.

Storages.

1782. Have you ever considered how the quantity could be increased? Yes. There are a large number of lakes and billabongs which could be utilised for the storage of a large quantity of water.

1783. Something was said here to-day with regard to making the water easier to get in the summer time, by locking;—if it were for navigation you could not use it? You could use a great deal of water, and still have enough for navigation.

Locking.

1784. Suppose the river is locked so as to keep 6 feet of water in the channel to allow of boats drawing that depth to go up and down; obviously you cannot reduce the level of the water below that without stopping navigation? I should think it would have to be much more than 6 feet.

1785. Call the depth anything you like? Surely, if by raising that level you impound all the water now going to waste, and have, say, a lock 10 or 12 feet, and boats drawing 6 feet, you would have at least 4 or 6 feet of water to draw upon.

1786. Then your idea is to increase the storage in addition to locking the river? Yes.

Harry Percy Thomson, Commissioner of the Mildura Irrigation Trust, sworn and examined:—

H. P. Thomson. 9 June, 1902.

1787. *President.*] What is your name? Harry Percy Thomson.

1788. You are a resident and owner of land in Mildura? Yes.

1789. You are also a Commissioner of the Water Trust? Yes.

Increased settlement.

1790. Do you regard the prospects of an increase in the settlement as good? Yes. I think there is every chance of a fair increase here. A great number of abandoned blocks have been taken up lately; there are a great many inquiries now, and there is every likelihood of new blood being brought into the settlement.

1791. Is there a disposition to purchase from the mortgagees? A great many of the mortgaged blocks have been sold during the last two years.

1792. Is the rate of increase, so far as you can see, likely to be augmented as the result of the construction of the railway? I should say so.

1793. So that, so far as you are able to judge, the prospects of Mildura are good? Yes.

Irrigation of paramount importance.

1794. Have you thought about the question of navigation in connection with Mildura;—you know that there is some sort of understanding between yourselves and the Government of Victoria to send the produce down by railway instead of by the river;—do you regard the navigability of the river, in view of that understanding, of very great moment? I do not regard it of such importance as before the railway was started; if navigation could be brought about without interfering with irrigation, I should like to see the two go hand in hand. But irrigation is of paramount importance here, although the river will be used by Mildura people more or less all along.

TUESDAY, 10 *JUNE*, 1902.

[*The Commission met at the "Euston Hotel," Euston, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Robert Robison McMonnies, storekeeper, Euston, sworn and examined:—

R. R. McMonnies. 10 June, 1902.

1795. *President.*] What is your name? Robert Robison McMonnies.

1796. You are a resident and storekeeper at Euston? Yes.

1797. How long have you been here? About twenty-eight years altogether on the Murray.

1798. How do you get your stores? By the river, when it is navigable.

1799. From which direction? Principally from Melbourne, but sometimes from South Australia.

Cost of carriage.

1800. What is the difference of cost in carriage when the river is navigable and when it is unnavigable? About £5 5s.

1801. Could you quote the two prices? River freight from Echuca 15s. per ton, cartage from Swan Hill £6.

Navigation.

1802. Do you regard it as of importance to Euston that the river should be navigable the whole year round? Yes; of great importance.

1803. How many months of the year, as a rule, can you get goods by boat? Six or seven.

Irrigation.

1804. Are you at all interested, as far as Euston is concerned, in the question of irrigation? It would be a success in this country.

1805. Have you had any experience of it? Only in a very small way.

1806. *Mr. Burchell.*] Are there any farms in this locality? There are two or three leaseholders who grow stock.

1807. Do they send stock away from here? Yes.

1808. Is there any wool shipped from here? Yes.

1809. Where is it sent to? To Melbourne, *via* Echuca.

1810. Does any ever go down the river to South Australia? No.

William James Rockett, storekeeper, &c., of Euston, sworn and examined:—

W. J. Rockett. 10 June, 1902.

1811. *President.*] What is your name? William James Rockett.

1812. Are you a resident of Euston? Yes.

1813. What are you? A general storekeeper, farmer, and grazier.

1814. How long have you been here? Twenty-two years; and I have been connected with pastoral pursuits in the district during the last twenty years.

W. J. Rockett. 10 June, 1902.

1815. Do you think the district has improved? No; it has declined for the past six or seven years, owing principally to the droughts.

1816. Where do you get your goods from? Principally from Victoria; but also from Sydney and South Australia.

1817. Do the goods you get from Victoria come *via* Swan Hill or Echuca? Mostly from Echuca while the river is navigable.

1818. How do you get your goods from South Australia? By steamer, when the river is available.

1819. How from Sydney? Round by Melbourne; thence by rail to Echuca, and by water here.

1820. Do you agree with what the previous witness said in reference to the cost of cartage *versus* river freight? Yes; that is correct, so far as my experience goes.

1821. *Mr. Burchell.*] How do your freights compare with one another from Sydney, Melbourne, and Adelaide? We find Victoria the cheapest.

1822. Where do you get your flour from? Echuca.

1823. Have you ever thought of going in for irrigation here? Yes.

Wool shipped.

1824. Could you give the quantity of wool shipped from here? About 2,200 bales of scoured wool from Euston station—it has been as high as 3,000—and between 300 and 400 from the township.

1825. Where does it go? To Victoria.

1826. Do you expect to have much this year? There will be a big decrease on account of the drought.

1827. Have you ever had the river so low that you could not get the season's wool away to market? Not if they got it in before the end of December.

Michael Joseph Horan, Sub-collector of Customs, at Euston, sworn and examined:—

M. J. Horan. 10 June, 1902.

1828. *President.*] What is your name? Michael Joseph Horan.

1829. What are you? Sub-collector of Customs at Euston.

1830. Have you the details of imports and exports from Euston? Yes.

Imports and exports.

1831. Will you give them to us? The returns do not include goods cleared at Swan Hill, Echuca, or Wentworth; the total value of the imports for the year 1901 was £12,567—that is, from Victoria down river. The total, coming up the river from Adelaide, was £108. The value of exports for 1901 was £43,680—the whole to Victoria. The total value of the wool exported was £29,942—the balance, £13,738, was mostly live stock.

WEDNESDAY, 11 *JUNE*, 1902.

[*The Commission met at the Court-house, Balranald, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Patrick Maxwell Murray, Mayor of Balranald, sworn and examined:—

P. M. Murray. 11 June, 1902.

1832. *President.*] What is your name? Patrick Maxwell Murray.

1833. You are a resident, and Mayor of Balranald? Yes.

1834. How long have you been a resident? For two and a half years.

Pollution of river.

1835. You are here to-night to put forward the views of the Council, as their representative? Yes. At the present time the Murrumbidgee is 9 inches below zero on the gauge, and has been so, more or less, for months past. The river having passed such towns as Gundagai, Wagga, Narandera, and Hay, by the time it reaches Balranald, with its insignificant volume and sluggish current, the water is very seriously polluted. At the present time the town is threatened with an epidemic of typhoid, for which the river water is held to be responsible. The local medical practitioner advises boiling the water before use, and also the milk from cows drinking the water; and in the local hospital he has disallowed the consumption of fish taken from the river. The Council, from the health point of view alone, are desirous of having the river effectively locked, as it is considered that, although the sewage would still be discharged into the river, the volume of water would be such as to render it harmless.

Sewerage.

1836. What are you doing in regard to your own sewerage? We have applied for a grant to enable us to put it on a proper footing.

1837. I suppose you realise that what you complain of in regard to your neighbours above is taking place in respect of Balranald? Yes.

1838. And, as a council, you are anxious to take steps to correct that? Yes.

1839. You know that Hay, which is the largest town immediately above you, is carrying out sewerage works? Yes.

1840. So that the sewerage of that town will be intercepted? Yes.

1841. You also know that Narrandera is carrying out an instalment of a sewerage system? I was not aware of that.

1842. Nevertheless, you think the volume of water is so small that the organic matter is a menace to the health of the people of Balranald? Yes.

1843. And your remedy is to put in locks and weirs so that the volume of water will be increased? Yes, and purify the sewerage.

1844. Do you think that the proper remedy;—do you not think that the remedy is indicated in the questions I have put to you? That scheme is beyond our means for many years to come; it is out of the question in a town of this size.

1845. What about the people below you? They have the Murray water to purify the sewerage. This is the lowest town on the Murrumbidgee.

Locks and weirs.

1846. As representing the town of Balranald, apart altogether from the sanitary question, how does the town regard the question of locks and weirs? We are unanimously in favour of locks and weirs.

1847. For what reason, apart from the sanitary question? One reason is that we will have to pump our water supply from a much easier level. If the river were locked we would have to pump approximately

P. M. Murray. 11 June, 1902.

6 or 8 feet instead of 26 feet as at present. It would also serve our irrigation area, which is at present a dead letter for want of water.

1848. Then apart from trade interests, you think that to raise the level of the water would be an advantage to you, from the point of view of the domestic water supply of the town, and also for irrigating the area that is set apart for that purpose? Yes.

1849. *Mr. Murray.*] Do I understand you to say that the town council intends to propose locking the river as a means of conserving water in the river channel chiefly? Yes; to have the river full of water.

1850. Do you think that would be the cheapest way of conserving water? Possibly the cheapest way would be, as the Chairman has indicated, to deal with the sewerage as is proposed at Hay; but, as I have stated, that is entirely beyond our means.

1851. Do you think the cheapest way would be to conserve water in the river channel;—who is your professional adviser? I am not answering from a professional standpoint. What I have stated is merely our own idea.

Reservoirs.

1852. Does not the construction of reservoirs seem more natural? A reservoir would not be possible in this district. I do not think there are any reservoir sites in the district.

1853. You have had no professional advice at all? No.

1854. Have you had any advice as to the question of sewage disposal? No.

1855. Does the council propose to construct the locks itself? No.

1856. Would it cost more to provide for the needs of the town by putting locks in the river or by disposing of the sewerage by some modern system? Possibly the disposal of the sewage would cost less. That would fall on us. The locking of the river, we hope, will fall on the Government.

1857. According to the methods adopted of recent years, towns like Balranald, are sewered at something like £1 per house, and a continuous cost of some 5s. or 6s. per head per annum;—a single weir would surely cost far more than that. As a town we must look beyond that; we must look to the benefit accruing to the adjacent country.

1858. What benefit? The increased prosperity of the district.

1859. In what way? By increased supply of water.

1860. Where have you seen a system of locking adopted for the purpose of conservation? So far I have seen none.

N. vigation.

1861. Locking the river for navigation is inconsistent with locking the river so as to allow the water to be used? We do not consider the two purposes inconsistent.

Irrigation.

1862. If you pump the water out of the locked reaches for irrigation, how is navigation to be effected? We do not intend to pump the water out of the locks. If this river is locked we consider that an enormous number of acres can be irrigated by gravitation.

1863. Is the flowing volume sufficient to irrigate a large area? In any ordinary season.

1864. Has the flow been taken in summer time? I believe it has.

Walter Alexander Macpherson, manager of Paika Station, on the Murrumbidgee River, New South Wales, sworn, and examined:—

W. A. Macpherson. 11 June, 1902.

1865. *President.*] What is your name? Walter Alexander Macpherson.

1866. You are manager of Paika station? Yes.

1867. On what river is it situated? The Murrumbidgee.

1868. How far above Balranald? We run right down to Balranald.

Area.

1869. What is the area? 350,000 acres.

Stock.

1870. What stock? Sheep and cattle, between 40,000 and 50,000.

1871. You are fairly well acquainted, not only with the country included in your own station, but also with the country surrounding it? Yes.

1872. Have you been there long? All my life—about thirty years.

Rainfall.

1873. You have prepared a statement, have you not? Yes. The greatest disadvantage to contend with in carrying on a pastoral occupation is the very small rainfall, the average for the last twenty years being only 12 inches. As a set-off against the small rainfall, however, the system of rivers flowing through the country has proved a great standby to the districts through which they flow. The whole of the country embraced in the river system has a very small grade—about 4 inches to the mile—and the channels of the rivers not being large enough to carry away the flood-waters from the hills in rainy seasons, the rivers overflow their banks and naturally irrigate a large area of land on each side. The water, containing a large amount of sediment, not only enriches the land by the deposit it leaves, but has gradually built up the banks on each side to such an extent that the river, with the exception of a few isolated ridges and sandhills, is the highest part of the country for miles out on either side, thereby simplifying any scheme of artificial irrigation that might be proposed. I have taken advantage of this feature, and have run the water out 35 miles by pumping; in times of flood the water traverses the whole of this distance by gravitation. In the district embracing the country from the junction of the Lachlan with the Murrumbidgee to the junction of the Murrumbidgee with the Murray, an area of 323,420 acres, is naturally irrigated when the river is 17 feet at Balranald. This irrigated land will carry a sheep to the acre. And, further, an area of over 1,500,000 acres is benefited by a water frontage to many creeks, lakes, and lagoons, which are filled in flood-times. With the exception of a few reserves, the whole of the flooded lands embraced in the Balranald district have been purchased from the Crown at an average upset price of 25s. per acre, such price being about twice the value of the land back from the river, not irrigated, the purchasers recognising the enhanced value placed on the frontage lands by their natural irrigation.

Natural irrigation. Carrying capacity. River frontages.

Water conservation.

I wish to protest against any isolated scheme of diverting water from the Murrumbidgee that may be in operation at the present time or which may be proposed in the future, until some broad scheme of water-conservation, embracing the locking of all the rivers, is carried out. In my opinion, the Federal Government is the only authority which can satisfactorily execute such a scheme. In spite of the protest of all the people residing on the Lower Murrumbidgee, a cutting, with a floor width of 16 feet, and on a level with the bed of the Murrumbidgee, has been constructed by the Government at Yanko Creek, down which is diverted a large quantity of the water of the Murrumbidgee, thereby reducing the volume of the floods when they reach the Balranald district, and proportionately the area of country irrigated.

Yanko Creek.

Floods.

On an average, every second year is a flood year in the Murrumbidgee—that is to say, the river overflows its banks to a greater or lesser extent every second year; but there has often been a succession of years when

W. A. Macpherson. 11 June, 1902.

when, although the river channel was full, it did not overflow, and the benefits that would have accrued from irrigation had it done so were lost. To ensure an annual inundation of the low-lying ground, a series of locks should be constructed which would back up the flood-water in times of small flood, and throw it over the low-lying land adjacent to the river. The Interstate Commission, to be appointed under the Federal Constitution, will decide all the railway freights between the different States; and when the preferential rates now in existence shall have been abolished, the probability is that the rates of freight on produce will be more than doubled. This brings home the fact that the natural and cheapest route to the seaboard will be by river to Victor Harbour; but until the whole of the rivers have been locked, and a cutting made from Goolwa to Victor Harbour, that route will remain closed.

Preferential freight. Natural outlet.

1874. You referred to the diversion of the water at the Yanko Creek? Yes.

1875. You told us, also, that you had diverted large quantities of water a distance of some 35 miles by means of pumping, and by gravitation when the river was sufficiently high? Yes.

1876. Do you not think it is just as legitimate for the people on the Yanko to get water from the Murrumbidgee as it is for the Paika station? No.

1877. For what reason? I believe the people on the river at the Yanko have a perfect right to the water; but not the people where the water goes to. They adopt an unnatural means of getting the water—the water is taken right away from the river into a country that does not belong to the river.

1878. Do you not know that the water from the Murrumbidgee has always overflowed into the Yanko? Yes; but only in flood-time.

1879. But does the water find its way to the place you speak of on your station, 35 miles out? Yes.

1880. Without pumping? Yes; my scheme does not interfere with anybody—I submit that their scheme does.

1881. I understand you to say that the effect of locking the Lower Murrumbidgee—I suppose up as far as Hay—would be to raise the level of the water in the river, and with a moderate flood the low-lying land below Maude, running down as far as Balranald, would be effected? Yes.

Effect of locking the Murrumbidgee.

1882. Would you be affected in any other way by the locks and weirs? We would have permanent navigation, which is a great thing.

1883. Where do you send your wool to now? To Melbourne, *via* Echuca.

1884. Supposing the river were locked, where would you send it to then? South Australia would be the cheapest way.

1885. Will you explain why you referred to the cutting between Goolwa and Victor Harbour? Only from what I have read and heard about it.

1886. Do you think that a light railway would meet the case of the pastoralists—supposing they got that and did not get the locks and weirs? I do not think we would ever use the railway. At the time we would want it, the river is always in flood—that is, in the wool season—and I do not think we would put a bale of wool on the railway if it was here.

Light railway.

1887. It would not meet the case? No.

1888. Is there any water in the Ptarpunga or McCommon Lakes at the present time? No; I have dammed the flood-waters out.

1889. And used the bed of the lakes for pastoral purposes? Yes.

1890. Could you tell us what the level of the water is at the Balranald gauge when they do fill? The McCommon Lake would fill with about 17 feet at the Balranald gauge. It would take the 1870 flood to fill the Ptarpunga Lake.

Level at which lakes fill.

1891. It is too high for the purpose of conserving water to be made available when required for navigation? Yes.

1892. Is Ganaway Lake very defined? Yes. It is a shallow lake.

1893. At what level does the water back up there? At 15 feet at the Balranald gauge.

1894. What about Maremley? About the same.

1895. Is it connected with the river direct? There is really no connection. The water floods out over the flats; there is no defined creek into it.

1896. Do you know Lake Taylor? Yes.

1897. That is really a lake that is fed from the Murrumbidgee too? Yes.

1898. At what level would the water flow into that? I should think about 15 feet.

1899. These lakes are all more or less connected with channels? Yes.

1900. *Mr. Burchell.*] You mentioned 323,000 acres of your land being irrigated? Not of my own.

Irrigated area.

1901. What depth of water? It varies a good deal; I should say about 1 foot.

1902. You say you carry one sheep to the acre; what is the value of that sheep;—is it worth 5s.? Not this year.

1903. Would it be as high as 10s. in any year? No.

1904. Do you know that where irrigation is carried on under intense cultivation the land is worth £50 to £100 per acre? No.

1905. That is the case at Renmark? I did not know that. I do not think this land could be worked like that. Unless the water were banked off altogether it could not be controlled.

1906. Does any of the water get back into the river again? It all goes back.

1907. Where? All along the frontage.

1908. *President.*] When you spoke of irrigation you referred to the flooded country not irrigated in the ordinary sense of the term? Yes.

Humphry Davy, homestead lessee, "Glen Dee," near Balranald, New South Wales, sworn, and examined:—

H. Davy. 11 June, 1902.

1909. *President.*] What is your name? Humphry Davy. I hold homestead leases, and reside at "Glen Dee," in this district.

1910. How many acres? About 35,000 acres.

1911. What stock? I could not answer that definitely; nearly half my stock have died during the present season.

1912. How long have you been in the district? Thirty-five years.

1913. You heard the questions I put to the previous witness in regard to the lakes? Yes.

H. Davy. 11 June, 1902.

1914. Do you agree with his answers as regards the levels? I could not reply to that question, as to the levels, because I have not noticed the various heights of the river when the water has been filling those lakes.

1915. Have you prepared a statement? Yes. I am the holder of Crown and freehold land on the Murrumbidgee River, and am well acquainted with the Murray and its tributaries from their sources to the mouth. I regard the question of navigation as of importance, but that of irrigation as being ten times more important. Navigation will be superseded in the not very distant future by a more direct and speedy means of transit; but until this time arrives thousands of people, whose products would amount to millions sterling annually, must depend on water carriage. Improved navigation with an assured regular water supply would increase production about tenfold, and a natural scheme of locking from the mouth upwards would obviate the loss, now going on over the wide extent of country capable of relief, by the natural spreading of flood waters. The official estimate of the area of land directly benefited by the Murrumbidgee overflow in the Maude and Balranald districts, by a fairly high flood, is about 500,000 acres. Beyond that, flooding fills thousands of miles of creeks, billabongs, ana-branches, lakes, and innumerable depressions, penetrating far back. Succeeding droughts have reduced the number of sheep in this State from upwards of 60,000,000 to about 33,000,000, and it is doubtful if 1,000,000 sheep could be found now in the dry western district which formerly carried 7,000,000 or 8,000,000. In a recent report by the Board of Reference in this State, the following words occur: "But it is of opinion that the water diverted in the past and proposed to be diverted in the future has had and will have a deleterious effect upon the low-lying lands below Hay." Diversion through Yanko cutting was begun in 1850, when land-holders spent £10,000 on the off-take to benefit their holdings off the river. In 1885 the State Government agreed to improve the off-take, to divert water at 1 foot above summer level. Again, in 1891, 1893, 1901, and with the present work of 1902 nearing completion, it is believed that the total works will represent an expenditure of between £30,000 and £40,000. The associations, with which I am connected, advocate immediate locking of rivers prior to any diversions other than by pumping or by those having "river rights." In a report, dated 19th December, 1901, it is stated: "The first protest from residents on the river below Narrandera was only made within the last twelve months"; but I have personally engaged in protests, and the defence of river rights, for many years, and am in possession of a letter received from the Public Works Department, Sydney, dated April, 1899, in which it is stated: "The Secretary for Public Works has no intention of constructing or sanctioning the construction of any weir which will interfere with the summer supply of water in the lower part of the Murrumbidgee River."

Navigation and irrigation. Increased production. Murrumbidgee overflow. Drought. Yanko cutting. Locking. Protests.

1916. I gather from what you have said that you consider the surface of the river should be raised by locks and weirs; first of all, for the purpose of giving navigation; and, secondly, for diverting the water down the creeks leading off from the river into the low-lying country? Yes.

1917. The effect of that will be, as I understand you, to flood regularly a large area of country which is flooded occasionally, naturally? Yes.

1918. And, in addition to that, it would fill up the various depressions along these creek courses, and provide water for stock? Yes.

Raising river level.

1919. *Mr. Burchell.*] Have you any stock suffering from the want of feed now? Yes; I have stock dying every day.

Stock dying.

1920. Could you cart any feed for them? No; it is too expensive. With a navigable river, I could have saved my sheep.

Carting expensive.

1921. Which would be your nearest place to cart from? Swan Hill or Hay; it is about an equal distance from either place to my place.

1922. If the river were navigable now, would it be of any advantage to you? Yes.

1923. What do you estimate it would save you this year? As a small holder, it would save me a very large sum; but I could not say definitely.

1924. Do you know of any others that are affected? Yes; everyone is more or less affected.

Road and river carriage.

1925. What does it cost to cart pressed hay from Swan Hill to here? I think about £8 per ton.

1926. What is the freight by water? The ordinary freight would be about £4 10s. from Melbourne to my place.

1927. What is the distance by river? About 400 miles from Echuca, and 156 miles from Echuca to Melbourne. The fodder could, perhaps, be obtained nearer than that.

Thomas Henry Boynton, storekeeper, Balranald, sworn and examined:—

T. H. Boynton. 11 June, 1902.

1928. *President.*] What is your name? Thomas Henry Boynton.

1929. You are a resident storekeeper of Balranald? Yes.

1930. For what period have you been here? Twenty-two years.

1931. You are acquainted with the commercial interests of the district in so far as the navigability of the river is concerned, and also in regard to irrigation, so far as the water of the river will admit of it? Yes.

Floods. Soil soured. Irrigation.

The river could be utilised in flood times for supplying large storages for irrigation purposes. Whilst a flood is always of great benefit, the value of the water during 1891 and 1893 was practically neutralised by the destruction it caused by souring the soil owing to the length of time it remained on the land and its great depth, from 5 to 10 feet. Such flood-waters stored and then controlled would serve not only to render the river navigable at all times, but would enable all the present natural creeks and channels to be supplied with permanent water. The banks of the river being far higher than the land in the interior, irrigation by gravitation could be profitably carried out. If the use of the waters of the rivers were further sanctioned, settlement would be largely assisted.

1932. I gather from your statement that you are of opinion that if the flood waters are controlled it would be of benefit to the flooded country above Balranald? Greatly.

Effect of long flood.

1933. The point I gather from your statement is that, when the flood waters lie on the land for any lengthened period, they sour the land, and the benefit which would be derived as the result of the irrigation of the land is lost? Quite so. Prior to the last flood the land on the opposite bank of the river was covered with a new grass; but owing to the length of time the flood waters remained on the land the whole of the grass was destroyed, and the land is now quite bare again.

1934. Where do you get your supplies from? Melbourne, *via* Swan Hill, at present.

1935. When the river is navigable you get them *via* Echuca? Yes.

Pollution of river.

1936. You consider the sewerage being discharged into the river from the towns above Balranald objectionable? Yes.

T. H. Boynton. 11 June, 1902.

1937. Is it not objectionable for Balranald to do it? Yes, just as objectionable as it is for the towns above us.

1938. Do you not think the town of Balranald ought to take some steps to alter it then? It is not in a position to do so.

1939. *Mr. Burchell.*] Do you consider the river is being affected by the water that is taken out lower down? Yes.

1940. How does it affect you when they are hundreds of miles down the river;—do you think they are taking more than their share? Certainly.

1941. How much? I could not say. There are numerous schemes down there on the banks of the Murray that must take our water. Take Mildura, for instance.

1942. What area are they irrigating at Mildura? I could not say.

1943. How does 8,000 acres compare with the area that is flooded here during the flood season? It is very small in comparison.

1944. Well, that is all they are irrigating? But that water is pumped out of the river when the river is low.

1945. Do you think that is more than their share? It is more than their share in a low river.

Harry Lewis Harben, storekeeper, Balranald, sworn and examined:—

H. L. Harben. 11 June, 1902.

1946. *President.*] What is your name? Harry Lewis Harben.

1947. You are a resident and storekeeper of Balranald? Yes.

1948. For what period have you been here? About fifteen years.

1949. You are, therefore, acquainted with the requirements of the town and district in so far as they are affected by the river? Yes. I have been twenty-two years on the rivers, and consider that the locking of the rivers would greatly benefit those residing in their vicinity who have to depend on water carriage, either to procure their supplies or as a means of getting their produce to market. The nearest railway station to Balranald is Swan Hill, in Victoria, a distance of 60 miles; and in New South Wales, Hay is the nearest railway station, a distance of 120 miles. As a consequence, the town has to depend on the navigation of the river for the purpose of getting supplies, the cost of land carriage being prohibitive. Taking the average for past years, the navigability of the Murray and Murrumbidgee can only be relied on for about six months in each year, and as Balranald is the centre of a large district, extending a distance of 150 miles back, the majority of the people have to depend for their supplies on the local storekeepers. Hence the stores have to lay in very heavy stocks about December in each year to provide for all wants until June. In seasons like the present—and they are not rare—it is an impossibility to look so far ahead, and, if it were possible, there are financial difficulties standing in the way. It always happens that at the time of the year when fodder of all descriptions is required to keep stock alive, the rivers are unnavigable, and the heavy losses of stock which now occur might be obviated if permanent navigation were secured to enable fodder to be delivered at a reasonable cost. The cost of carriage from Swan Hill to Balranald, under ordinary circumstances, is about £3 per ton, but this year it is slightly less. As matters now stand, it costs those situated in the district about three times as much to get supplies from Melbourne, Sydney, or Adelaide as it does to bring them from any part of the United Kingdom to one of the above centres. With the locking of the rivers and permanent navigation secured to the mouth of the Murray or Goolwa, a huge saving in the cost of transit must result to all concerned. In my opinion, not only should the rivers be locked, but a canal should be cut from about Goolwa to Victor Harbour, so that river steamers could take their cargoes alongside ocean-going vesse's. Crops are never ready for shipment until about November or December, and that is the very time when the rivers are closed to navigation. I have seen wheat which, owing to its being just too late for the river whilst navigable, had to be held in store until navigation was open again. If the rivers were locked, and permanent navigation secured to Victor Harbour, it would be of immense benefit to wool-growers, as they could then get their produce to the seaboard at about one-half the rates at present obtaining.

Balranald dependent on navigation. Permanent navigation. Road carriage. Goolwa canal. Wheat detained.

1950. You are very much impressed with the importance of locking the rivers Murray and Murrumbidgee, I suppose, from Hay to Balranald also? Yes.

1951. Have you ever taken into consideration, and put side by side, the advantage that would accrue, and the cost? I have never gone into figures over the matter.

1952. Supposing it is found, from the very nature of the work, that the locking costs an enormous sum—and, necessarily, it would have to be paid for directly or indirectly—do you not think it would make the freight, owing to the heavy tolls that would have to be paid for the use of the locks, almost prohibitive? No.

Freight.

1953. You think, then, that in addition to the navigation that would be secured, there are other benefits to be derived? Yes.

1954. And those have to be taken into consideration? Yes; in connection with navigation.

1955. *Mr. Murray.*] Have you any estimates of the cost of those works? No.

1956. But you think it would be an advantage to enable the river boats to go out to Victor Harbour and deliver their cargo alongside the ships? Yes; it would save the cost of transhipment and land carriage.

1957. Have you had any experience as a seaman? No.

1958. Do you know whether Victor Harbour would be a fit place to take river steamers to for the purpose of discharging cargo? From my experience, it would.

Victor Harbour.

1959. You know it sufficiently to say that it would be practicable to take river boats alongside there? Yes.

1960. You have never seen storms that those boats could not weather? I am not going to say that.

1961. You think it would be practicable? Yes. There is a good breakwater there.

S. Lindsay. 11 June, 1902.

1962. The following statutory declaration was received from Mr. Samuel Lindsay, of Yanga Station, Balranald, New South Wales, who was unable to attend personally and give evidence whilst the Commission was at Balranald:—

I, Samuel Lindsay, of Yanga Station, Balranald, in the State of New South Wales, do hereby solemnly declare and affirm that I am the manager of Yanga Station and have known the district in that capacity for seven years, and I am acquainted with the requirements of the district in the way of water conservation.

Yanga is situated on the Murrumbidgee River, having a frontage of about 40 miles on that river, and in a district with a very low and uncertain rainfall, subject to extreme droughts. Our

S. Lindsay. 11 June, 1902.

Our mainstay in resisting the effects of the dry time is that the run is naturally inundated more or less every year, and, for that reason, land has been purchased at a very high value.

We now find that, notwithstanding our protest, the Murrumbidgee is being tapped by the Yanko cutting, thus depriving us of the volume of water hitherto received.

I wish to point out that the higher the water in the river is the larger area of land inundated.

To compensate us for this loss we request that locks be placed in suitable parts of the Murrumbidgee River, beginning at its junction with the Murray and continuing up river towards Hay, the locks to be of such a nature that the height of the river can be raised in such a manner so as to afford irrigation by gravitation, and the permanent navigation into the Murray, thence towards Port Victor; our flood map will show the extent of country inundated by the 1894 flood, producing a great growth of herbage and grass.

It is needless to point out the benefits received by such inundation if that could be effected every season.

And I make this solemn declaration as to the matter aforesaid according to the law in this behalf made, and subject to the punishment by law provided for any wilfully false statement in any such declaration.

(Signed) SAMUEL LINDSAY.

Taken and declared at Balranald, in said State, this twelfth day of June, 1902, before me,—

P. M. MURRAY, J.P.

WEDNESDAY, JUNE 18, 1902.

[*The Commission met at Talmalmo Station, New South Wales, at* 1 *p.m.*]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).

STUART MURRAY, ESQ. | FREDERICK N. BURCHELL, ESQ.

Robert Smithwick, grazier, Talmalmo Station, sworn and examined:—

R. Smithwick. 18 June, 1902.

1963. *President.*] What is your name? Robert Smithwick.

1964. You are owner of Talmalmo Station? Yes.

1965. How many acres have you? Between 4,000 and 5,000 acres of freehold land, and 300 to 400 acres of leasehold.

Stock.

1966. Have you much stock on the land? About 4,500 sheep and 200 head of cattle.

1967. You have been acquainted with the River Murray for a number of years? Yes; I have been here since 1858.

1968. You know the land above and below Jingellic? Yes.

1969. And you have a general idea as to the land values? Yes.

Land values.

1970. Tell us a fair value—not for any particular land—but of the land on the flats;—give us the value of the land without regard to the improvements or severance, taking the good land with the bad? The flat country is very good, and I do not believe you could expect to get it under £5 per acre. That would certainly be within the mark from what I know of it. There is a paddock 6 or 7 miles up the river from here which sold at Albury the other day at £7 per acre.

1971. And the hill country? That is not worth so much, of course. It is not worth more than about 30s. per acre unimproved, perhaps; but it cost us £2 per acre in improvements by deferred payments. All the land which has been selected has had money expended on it, and you could not expect to get it for less than it cost.

1972. *Mr. Burchell.*] What proportion of your 5,000 acres is flat, and what hill? I am not valuing my own land, but am speaking generally of the whole of the country you allude to; but I suppose there is about 500 acres of hill in my land.

1973. How many sheep will the hill country carry? I could not say, because every block contains part of the hill land and part of the flat.

1974. But you carry the stock you have named on the whole lot? Yes; I have them on it all through the dry seasons.

FRIDAY, 27 *JUNE*, 1902.

[*The Commission met at the Shire Hall, Rushworth, Victoria.*]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).

STUART MURRAY, ESQ. | FREDERICK N. BURCHELL, ESQ.

George Garson, Engineer of the Echuca and Waranga Waterworks Trust, and the Shire of Waranga, sworn and examined:—

G. Garson. 27 June, 1902.

1975. *President.*] What is your full name? George Garson.

1976. You are Engineer of the Echuca and Waranga Trust, and the shire of Waranga, and are at present acting for Mr. Stuart Murray as Engineer-in-Chief of the Water Supply Department, are you not? Yes.

1977. How long have you been connected with the works in this district? Nine years.

1978. From their inception? No; the Trust was constituted in 1882.

Trust area.

1979. What is the area of the Trust? About 300,000 acres.

Expenditure.

1980. What has been the expenditure on the works? In round numbers, £70,000; but this amount was written down to £35,000 by the Amending Act of 1900.

Works.

1981. What do the works comprise? Channels for the distribution of the water, consisting generally of a contour channel along the southern boundary of the district and distributary channels having, generally, a northerly direction.

1982. What is the length of the channels? About 230 miles.

Channels.

1983. Do you get your water through the Rodney Irrigation Trust channels? Yes.

Annual supply.

1984. What is the estimated quantity you use per annum? About 3,500 cubic feet per minute for from seven to nine months in the year.

Irrigated area.

1985. What area do you irrigate? The net area irrigated last year was 7,200 acres.

G. Garson. 27 June, 1902.

1983. How is that divided? Cereals, 1,260 acres; lucerne, 2,480 acres; maize and sorghum, 70 acres; orchards and gardens, 90 acres; grass, 3,300 acres; total, 7,200, or, including successive waterings, 10,200 acres.

1987. That is about one and a-half waterings per year for the 7,200 acres? Yes.

1988. What quantity of water do you put on per acre? About 6 inches at one watering.

Depth of watering.

1989. May we assume that the 3,500 cubic feet per minute for eight months per year is only sufficient to water the 7,200 acres 9 inches deep? No; the whole district is supplied for stock and domestic purposes. The 230 miles of channels must be kept running, which, of course, means a large amount of water, besides what is available for irrigation purposes.

Stock and domestic supply. Losses.

1990. Could you give the percentage consumed by cattle? I estimate that one-half of that water is necessary for stock and domestic supplies.

1991. What proportion do you estimate is lost by evaporation and seepage? I could not say certainly; but do not think more than 25 per cent.

1992. How do you arrive at the quantity, 3,500 cubic feet per minute, delivered to your Trust? I know the delivery from each of the channels—we receive from Rodney by measurement—we have gauges in the channels.

1993. So far as those figures are concerned, you are absolutely certain of their accuracy? Yes.

1994. Have you a plan of the district, which you intend to put in? Yes [*Exhibit* 65].

Proposed extension.

1995. Is there any idea of extending the irrigation area? Yes; a proposal has been made recently for forming an Irrigation Trust and the expenditure of about £40,000 on new channels, with the expectation of getting an allotment of 10,000 cubic feet per minute from the Waranga reservoir, if it should be constructed.

1996. What area will that have the effect of bringing under irrigation? I estimate the supply would be capable of irrigating 30,000 acres, two waterings.

Revenue—how raised.

1997. How is the revenue of the Trust raised? By a general rate on the shire valuation, and by sales of water.

Rates.

1998. What are the general rates? Differential, from 1s. 3d. to 4½d. in the £; the actual figures being 1s. 3d., 1s., 9d., and 4½d.

1999. What is the total revenue produced by those rates? £2,600 on a ratable valuation of £45,000.

2000. What is the amount produced by sales of water? About £700 last year.

2001. The total revenue for last year then amounted to £3,300? Yes.

Water charges.

2002. What other charges for water do you make? For filling tanks, 6d. per 1,000 cubic feet, with a minimum charge of 5s.; for growing cereals, sorghum and for gardens and orchards, 2s. per acre; for lucerne and grass, 1s. per acre.

2003. Those charges are in addition to the general rate referred to? Yes; all water delivered is charged for at those rates.

2004. Does the revenue received, viz, £3,300, pay for interest and maintenance on £35,000, the present liability of the Trust? Yes.

Increased supply required.

2005. Do you wish to say anything further with regard to the deviation works of the Trust? I consider it absolutely necessary that, if possible, an increased supply should be given. The use of water is becoming greater every year. I look upon 10,000 cubic feet per minute as the minimum supply which will effectually serve the district, and from my knowledge of the district, I am confident that the increased liability necessary to carry out the required works would be readily accepted.

2006. *Mr. Murray.*] You say that 10,000 cubic feet per minute would be deemed a satisfactory amount by the Trust? Yes.

2007. Have you seen the report of the Railway Standing Committee, on the Mallee Water Supply, including the extension of the Goulburn main channel? Yes.

2008. Have you observed the volume they proposed to assign to the proposed Trust? Yes; 4,500 cubic feet, with another 4,500 feet for a small additional cost.

Losses.

2009. On working out the figures you gave of the water supplied, I find it gives a total of 1,209,000,000 cubic feet per annum; half that would be about 604,000,000; taking the 1-inch acre at its ordinary valuation of 4,000 cubic feet, the quantity of water used in irrigation is 245,000,000 of cubic feet; so that we have 245,000,000 cubic feet actually applied to the land, as against 604,000,000 received for and devoted to the purposes of irrigation;—how do you account for the discrepancy? When I said 6 inches to the acre, I meant 6 inches used in effective irrigation on land suitable for the purpose, *i.e.*, agricultural land; but at certain times of the year the water is delivered into swamps, which take 12 inches—that is, at times when the demand for agricultural lands is insufficient to absorb the supply.

2010. Do I understand that the water delivered at such times is delivered on land neither graded nor prepared? It is delivered into swamps, but could be used to more advantage on agricultural lands.

2011. At the same period? No; it is when there is no demand for it otherwise (say) at harvest time or after rain.

Extension—how possible.

2012. You consider it possible to extend your irrigation area? Yes.

2013. By means of economising the water? If it could be applied to agricultural lands, or lands which would not use more than a reasonable quantity of water, the area could be extended. There is also some water which runs to waste during the eight months' period; if that were all applied it would be capable of irrigating (say) 50 per cent. more ground. I think 15,000 acres could be irrigated from the present supply.

2014. Would any of the waste be avoided by improving the condition of the channels? The channels are in fairly good condition. The Trust has done a great deal lately to bring them into fair working order, and, though there is some waste, it is not excessive.

2015. What works have been carried out in order to avoid waste by soakage? Proper banks have been constructed.

2016. Are they lined? No; we rely on the soil of the country to hold water.

Soil water-tight.

2017. Is there any material in the district suitable for lining? It is not necessary; most of the soil is very water-tight, if the water is kept running through it.

Soakage and evaporation.

2018. What do you estimate the actual waste by soakage alone to be? A rough estimate is 25 per cent. by soakage and evaporation. I could not say how much by soakage alone.

2019. Would 20 per cent. for loss by soakage be a reasonable amount? I could not give any figures. If you have wide channels, you will have much more waste than if you have the water a fair depth.

G. Garson. 27 June, 1902.

2020. What is your system of taking orders for the delivery of water? We take orders day by day.
2021. Do you think any advantage would be derived from the adoption of orders for the year or season? No; it would not suit the convenience of the people. They will not give orders more than two weeks ahead.

Economical use of water.

2022. Having regard to the fact that the time is at hand when water must either be used to more advantage, or applied elsewhere, could nothing be done to improve the system of taking orders for delivery of water? The demand at any time depends so much upon the weather that if orders were given, applicants would back out of them if they did not want the water at the time ordered. I do not think it would be possible to get orders placed more than a month ahead.
2023. How do they manage in other countries? Irrigation is more systematised than here.
2024. The weather is a very uncertain quantity? Yes.
2025. Is that an advantage or otherwise to the agriculturists? It would be better if rain came at definite times; but as it does not do so, it is impossible to arrange at the beginning of a season for the quantity of water required.
2026. You mean that irrigation is merely a complement to a deficient rainfall? Yes; at certain times, but not entirely.

Irrigation season.

2027. When do you use the bulk of your water? In dry springs and in dry autumns we use large quantities; in wet springs and autumns we use practically none. During the months of December, January, February, and March the demand is fairly even, but it increases towards the end of March if the weather continues dry.

Improvement of channels and banks.

2028. Am I right in assuming that nothing could be gained by improving the condition of the channels, or by systematising the delivery of the water? No; the channels and banks should be brought into the most effective state possible. In this district they are in fairly good order, and they are being improved as required.
2029. What further improvements would you make? The banks might be improved where they are weak at present.
2030. You mean raising the banks to prevent overflow of the water? Yes; and in some places they are leaking.
2031. What would you do for that? Put stronger banks.

Maintenance.

2032. That is little more than a question of maintenance? In some cases maintenance means making banks. If that meaning is taken, then it is maintenance.
2033. That would involve an increased annual outlay? The revenue is increasing, and would overtake the expenditure.
2034. What proportion of the loss would be saved in that way? I could scarcely give the percentage.
2035. I suggested 20 per cent. before;—would that be a fair estimate? It would not exceed that amount.
2036. Even that is very much short of the difference between 604,000,000 and 245,000,000? Yes; but I stated that, in my opinion, if the water were effectively used, an area of 15,000 acres could be irrigated, instead of 10,000 acres, which means that the loss would be reduced by half.

Systematising delivery.

2037. I suggested systematising the delivery in order to avoid loss, but you say that would be impossible;—could you suggest any means by which it could be overcome? If the water were delivered at an off-take to the Trust, the supply could be reduced at times when it is not required.
2038. How would that effect a saving? It would save the water running through the channels. When it was not being used it would not be supplied.
2039. How would you avoid loss by evaporation? It could not be done.
2040. If a system of works were constructed to deliver 10,000 cubic feet per minute, and the Trust said, "We will not take the water," so that it is left in the basin, the water would be wasted as much as if they took it but did not apply it to the land? Yes.

Effective use of water.

2041. Supposing the Trust contracts with the Board of Works to receive a certain quantity of water, which amount is received, how is that water to be used effectively? The only way I know is to use it on crops which require water during the hot months of summer, *i.e.*, November, December, January, February, and March.

Crops.

2042. What crops would they be? Principally lucerne—fodder crops and fruit. If you rely upon cereals and grass for revenue, you may have a large revenue one year, and nothing the next; it depends so much upon the season whether water is wanted or not.
2043. You can make no other suggestion than that the water should be utilised in the summer months? I do not think so.
2044. That would account for only three or four months? You could count, on the average, on having a dry spring or a dry autumn, and could, therefore, extend the time to, say, six months.
2045. Suppose you utilised the whole supply during that time, when the consumption was reduced the water would simply be wasted? Yes.
2046. It would really matter little whether the waste was in the Trust channels or in the reservoir? I do not think you could avoid the loss by evaporation in any way.
2047. It would avoid a debit to the Trust? Yes. When I speak of 10,000 cubic feet of water, it is a strictly limited quantity, and, in my opinion, will have to be used to the greatest advantage on crops which cannot be grown without water.
2048. How do you propose to use it to the best advantage? By distributing it in the channels when required, and by having a sufficient area under irrigation, and growing those crops which come on in the hot part of the year.
2049. *Mr. Burchell.*] Is the whole 300,000 acres of the Trust rated? Yes.
2050. How are the various rates decided? The greater portion is rated at 1s. 3d.
2051. Why is that so? Because the channels are within easy reach for stock and domestic purposes.
2052. What distance from the channels is the land which is rated at 1s.? Anything over a mile is 1s.; over 2 miles 9d., and the 4½d. rate is for small portions which are cut off from direct participation in any way.

Amount written off.

2053. Why was the £35,000 written off? It was done by Act of Parliament.
2054. Were they asked to do so by the Trust? The water districts generally throughout Victoria were supposed to require assistance.

2055.

G. Garson. 27 June, 1902.

2055. What interest were you paying on the £73,000? Six per cent.—4½ interest, and 1½ towards a sinking fund.
2056. What interest are you now paying on the £35,000? Four per cent. interest, and ½ per cent. to sinking fund.
2057. You mentioned an extension of the works in connection with the Waranga reservoir;—do you think you could pay the increased interest on the larger works? Yes; the district would be willing to pay it.

Rainfall.

2058. What is the rainfall over the Trust area? In wet seasons 20 to 21 inches, but for the past five years the rainfall was only 14 or 15 inches.
2059. *Is that sufficient for cereal crops without irrigation?* Yes; *if the rain falls at the proper seasons,* but it was not sufficient last year.

Thomas Crothers, Chairman of the Echuca and Waranga Waterworks Trust, Rushworth, sworn and examined:—

T. Crothers. 27 June, 1902.

2060. *President.*] What is your full name? Thomas Crothers.
2061. How long have you occupied your present position? About six months.
2062. Were you connected with the Trust previously? Yes.

Irrigation. Crops benefited.

2063. Are you a believer in irrigation? Yes.
2064. Do you think it benefits the land to an appreciable extent? Yes.
2065. Have you formed any opinion as to what extent? It is of great value in the summer to grass, lucerne, amber cane, and so on.
2066. Could you give us the monetary value? I have not gone into it, but 20 acres of lucerne, if water can be got when wanted, is worth 100 acres of natural grass.
2067. Do you use a great deal of water for stock and domestic purposes? Yes.
2068. Only a small portion of your Trust is irrigated, is it not? Yes.

Land value improved.

2069. Do you think the fact of land having attached to it a permanent water supply, even though the land be not irrigated, increases its value to an appreciable extent? Yes.
2070. Could you say to what extent? Say, from £1 to £1 5s.
2071. I understand that your Trust is desirous of extending the irrigation area? Yes.
2072. You heard the evidence given by your engineer in that respect—do you agree with it? Yes.

Lewis Burge, President of the Shire of Waranga, sworn and examined:—

L. Burge. 27 June, 1902.

2073. *President.*] What is your full name? Lewis Burge.
2074. You are President of the shire of Waranga? Yes.
2075. As such you are acquainted with the locality, and with the land values? Yes.
2076. Were you acquainted with the Waranga district before the water was obtained? Yes.

Land values.

2077. Will you tell us what you consider the relative values of land before and since the water has been available for cattle and domestic purposes only? Land has gone up from £2 to £3 per acre on an average.
2078. Are you acquainted with any instances where the land has changed hands since the water has been available in the district? Yes.
2079. What, in your opinion, has been the difference in the amount the land sold for as compared with what it would have fetched had there been no water? From £2 to £3 per acre.
2080. What would the land be worth without water? Say £4.
2081. And with water? £6 to £8.

William Gunn, landowner, of near Rushworth, sworn and examined:—

W. Gunn. 27 June, 1902

2082. *President.*] What is your full name? William Gunn.
2083. Are you a resident of Rushworth? I reside 4 miles from Rushworth.
2084. Are you an owner of land? Yes.
2085. You are a Commissioner of the United Echuca and Waranga Water Trust, chairman of the Urban Trust, and councillor of the shire? Yes.
2086. You heard the evidence given by the shire engineer? Yes.
2087. Do you agree generally with what he said? Yes.
2088. Do you wish to amplify it? I wish to emphasise it.

Supply.

2089. Do you consider the 10,000 cubic feet per minute which he mentioned would be sufficient? It should be the minimum supply.

Losses.

2090. Do you agree with what he said as to the considerable losses of water? Yes; there is a great deal lost by evaporation, leakage, and by water running to waste through not being used.
2091. Can you suggest any remedy? No; but the consumption is increasing, and has been doing so for some years past. People are getting educated to the benefits of irrigation.

Irrigation increasing.

2092. Can you give any proof of the tendency to irrigate more now than in times past? The only proof is that the sales of water have increased.
2093. To what extent? £200 or £300 last year.
2094. Would that not be accounted for by the fact that it was a dry season? That would be a factor, no doubt.

Independent supply required.

2095. Is there anything else you wish to add? It would be a very great advantage to have an independent supply instead of getting our water through the Rodney channels.
2096. In what way would it be an advantage? We could have greater control of it. Our supply is very much reduced at times. The Rodney people have to be considered first. That is one reason why I think it would be a great advantage to have an independent supply, and it could only be got by the construction of the Waranga basin.
2097. You do not pay anything towards the national works? No; they are for the good of the country.

Thomas

Thomas Harriman, landowner, Waranga, sworn and examined:—

T. Harriman, 27 June, 1902.

2098. *President.*] What is your full name? Thomas Harriman.
2099. You wish to give evidence in regard to the Waranga basin? That is one thing.
2100. Do you regard that work as a necessity in connection with the extension of the large channel towards the mallee country? No; I do not think that the basin is necessary or that it would be a success.
2101. Why? Because it is a large area, and would have a very shallow depth of water. The evaporation would, therefore, be very great, and it would be an enormously expensive scheme; further, it will take so many years to build that it will keep the mallee people waiting too long for the water.

Murray scheme.

2102. What do you propose as a substitute? The Murray scheme would be the best.
2103. You propose that the water should be brought from Bungowannah? Yes; or that the Goulburn should be blocked at a place called Molesworth.

Storage at Molesworth.

2104. You think that, instead of an impounding reservoir being constructed at Waranga, one should be made at Molesworth, on the Goulburn? Yes.
2105. What do you say as to the water from the Murray being required on the west side of the Goulburn? If the Upper Goulburn scheme, near Molesworth, is carried out, the Murray water would not be required on the west side of the Goulburn.

Talmalmo Reservoir.

2106. But if it is not adopted? Then I think there is a sufficient basin at Talmalmo, which, I think, would be very much better than to spend upwards of £1,000,000 in making the Waranga reservoir.
2107. One of your reasons for objecting to the reservoir being constructed at Waranga is the value of the land at that place? Yes; I understand that something like 14,000 acres of land will be covered with water, some of which is the most valuable land in Victoria.
2108. At what do you estimate the value of the land? Five pounds per acre. Some of it is now let at upwards of £2 per acre per annum.
2109. Have you any particular interest in giving us this evidence? I have no axe to grind; but I think it would be a pity to spend so large a sum of money, and have such a long delay, when the people in the mallee are now wanting the water. I was one of the first irrigationists in the Goulburn Valley, and believe thoroughly in it.
2110. What has irrigation done for you in the way of increased values? At the present time I am only irrigating about two acres of land.

Value of irrigation.

2111. What do you irrigate? Fruit and vegetables; but formerly I irrigated lucerne, and I know that you can grow crops with the water which you could not attempt without. In speaking of the value of water, I might say that one person at Girgarre took £205 in one year from seventeen cows fed on irrigated lucerne.
2112. *Mr. Murray.*] What are you? An orchardist.
2113. Have you had any experience as an engineer? No.
2114. Have you been reading up the subject of storage from the Goulburn? Yes. I am interested in the water supply.

Cost of Waranga Reservoir.

2115. You spoke of the cost of the Waranga reservoir as being over £1,000,000? I go by the papers, and think that sum was named in the report of the Railway Standing Committee.
2116. I will read from that report:—"The total cost of the modified Goulburn-Mallee scheme, inclusive of £85,000 for the main distributary channels in the eastern Mallee was, therefore, £723,724, or £665,338 less than the works previously estimated by Mr. McGregor";—supposing you accepted that estimate as correct, would it modify your opinion as to the advisability of the works? I concluded that the whole scheme would cost about £1,000,000.
2117. The second estimate by the Railway Standing Committee is £700,000? But the actual cost of works always tops the estimate.
2118. Supposing you take £280,000 as a reliable estimate, would it modify your view? No; because I believe water could be taken to the Mallee more quickly and more cheaply.
2119. Speaking about this district, would not the Waranga basin serve it? No; you cannot use the basin for Rodney.
2120. Supposing the Waranga basin liberates the balance of the water in the river, is not that tantamount to giving it to Rodney? It would not relieve the draw on the reservoir.
2121. Would it not relieve the river to the extent of the water in the basin? No.
2122. Where is Molesworth? It is up the Goulburn, on the Yea railway line.
2123. On what branch of the Goulburn is it situated? I cannot say.

Capacity of Molesworth Reservoir.

2124. How much of the drainage area of the Goulburn does it include? I have been told thousands of acres, surrounded by hills, with the exception of where the Goulburn River comes out. Several persons have told me this, and they say that 3 chains of weir would block the water to a depth of 100 feet.
2125. Do you know the site on the Upper Murray to which you referred? No.
2126. You said it would be of more value than Waranga? If there is a sufficiently large basin on the Upper Murray to provide water to the people below it, I do not see any necessity for using the Waranga site.
2127. You say "sufficiently large";—would not the question of getting it filled have to be considered also? I do not think there would be any question about it.
2128. Which delivers more water, the Goulburn at the weir, or the Murray at Albury? I should think the Murray.
2129. How much does the Goulburn deliver in a year? That is an engineering question.
2130. Your information is only of a general kind, and derived from reading? Yes.

Arthur Edgar Castles, Secretary and Engineer to the Campaspe Waterworks Trust, Rochester, sworn and examined:—

A. E. Castles. 27 June, 1902.

2131. *President.*] What is your full name? Arthur Edgar Castles.
2132. You are secretary and engineer to the Campaspe Waterworks Trust, and at present acting as engineer to the Echuca and Waranga Trust, and the Waranga shire? Yes.
2133. When was the Campaspe Trust constituted? In 1889.

Area.

2134. What is the area of the trust? 44,447 acres.

Situation.

2135. Where is it situated? On the east and west banks of the Campaspe River, in the neighbourhood of Rochester.

A. E. Castles. 27 June, 1902.

2136. Have you a plan of the district to put in? Yes. [*Exhibit* 66.]

Works.

2137. What do the works comprise? A timber weir across the Campaspe, about 5 miles south of Rochester, with eastern and western regulators and off-takes, eastern and western main channels, of a total length of 25 miles 17 chains; No. 1 and No. 2 eastern branch channels, total length 8 miles 12 chains, with bridges, drops, checks, sluices, &c., and other minor works.

Expenditure.

2138. What has been the total amount borrowed and expended on those works? £62,000; but £52,685 of that amount has been written off, leaving a balance of £9,315.

Municipal valuation.

2139. What is the annual municipal valuation of the property in the area? £7,306.

Rates.

2140. What are the rates? 2s. 6d. in the £1, which brings in £913 5s.

Water charges.

2141. What are the charges over and above the rates? 1s. per watering of nominally 2 inches on 1 acre of crop and fallow land; grass land, 6d. per watering of nominally 2 inches per acre; dams, 500 cubic yards and under, £1 and 10s., according to the season of the year when they are filled.
2142. What revenue did you derive from sales of water last year? About £115. The total revenue received from sales of water for the past nine years equalled £400, or an average of £45 per year.
2143. Is the revenue from sales of water increasing? Yes; last year was the best year.

Area irrigated.

2144. Did you irrigate much land last year? About 1,000 acres of cereals and grass land, and ninety-two dams were filled.

Quantity of water allowed Trust.

2145. What is the quantity of water you are allowed to take from the Campaspe River? 4,500 cubic feet per minute from July to November, and 750 cubic feet per minute from December to June.
2146. Do you take the full amount you are allowed? No record has been taken of the actual quantity diverted; but, in my opinion, it would not nearly reach the quantity allowed.

Compensation water.

2147. Do you take the whole volume which comes down the Campaspe above the weir? No; a certain quantity is allowed to pass as compensation water, and the Campaspe is irregular in its flow, it is not running for several months in the year.
2148. Do you find any inconvenience on this account? Yes; comparatively little irrigation can be practised in consequence.

Supply not assured.

2149. What is the effect on the land in the Trust? Land-owners will not prepare their land for irrigation, because the supply of water is not assured, and this accounts to a great extent for the lowness of the sales of water.

Interest.

2150. Does the total revenue received—which you give as £913 5s. from rates, and £115 from sales of water, a total of £1,028 5s.—pay interest on the present liability of the Trust and for maintenance? If we started with the works in fair condition it would do so; but under existing circumstances it does not.
2151. *Mr. Burchell.*] Do you charge the 2s. 6d. rate over the whole area of the Trust? Yes.
2152. And that rate over 4,447 acres, only produces £913 5s. per annum? Yes.
2153. What is the average value of the land in the area? The municipal valuation, I consider very low. In my opinion the average value of the land is from £7 to £8 per acre.
2154. What was the £62,000 you mentioned spent on? Compensation, the weir, channels, and structures.
2155. What is the average rainfall in the district? I should say 20 inches.

John Walter Mason, M.L.A., sworn and examined:—

J. W. Mason, M.L.A. 27 June, 1902.

2156. *President.*] What is your full name? John Walter Mason.
2157. You are a farmer, resident in the district? Yes.
2158. And representative of the district in the State Parliament? One of the representatives.
2159. Have you been resident in the district a long time? Forty years.

Land values.

2160. Could you give any opinion as to the relative values of lands before and since the Trust was constituted? There has been a general rise in values independent of the water; but no doubt the land commanded by the channels is the most valuable. I would give £1 per acre more for land commanded by the water-channels than for land not so situated.
2161. Do you mean water for irrigation, or stock? Both combined.

Demand for water.

2162. Do you advocate an extension of the area? Yes; I advocate a larger and more regular supply. One of the great faults at present is that you cannot depend on the time when you can get the water, owing to the big demand there is for it.
2163. Do you think that if there were a large storage, such as that suggested at Waranga, it would meet the difficulty? I have no doubt of it.

Value of water supply.

2164. Is there anything else you would like to add? From practical experience for the past eight years, I can say that the water has been of immense benefit for stock and domestic purposes; without it, there would have been an exodus of farmers from the district. It is impossible to calculate the benefit the channels have been, apart from irrigation altogether.
2165. Do you think it would be a wise policy to extend the irrigable area? Yes.
2166. *Mr. Murray.*] I understood you to say that the inability to get water when it is required, is a serious drawback? Yes.
2167. Did I understand you to say the inability referred to was owing to so many people requiring it at one time? Yes.

Enlargement of channels.

2168. Does it not appear to you that the prime essential to obtaining a supply to meet the case would be the enlargement of the channels? The enlargement of the channels would not be sufficient without additional storage.
2169. To what extent would the channels require to be enlarged to enable everyone to obtain a supply of water at the moment they wanted it? We should not all want it at the same time, if we knew there was a certainty of getting it. We cannot depend on getting it at all now.
2170. Then your complaint really is that you are dependent on Rodney for your supply? Yes, our supply is not assured; if it were, we could arrange all right.

System-atising delivery.

2171. You heard what I asked Mr. Garson about arranging beforehand for a supply of water;—do you think that would be practicable? I have had no experience, but do not think it would. I would have no objection, however, to giving it a trial, if we had an assured independent supply.

J. W. Mason, M.L.A. 27 June, 1902.

2172. *Mr. Burchell.*] I understood you to say you had been in the district forty years;—was any farming carried on at the time you came here? Yes.
2173. How did you get on for a supply for domestic and stock purposes? The farms were on the banks of the river mainly. I have, however, seen water carried from the Goulburn to Rushworth. There is no natural water, apart from dams.
2174. *President.*] Is there anything further you wish to add? Only to emphasise the great benefit the water has been to our people during the past dry years.

George Garson recalled and further examined:—

G. Garson. 27 June, 1902.

2175. *President.*] You wish to make a further statement with regard to the future requirements of the district? Yes; I mentioned that a scheme to take delivery of 10,000 cubic feet per minute is under consideration at the present time, and that application has been made to the Government for an additional loan for that purpose. In fixing the supply at 10,000 cubic feet per minute, the intention was to meet the early requirements of the district—that is to say, to fix a supply which would only necessitate the expenditure of a sum of money, the interest on which the district could pay at the present time; but I did not intend to convey the idea that 10,000 cubic feet per minute is the quantity which this district could with advantage use. There are 300,000 acres of land in the district, and certainly not less than 200,000 acres could be irrigated with advantage. The suggested scheme only provides for the irrigation of 30,000 acres, so that only one-sixth of the irrigable area of the district would be provided for. I think a supply of not less than 20,000 cubic feet per minute is required for a very moderate development of irrigation within, say, the next twenty years. That quantity would irrigate 60,000 acres.

Future requirements.

Irrigable area.

2176. And you estimate you have 200,000 acres irrigable? Yes.

Irrigated grass land.

2177. What is your idea of the value of irrigation on purely grass land? The advantage of irrigating grass is that in dry autumns you assure a good springing of grass for stock when the natural rainfall is deficient. Irrigating in the month of March, you would have good grass the following month.

Price of water.

2178. How much do you think you could afford to spend on irrigating grass in this district? One shilling per acre over and above the general rate would, I think, be exceedingly cheap at that time of the year.
2179. What could you afford to spend on growing lucerne? Two shillings, I think.
2180. Could you afford to spend more? I think 2s. for one watering.
2181. *Mr. Murray.*] You say that you think the Trust should eventually get a supply of 20,000 cubic feet per minute? Yes; an average of that amount.
2182. Would your channels be large enough to deal with the extra quantity? You might increase the number of the distributing channels.
2183. Would you find any difficulty in enlarging the main channel? I have not found any difficulty so far.
2184. The cost would not be prohibitive? No; but if the channel is in bank it would increase the difficulty.
2185. Your purpose is to enlarge the channels in future? Yes.
2186. You say the water should be used chiefly in the hot summer months? Yes.
2187. And that you think the water is of small value in the winter? Yes.
2188. You have had a good deal of experience in this district? Yes.

Winter irrigation.

2189. Have you not found that the best seasons follow wet winters? Yes.

Requirements variable.

2190. But in spite of that you think winter irrigation would not pay? I did not imply that winter irrigation would not pay; what I said was that the available water could be more profitably used in the growth of lucerne and other fodder crops during the summer.
2191. The volume of water applied for is 10,000 cubic feet per minute? Yes; I understand that is the quantity estimated for a certain number of days' delivery; but it does not mean that 10,000 cubic feet per minute should be delivered all the time. We might want 7,500 sometimes, and more than the 10,000 at others.
2192. Would you have the right to demand the larger amount? I presume that if the water were available it would be delivered at the request of the Trust. For instance, if we had a wet October no water would be required during that month; consequently there would be a larger supply available later on, and if it were asked for I presume it would not be unreasonable to deliver it, so long as the total quantity did not exceed the amount agreed upon.
2193. That would require constant regulation, and thus increase the cost of working? I do not think there would be any great difficulty.

SATURDAY, 28 JUNE, 1902.

[The Commission met in the Board Room, Rodney Irrigation Trust, Tatura, Victoria.]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

William Hector, Engineer, Rodney Irrigation and Water Supply Trust, Tatura, sworn and examined:—

W. Hector. 28 June, 1902.

2194. *President.*] What is your full name? William Hector.
2195. You are engineer to the Rodney Irrigation and Water Supply Trust? Yes.
2196. What is the area of the Trust? 297,545 acres, including an area of about 20,000 acres lately excised, which would make the present area 277,545 acres, including roads and reserves. The irrigable area is 230,615 acres.

Area of Trust.

Area irrigated.

2197. How much of that area did you irrigate last year? Nearly 41,000 acres. The figures for the first and second portions of the year respectively are as follows:—First half, fruit-trees and orchards, 1,919¾ acres; gardens and miscellaneous, 164¼ acres; vineyards, 261½ acres; amber cane, broom-corn, &c., 37¾ acres; barley, 179 acres; lucerne, 516 acres; oats, 470 acres; wheat, 682½ acres; fallow-land, 29 acres; grass, 54 acres; total, 3,744¼ acres. Second half, orchards, 3,339¾ acres; gardens and miscellaneous,

miscellaneous, 411½ acres; nursery, 20¼ acres; vineyards, 1,472½ acres; amber cane and broom corn, &c., 92¾ acres; barley, 15 acres; lucerne, 14,485¾ acres; stubble land, 8,455½ acres; grass, 8,776½ acres; total, 37,069¼ acres. W. Hector. 28 June, 1902.

2198. What is the net area irrigated? For the first half, 3,600 acres; the second half, 29,549¼ acres.
2199. A total net area of 33,149 acres? Yes, approximately.
2200. How much water do you apply each watering? Three inches, as fixed by the Trust.
2201. That is over the 41,000 acres? Yes.
2202. Are you absolutely sure about that quantity? That is the amount fixed by the Trust; but actually I believe it amounts to three times that amount.

Depth of watering.

2203. Do I understand that you put on 9 inches? I consider so.
2204. Could you give us any idea of the amount of water diverted into the channels of the Trust from the 1st July, 1901, to 30th June this year? Approximately, 11,000 cubic feet per minute.

Quantity of water diverted.

2205. What proportion of that amount do you estimate is used for stock and domestic purposes? For the first half of the year, 8,998,017 cubic feet; for the second half, 28,237,598 cubic feet.

Stock and domestic supply.

2206. What do you estimate the loss from evaporation and seepage at? Forty to 50 per cent. in our territory.

Losses.

2207. How do you arrive at the quantity used for stock and domestic purposes? By taking 1 gallon per acre per diem for the time the water is running.
2008. Do you consider that accurate? It would be a fair average.
2009. How do you form your opinion as to the 40 to 50 per cent. loss by evaporation and seepage? I formed my opinion by knowing the actual amount allowed into the channels from the head-works, the amount used for irrigation, and the quantity left in the channel afterwards.
2210. Is it possible to prevent any of that loss? Yes.

Prevention of loss.

2211. In what way? If the channels could be lined with an impermeable material.
2212. Do you think that is the only way? Yes.
2213. How many off-takes from the Goulburn National Works have you? Three.
2214. Could you tell us the amount of water per cubic foot you deliver during the eight months? I have not those figures.
2215. May we take it that the 11,000 cubic feet per minute which you mentioned, added to the 3,500 cubic feet per minute taken for the Echuca and Waranga Trust area, is the quantity delivered from the Goulburn National Works? I should say so.

Amount of water supplied to Trust.

2216. What is the capacity in cubic feet per minute of the three off-take channels from the Goulburn works to which you referred? No. 1 off-take, 1,356 cubic feet per minute; No. 2, 9,400 cubic feet per minute; No. 3, 17,246 cubic feet per minute; total, 28,002 cubic feet per minute.

Capacity of channels.

2217. What amount do you receive? An average of 11,000 cubic feet per minute, with a maximum of, say, 18,000 to 21,000 cubic feet per minute.
2218. Do you ever take up to the full capacity? No.
2219. What quantity, on an average, do you supply to the Echuca and Waranga Trust during the period you have named? About 4,000 cubic feet per minute.

Supply to Echuca and Waranga.

2220. What is the total length of the channels? 500 miles, approximately.

Length of channels.

2221. *Mr. Murray.*] You say the area watered is 40,815 acres? Yes; approximately.
2222. You were paid for 12,000 cubic feet per acre? Yes.
2223. You say the quantity actually used is three times that amount? Yes.
2224. That would make 1,470,000,000 cubic feet? Yes; roughly.
2225. Then 1,470,000,000 cubic feet was actually used? Yes.
2226. And 37,000,000 cubic feet for stock and domestic purposes? Yes.
2227. A total of 1,507,000,000 cubic feet during the year? Yes.
2228. And you say you received 11,000 cubic feet per minute for eight months of the year? Yes, for our own use, approximately.
2229. And that 40 to 50 per cent. is lost by evaporation and by percolation through the channels? Yes.
2230. That would leave 1,901,000,000 cubic feet? Yes.
2231. Although you only account for 1,507,000,000 feet? Yes.
2232. What becomes of the 400,000,000 cubic feet? There must be an allowance made for the quantity stored, and for that which runs to waste to the river.
2233. What do you think would be a fair quantity to use for irrigation upon the class of land in this district, supposing it were all graded and prepared? Six to 8 inches.
2234. Could you suggest any means for reducing the present waste? No other than stated.
2235. Suppose the Trust were called upon to reduce it, could you suggest any means of doing so;—what condition are the channels in at present? Fair.

Condition of channels.

2236. They are broken down in many places; surely you do not call that fair condition? I consider them to be in fair condition having regard to the state they were in four years ago.
2237. Do you not think that if the channels were put in better order there would be a great saving? Yes.
2238. There is less than a third of the water which you obtain used on the ground? That is so.
2239. *Mr. Burchell.*] Is water used from those channels for domestic purposes? Yes.
2240. The channels the cattle walk through and make use of? Yes.
2241. What is the rainfall through this shire? It averages about 18 inches.

John Allan, Chairman of the Rodney Irrigation and Water Supply Trust, Tatura, sworn and examined:—

J. Allan. 28 June, 1902.

2242. *President.*] What is your full name? John Allan.
2243. You are President of the Rodney Irrigation Trust? Yes.
2244. Do you regard the Trust as being financially sound since the Government has written off a proportion of your indebtedness? Yes.

Financial position.

2245. You consider you will be able to pay interest on the remainder, and maintain the works in a proper state of efficiency? I think we can pay interest, but shall find it difficult to maintain the works.
2246. Is the use of water for irrigation increasing in this district? It has been higher than this year—of course it depends on the seasons to a large extent, generally speaking however, it is on the increase.

J. Allan. 28 June, 1902.

2247. Your channels would irrigate considerably more than they do at present? They will not irrigate the amount required in March, at other times a great deal runs back in to the river unused. The difficulty is to supply the water as it is wanted.

Capacity of channels.

2248. You heard what your engineer said as to the maximum carrying capacity of the channels, and the amount used? That is not my idea. In my opinion the channels will not carry 30,000 cubic feet per minute. We have instructed our engineer to run them to their full capacity, and yet the people at the north end of the Trust could not get their full supply.

Goulburn mallee scheme.

2249. Do you wish to say anything in regard to the Goulburn mallee scheme? I see no objection to the winter water of the Goulburn going to the mallee, provided the necessary storage is constructed.

2250. That is, you have no objection to the water you do not want going to the mallee country? We want it all in summer, sometimes more than we can get. I am not favourable to the Murray mallee scheme, because I do not think there would be sufficient water for one thing, and I think it would be a very expensive thing for another.

2251. You think there would not be sufficient water, that the scheme would be a very expensive one, and that it is not wanted? That is my opinion.

2252. *Mr. Murray.*] Upon what grounds do you base your opinion? I understand there is a proposal to supply Deniliquin and Narrandera; when New South Wales is supplied there will be no water left for the mallee country.

2253. Assuming that New South Wales offers to give Victoria a quantity equal to the amount she takes, would there then be sufficient? In winter there might be, but not in summer.

2254. Do you know what quantity would be stored? I have no idea, but think it would not irrigate a very big area.

2255. Did I understand that you think it would be impossible to take water to the mallee on account o the cost? Yes; I have travelled the country, and think it would be.

2256. Do you know the route of the channel? Approximately.

2257. Then how can you form an opinion as to the cost? I have a rough idea, but nothing certain.

2258. *Mr. Burchell.*] Are you a farmer? Yes.

2259. How long have you been in the district? Twenty-five years.

2260. How much land have you? 500 acres.

2261. How much do you irrigate? About 50 acres.

2262. What does it cost you per acre to water? A lot more than most people, as I had to make a difficult channel.

2263. Apart from the cost of that channel, what does it cost you for water? A 2s. rate on the valuation and 1s. per acre for the land irrigated.

2264. For 8 or 9 inches? Yes; according to our engineer.

John Augustine Carey, Secretary to the Rodney Irrigation and Water Supply Trust, Tatura, sworn and examined:—

J. A. Carey. 28 June, 1902.

2265. *President.*] What is your full name? John Augustine Carey.

2266. You are Secretary to the Rodney Trust? Yes.

2267. What is the total expenditure on the works? £221,833 3s. 1d, the amount of loan funds advanced to date.

Liability.

2268. What was the effect of the Relief Act recently passed by the Victorian Government, so far as your Trust was concerned? The liability was reduced by £148,227 19s. 2d., leaving an indebtedness on 31st December last of £72,225 5s. 7d, after allowing for payments made in redemption of the loan.

2269. Which bears interest at 4 per cent.? Yes. Repayment is made by a contribution of ½ per cent. to Redemption Fund.

Rateable value.

2270. What is the rateable value of the property in the Trust? £49,464 10s.

Rate.

2271. What is the general rate? Two shillings in the £1 on the municipal valuation.

Exemptions.

2272. Is there any exemption? Along the Goulburn frontages some of the land is liable to flood when the river overflows; in such cases a refund of 1s. is made to the owners, but the total amounts to only about £120.

Water charges.

2273. What do you charge for the water supplied for irrigation purposes? For the irrigation of crop, orchards, and all other products except lucerne, grass, stubble, and fallow land, and land to be ploughed, 8d. per inch per acre for the first watering, and 6d. per inch per acre for the second watering, and 4d. per inch per acre for the third or any subsequent watering during any one season; and for the irrigation of lucerne, grass, stubble, and fallow land, and land to be ploughed, 4d. per inch per acre. I would like to explain the statement of the engineer with regard to 3 inches being taken as the standard measurement of a watering. This is in accordance with a regulation of the Trust, afterwards approved by the Governor in Council, which states: " . . . where it is impossible, by reason of the absence of a gauge, to measure the volume delivered, a watering shall be deemed to be 3 inches on an acre."

2274. Have you a statement of the revenue of the Trust? It varies so much that it is hardly possible to give the annual revenue.

Revenue of Trust.

2275. What was the revenue last year? £6,555 17s. 9d., from rates, sales of water, and miscellaneous charges, which do not amount to a great deal. The details are: arrears and current rates, £4,703 13s. 4d.; sales of water for irrigation and other purposes, £1,742 6s. 4d.; miscellaneous receipts, £109 18s. 1d.

2276. How do the sales of water for that year compare with former years? Unfavourably, as compared with our maximum year, of which I can give the following particulars: the largest area irrigated in the Trust in any one year was in 1896–7, when the gross area irrigated was 65,421 acres, and the value of the water sold was £3,522 1s. 8½d.; but the charges for water in those days were higher than at present. Lucerne was then subject to a sliding scale, whereas it is now 1s. at any time.

2277. Then the gross area irrigated has declined? Taking an average of seven years, last year's revenue was fair.

2278. Do I understand that the tendency is not to increase the area irrigated? It has fallen off since 1896–7.

Financial condition.

2279. Now that your capital indebtedness is decreased as indicated, and taking water charges in conjunction with the general rate, do you regard the Trust as financially sound? Yes; this district can meet interest on its present capital indebtedness,

2280.

J. A. Carey. 28 June, 1902.

2280. And maintain the channels at their present efficiency? Yes; and the valuation on which the present rate is based is very low.

2281. Could you compare the present ratable valuation in the district with that of former years? I could do so roughly.

Land values.

2282. Will you do so? In the heart of the district the land is valued at £64 per 320-acre block, whereas ten years ago it was £72 for the same area, or 6d. per acre more.

2283. That would show the valuation is going down? The municipal valuation has gone down, but the value of the land has gone up.

2284. Is that due to the water being available? Yes.

2285. Yet, so far as the assessment is concerned, the valuation has been reduced? Yes; but the shire council are now making a new valuation, which will, I believe, correspond more nearly to the true value of the land.

2286. Do you think that will be higher than it was ten years ago? I think so.

2287. As the result of the water being available? Very largely.

2288. What, in your opinion, is the increased value due to the water supply being available? I think £2 per acre a low estimate.

2289. You have had a large experience in these matters? Nearly twenty years.

2290. You said the valuation in this district is exceptionally low? Yes.

2291. Do you know anything of municipal valuations in the State generally? No; but I can compare ours with the adjoining municipalities.

2292. Are yours lower than Shepparton, for instance? I think so.

Uniform rate.

2293. *Mr. Burchell.*] Is the rate the same on all lands, whether the channel abuts the section or not? It makes no difference now. Up till two years ago we had a graduated rate, differentiating between river-side lands and lands that could not be supplied, and the rest of the district, but the present one is the same for all land.

William Hector recalled and further examined:—

W. Hector. 28 June, 1902.

2294. *Mr. Murray.*] I asked you a question during your previous examination as to the possibility of reducing the waste in the use of the water? Yes.

2295. What is the condition of the land irrigated generally, as to its adaptability for the utilisation of the water supply;—is it properly graded? No; there could be a great improvement in that way.

Land not graded.

2296. If the land were better prepared the same results could be obtained with less water? Undoubtedly.

2297. Does the Trust take measures to encourage or require land to be prepared for irrigation? They try to encourage it, but it is difficult to get owners to do it; during the last few years, however, there has been a great improvement in this respect; people are beginning to see the necessity for grading.

Grading beneficial.

2298. You think they will continue to do so? Those who have tried grading have found it of great benefit.

2299. Do they use less water? Yes; but the great advantage is that they get the irrigation over in less time.

SATURDAY, 28 *JUNE*, 1902.

[*The Commission met at the Shire Hall, Shepparton, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

John Montgomery Coane, C.E., Engineer to the Shepparton Waterworks Trust and Shepparton Shire, sworn and examined:—

J. M. Coane, C.E. 28 June, 1902

2300. *President.*] What is your name? John Montgomery Coane.

2301. You are a civil engineer in private practice? Yes, in Victoria.

2302. You are also engineer to the Shepparton Waterworks Trust and Shepparton Shire? Yes.

2303. Have you a plan of the existing works in the Shepparton Trust? Yes. I have a plan here which shows the existing works of the Shepparton Shire Waterworks Trust, the boundaries of the adjoining Waterworks Trusts, and the boundaries and proposed works of the proposed Eastern Goulburn Trust, for which a petition is now before the Minister of Water Supply of Victoria. [*Exhibit* 67.]

Area.

2304. What is the area of the Shepparton Trust? It is about 200 square miles in round numbers.

2305. Can you give us the acreage? 128,000 acres.

Channels.

2306. How many miles of creeks and channels have you in the area? About 154 miles, forming a reticulation for the water from the Broken River diverted by the Gowangardie weir.

Expenditure.

2307. What has been the expenditure, so far as capital is concerned, to date? In round numbers, about £22,000.

Present indebtedness.

2308. Some readjustment of that amount has taken place, has it not? Yes; the present indebtedness is about £15,500; the Trust area is shown on Exhibit 67 by the margin in blue.

Stock and domestic supply.

2309. Is there any irrigation at all in the Trust? No; these channels are purely for stock and domestic supply.

Amount of diversion.

2310. Can you give us the quantity of water diverted from the Broken River by the weir? About 2,000 cubic feet per minute as a maximum.

2311. What is the minimum? It goes down to a mere trickle, say, 100 cubic feet a minute.

2312. What is the approximate total volume? I could not give that; the channels are running very irregularly in accordance with requirements.

Capacity of main channel.

2313. *Mr. Murray.*] What does the main channel take? About 2,000 cubic feet a minute; that is the maximum. It goes down to below 100. The channels are closed generally for three months in the summer, and for about two months in the winter; that leaves seven months of diversion.

Annual diversion.

2314. What, in your opinion, is the annual diversion? The annual diversion is about 150 million cubic feet.

2315. Could you give us what that is per acre? About 1,200 cubic feet per acre per annum.

2316. That is used wholly for stock and domestic supply? Yes. A proportion of that runs through the Trust area into the next Trust, into a natural creek to the north.

2317.

J. M. Coane, C.E. 28 June, 1902.

2317. To any great extent? Yes; at times a good deal runs through into the Numurkah Shire Water-works Trust. A couple of hundred feet a minute at times go through there; it goes to form a water supply for the adjoining territory.

Revenue—how derived.

2318. *President.*] How is the revenue derived? By the imposition of a rate of 1s. in the £ of annual value on the area within the Trust.

Exception.

2319. Is there any exception to that? This exception: that certain landholders outside the Trust boundaries pay a certain fixed charge for filling dams.

Charge for filling dams.

2320. What is that charge? If supplied during the months of January, February, or March, filling any tank not exceeding 500 cubic yards capacity, the sum of £1 10s. for each tank supplied; for any tank exceeding 500 cubic yards capacity, but not exceeding 1,500 cubic yards capacity, the sum of £2 10s. for each tank; for any tank exceeding 1,500 cubic yards capacity, the sum of £3 for each tank. If supplied during any period of a year other than the months of January, February, or March, for any tank not exceeding 500 cubic yards capacity, the sum of 15s. for each tank; for any tank exceeding 500 yards capacity, but not exceeding 1,500 yards capacity, the sum of £1 5s.; and for any tank exceeding 1,500 cubic yards capacity, the sum of £1 10s.

Total revenue.

2321. Can you give us the revenue derived from the general rate, and also from the water sales? The revenue for this year was £1,340.

2322. How is that made up? £1,320 for rates and £20 for sale of water outside the Trust area.

Financial condition of Trust.

2323. Having regard to the maintenance of the present works, the capital expended, and the revenue derived, is the Shepparton Trust, in your opinion, as it exists at the present time, financially sound? Yes; it is sound, and there is a surplus, which is being applied to the construction of new channels.

Waste.

2324. Is there any waste, so far as you are aware? No; the waste in this Trust, as far as my observation goes, is practically nil now.

Steps taken to prevent waste.

2325. You say "now";—have any steps been taken to prevent the waste? Yes; the natural depressions and channels have all been defined, and the water is now concentrated into a narrower width than before.

2326. So far as you are aware, then, the Trust is financially sound and on a good footing? Yes; I should say it was decidedly.

Supply insufficient.

2327. Does the supply fully satisfy the demand, so far as stock and domestic purposes are concerned? No; during the summer months in some districts, where there is a difficulty of obtaining good holding ground for storing, there is a shortage. The supply needs augmentation by conserving the waters of the Broken River.

2328. Above the weir? Yes; at some point or points further up the river.

Proposed Shepparton Irrigation Trust.

2329. Will you explain to us the proposal that has been made for converting the Shepparton Water-works Trust into an Irrigation Trust? The plan handed in shows in brown colour the area that it is proposed to form into an Irrigation Trust, while the blue margin shows the existing stock and domestic supply Trust. It is not proposed to use the Broken River water for purposes of irrigation under the new scheme; but to divert water from the Goulburn River by a main channel running in the position of the double red line to the point marked "A," when it is proposed to begin to irrigate, by that time the water having got out above the surface. It is then proposed to carry a channel along on a falling grade of about 6 inches to the mile, until it reaches a natural creek, known as the "Nine-mile Creek," and to divert from it at various points westerly and north-westerly by channels along the ridge lines of the country; and to distribute from these main distributaries into minor distributaries running northerly and westerly for the purpose of irrigating the land. The existing channels of the Shepparton Water-works Trust, being generally in depressions or natural creeks, will be used as drainers for the surplus water from the irrigation channels, and in those existing channels the water will be carried away to the natural watercourses known as the "Nine-mile" and "Broken" Creeks, forming the northern boundary of the Trust area. All the main distributaries and main channels will also fall into this natural depression, and end there. Any surplus water then will be carried by the "Nine-mile" and "Broken" Creeks into the Murray River.

Works.

Area to be served.

2330. What area will that serve? The total Trust area, *ex* roads, is 205,000 acres.

Length of channels required.

2331. What length of channels? The national channel is 33 miles long; right main branch, 31 miles; left main branch, 26 miles; main distributaries, 133 miles; and the minor distributaries are set down approximately at 200 miles.

Cost of proposed scheme.

2332. What do you estimate the cost of the proposed scheme? This is merely a preliminary estimate, not based on detail surveys, and is necessarily more or less approximate. The promoters of the scheme have not been able to go to the expense of having sufficient details obtained to give an exact estimate, so that the figures given here are tentative. The cost of the Trust works is estimated at £110,108, and the liabilities to be taken over from other Trusts at £10,500. That includes a proportion of the money now owed by the shire of Shepparton Water-works Trust, and for some very small amounts for works in the other Trusts—that is, Numurkah and Tungamah.

Quantity of water required.

2333. What quantity of water have you asked for from the Goulburn head works? We have asked for 20,000 cubic feet per minute from May to November (the winter months); 15,000 cubic feet per minute in December; 12,000 in January; and 10,000 in February, March, and April, when the river is low.

Proportion to be irrigated.

2334. Have you prepared an estimate of your idea of the proportion of the area which will be irrigated? Yes; I assume that that will be sufficient to irrigate about 67,000 acres to a depth of 10 inches, bearing in mind the natural rainfall of about 20 inches. It is assumed in this estimate that, although 20,000 cubic feet per minute are asked for in the winter months—basing my statement on experience as an irrigator for the last ten years in this district—we will not want much water during the winter; that there will be practically no irrigation carried on during the winter months—that is, from the end of April to the beginning of October; because, during that time a very large percentage of the annual rain falls on the area.

Estimated loss.

2335. According to your calculation, what do you allow for loss? I took the seven months that I call the irrigating season, and ascertained that the diversions during that time would be practically 100,000-acre feet, and I assume that of that quantity, 56,000-acre feet could be put into use, and 44,000-acre feet would be lost by failure to utilise the full supply, and losses by evaporation and percolation. I am assuming that 56 per cent. of the whole would be made available, and 44 per cent. lost. On the eastern side of the river particularly, it is very sound carrying ground, and does not entail much loss by percolation.

J. M. Coane, C.E. 28 June, 1902.

2336. You know the Rodney channels;—does the ground on this side vary much from that? Not a great deal, except that the depressions here are not so deep, consequently there would not be so much embanked channelling, and therefore not so much loss. My experience of Rodney is that the losses occur principally where the channels are embanked, crossing depressions; a great deal of water runs through, and is delivered by the outlet channels back into the river or into swamp-lands adjoining the river. I do not hold the opinion that the loss is more than 44 per cent. over there even; but I wished to be on the safe side in making the estimate in this instance.

Goulburn River.

2337. Do you think the Goulburn River above the weir can afford the quantity that you have asked for, in addition to, say, the 103,000 cubic feet per minute provided for in the other channel on the western side of the Goulburn? In my opinion, it can, as during the months that I am estimating for—that is, the irrigating months, nothing like 103,000 cubic feet a minute is sought to be diverted on the western side.

2338. Are you aware of the quantity that is taken by the Rodney, Echuca, and Waranga Trusts? I do not know of my own knowledge.

2339. You are of opinion that there is ample water in the Goulburn above the weir for supplying, not only 103,000 cubic feet per minute in the National channel on the western side; but also the 20,000 cubic feet per minute that you have asked for on the eastern side? I am of opinion that the river can afford that quantity, 103,000 cubic feet per minute, during the winter months to fill the Waranga basin, if it be constructed, and leave 20,000 cubic feet per minute for the eastern side.

Bungowannah channel.

2340. Do you know that it has been proposed to the Railway Standing Committee that a channel be constructed from Bungowannah, near Albury, to the upper side of the Goulburn weir, for the purpose of supplementing the water of the Goulburn for the district in the vicinity of the Goulburn, and right out west towards the mallee country;—what is your opinion about that? My opinion is that it would not be available to do that; because, as far as I can judge from gaugings, and my knowledge of the country, there is plenty of duty for the Murray water to do in supplying the land lying between the Murray River and the Billabong in New South Wales, and what may be called, "The valley of the Murray" in Victorian side, besides affording water for navigation and irrigation on the lower river.

Duty of Murray water in Valley of Murray.

Goulburn River, utilisation of waters of.

2341. Do you think that, so far as the district beyond the Goulburn weir in a westerly direction is concerned, it requires the water that can be taken from the Goulburn River, and that it is not necessary to supplement it by any water diverted from the Murray River at Bungowannah? I consider the Goulburn River is sufficient for the purpose of irrigating a large proportion of the 800,000 acres in the Echuca and Waranga, Rodney, and Eastern Goulburn Trusts, and for the diversion of a limited quantity of stock supply to the west, if necessary, towards the mallee.

Murray River, utilisation of waters of.

2342. Where would you use the water from the Murray, in addition to what is being used now at Kow Swamp and downwards? The plan which I put in [*Exhibit* 68] shows in green colour about 650,000 acres lying south of the Murray River between Albury and Barmah, which would appear to be properly irrigated from the Murray River, as being part of the Murray Valley. North of the Murray, up to the Billabong Creek, there is a large area of land that requires watering, generally known as Southern Riverina. This area can be watered only, so far as I know, from the Murray.

Waters of rivers flowing northward.

2343. You hold the opinion that, inasmuch as the Goulburn will serve a portion of the country which it was intended should be served from the proposed diversion at Bungowannah, the fullest use should be made of the Goulburn, and the balance reserved for the land that could not be watered in any other way, except from that point? My opinion is that the waters of the rivers flowing northward from the Main Dividing Range, including the Goulburn, Campaspe, Loddon, Avoca, and Wimmera, should be stored and fully utilised, before any attempt is made to carry water from Albury westwards towards the mallee.

Storage sites on Goulburn River and catchment area.

2344. Do you know the catchment of the Goulburn above the weir? Yes; I know the country, and I know from plans that the area is, in round numbers, 4,000 square miles of hilly country, with a rainfall up to 50 inches, and over 50 inches in one part. There are several sites that I believe might be utilised for storing; one particularly where a large amount of water could be stored at a reasonable outlay, and I should, therefore, say that, before any channel such as has been proposed from the Goulburn weir westward towards the mallee is constructed, every effort should be made to store the waters of the Goulburn and other rivers flowing north from the main range.

Diversion from Broken River.

2345. *Mr. Murray.*] You divert now about 150 million cubic feet a year from the Broken River? Yes.

2346. There is not any used for irrigation? Practically none. I believe that a few people along the rivers may pump—by means of steam-engines, and in one or two cases by windmills—a very insignificant quantity; but there is none of it diverted by gravitation for irrigation purposes.

Stock and dometic supply.

2347. Are we to assume that the whole 150 millions are used for stock and domestic supply? Yes; I think so, with the exception of what I referred to before as passing on to Numurkah, and even that is used for stock and domestic supply, but in another Trust area.

2348. How much would it amount to? 150 cubic feet per minute, I should say, might be taken off the 500 feet.

Area.

2349. What is the area? About 128,000 acres.

2350. Is not 100 million cubic feet for the year an excessive supply for stock and domestic use for 128,000 acres? I do not think it is. The evaporation is very great.

2351. That includes the evaporation? Yes.

Evaporation.

2352. What does that amount to? From 3 feet 6 inches to 4 feet per year from water surfaces.

2353. What would be the loss in your present system? The loss, I should say, was practically all from evaporation.

2354. How much is actually used? I should say two-thirds; 67 million cubic feet in the year.

Percolation small.

2355. Do you not think the loss would be greater than from artificial channels? I do not think so. I have gauged them high up and lower down by floats, and really the loss is very small; it is very retentive ground.

Previous supply.

2356. *Mr. Burchell.*] Previous to these works being carried out, what was your water supply? The water supply was pumped from the Broken River into certain natural depressions or creeks, approximately in the same position as the channels that are shown in blue on *Exhibit* 67.

2357. When were they carried out? They have been about two years in operation now.

2358. Before that? They pumped into the natural depressions.

J. M. Coane, C.E. 28 June, 1902.

2359. When did you commence pumping at all? I believe fifteen or sixteen years ago.
2360. What did they do before that? They used to drive their cattle to the rivers, and cart water, and catch a limited amount in tanks.
Rainfall. 2361. Is 20 inches the average rainfall for this district? Yes; in round numbers.
Additional area could be commanded. 2362. *President.*] Is there any other area that could be commanded, and therefore irrigated, supposing water to be available from the Goulburn River, than the one that you have indicated to the east of the Goulburn and comprised in the proposed Irrigation Trust? Assuming the water to be available, there is an area lying between the north boundary of the proposed Eastern Goulburn Trust and the Murray River, which would be commanded by the main channel from the Goulburn weir.
Additional storage required. 2363. What is your opinion as to the sufficiency of the water for that purpose? Without any storage in addition to the Waranga basin, there would not be sufficient water to irrigate that area. If there was a large storage up the river which would augment the summer supply, the area could be irrigated by the Goulburn. That area is shown on *Exhibit* 68 lying to the west of the dotted line, approximately north from the north-east corner of the Eastern Goulburn area.
Storage site Kerrisdale. 2364. *Mr. Murray.*] Could you tell us something about the storage sites, of which you spoke, on the Upper Goulburn? There is a storage site that I know of—of course, I cannot speak as having made surveys—at Kerrisdale, where there are silurian ranges approaching each other on each side of the river, immediately below the junction of the King Parrot Creek with the Goulburn.
Storage site Traawcol. 2365. Has any survey been made at all? I am not aware of it, but I think it would be well worth a trial survey. There is another site at Traawool, slightly west of the Traawool railway station, where the ranges come very close together, and a wall might be built there that would conserve a large amount of water.
2366. Masonry? Yes.
2367. I suppose you know the total annual volume of the Goulburn? I cannot say that I have got the figures in my mind for the moment, but I have studied the gaugings.
Goulburn gaugings. 2368. The minimum recorded volume is 51,000 million cubic feet;—how much do you suppose of that quantity can be utilised, supposing the Eastern Goulburn scheme were carried out with those storages? I have not gone into that very closely, but I estimate that the area of the Goulburn watershed is 2,560,000
Catchments. acres with a heavy rainfall up to 50 inches. It is proposed to irrigate from that a proportion of 800,000 acres, say one-third of it, which would mean that every 10 acres of catchment would irrigate or supply 1 acre of ground below annually. The Murray has 4¼ million acres of catchment, including the Mitta-Mitta and the Kiewa. Depending on that for watering, there are at least 2,250,000 acres, one-third of which would require to be irrigated; that means 6 acres of catchment to 1 acre to be watered from the Murray. And from the Broken River, 13 acres of catchment to 1 acre to be watered, assuming 40,000 acres in the latter instance to be supplied. The rainfall in the Broken River catchment is not as heavy as in the others. The Murray and Goulburn catchments would not greatly differ. In each case the rainfall at one or two points is over the 50 inches. In each there is a good deal of snow.
Bungowannah scheme. 2369. *President.*] In regard to the evidence that you have given in respect to the Bungowannah scheme, you desire to make an explanation? I desire to explain that I did not express an opinion adverse to the Bungowannah scheme so far as it related to the watering of the green area shown on *Exhibit* 68. I merely meant to convey that I did not agree with the proposal to divert the water from Bungowannah to the Goulburn weir.
2370. Your idea is that the water from the Murray should be used in the vicinity of the Murray, as shown in green on that plan? Yes.

James Nugent, Secretary to the Shire of Shepparton, and Shire of Shepparton Waterworks Trust, sworn and examined:—

J. Nugent. 28 June, 1902.

2371. *President.*] What is your name? James Nugent.
2372. You are Secretary to the Shire of Shepparton and Waterworks Trust? Yes.
2373. You have heard the evidence given by Mr. Coane with respect to the revenues? Yes.
2374. And you endorse what he has said? Yes.
Effect on land values of constant water supply. 2375. Have you any land values, past and present, which would give an idea as to the effect of the provision of water for the land;—what has been the effect of providing a constant supply of water for stock and domestic purposes on land values? In the past the upset value of land would be about £4 per acre. Since we have had the Trust, and since this area has been watered with the water of the Broken River, I should say the value would be £6 per acre.
2376. Do the municipal valuations confirm that? We have not made a valuation for the last four years.
2377. You are of opinion that that *will* be borne out? That would be the value I would take now—I am the valuer as well as the Secretary to the shire—if I was valuing the shire at the present time. Of course land has risen too in value in our district.
Other causes of increased values. 2378. What has been the cause of that, over and above the water supply? There has been more demand for the land in the district. A good few people who went to New South Wales a few years ago, and who thought they could stop there, have come back here and bought land. They have also come from other districts and bought land here.
2379. You think that, in conjunction with the supply of water, the *natural demand* has raised the value of land? Yes.
Irrigation would increase values. 2380. Compare the present values with the prospective values, supposing irrigation is initiated? I should say, if we had irrigation here now, the land would be worth from £8 to £8 10s. per acre at the very least.
2381. It would enhance the value to the extent of £2 10s. per acre? Yes; at the very least.
2382. On what do you base that opinion? Taking Rodney as a comparison; land has risen more than that in value at Rodney. All the land sold at Rodney this last year has averaged over £11 per acre; some as high as £13.
2383. And you are of opinion that that is due to the fact that water can be supplied for irrigation purposes? There is no doubt about that.
2384. Are you aware that the ratable land values at Rodney have gone down instead of up? In my opinion, it is the lowest valued shire in the Colony that has come under my notice, according to the value of the land.
2385. You think then that the fact of the ratable land values having gone down is no criterion? No criterion at all.

J. Nugent. 28 June, 1902.

2386. *Mr. Burchell.*] Is there any difference in the rate where the land is adjacent to the channel;—is it one uniform rate for the whole of your district? The land is valued according to what it would bring either at a capital value or rental value in the various portions of the shire; but it is a uniform rate throughout.
2387. Is the land not considered more valuable where it abuts the channel? I should think so; but you cannot always say that, because sometimes the best land is away from the channel, and while the land near the channel might have the benefit of the water, it does not necessarily follow that it would be the best land.
2388. At the present time the people are satisfied with the uniform rate? Yes.
Area. 2389. *President.*] Can you give us the exact area of the Trust? Including roads, 135,563 acres.
Number of ratepayers. 2390. *Mr. Burchell.*] What is the number of ratepayers in the Water-Trust area? 550, and 600 assessments.

George Gordon, President of the Eastern Goulburn Irrigation League, Shepparton, sworn and examined:—

G. Gordon. 28 June, 1902.

2391. *President.*] What is your name? George Gordon.
2392. You are President of the Eastern Goulburn Irrigation League? Yes.
2393. As well as being a land-holder in the district? Yes.
Benefits of irrigation. 2394. Will you give us your reason for advocating the proposed scheme? My reasons for advocating irrigation are: I came here some eleven years ago, and after I had been out here for two or three years I found that the people in Rodney seemed to be making more money, and doing better off the land than we were doing. To see what was the cause of this, I went over to Rodney to get acquainted with the irrigated areas, and to see how it was they were turning off more fat stock, and doing so much better than we were doing on this side. After spending a good deal of time amongst the people of that part, I found that their better circumstances were due to the benefit they were deriving from the water. On this side of the river, the land is practically lying idle from the middle of October until well on in April, generally up to the end of April. It is consequently lying idle six months in the year, and, therefore, giving us no return. In Rodney where they put down the lucerne and irrigate it, they can make more money off 300 acres than we can here off 1,000 acres during those six months, so that we are considerably handicapped in the way of production by not having irrigation.
Rainfall. 2395. Notwithstanding the fair rainfall—20 inches on an average—you think that it should be supplemented by irrigation? I do. I am sure it would pay the land-holders in this part of the district remarkably well.
2396. Do you know that although the Rodney Trust are able to command two-thirds of the whole of their Trust, we learn from evidence to-day that, as a matter of fact, only a very small proportion of the land was irrigated—only about 37,000 acres per annum, or about 10 per cent.? Yes; I believe that is so.
2397. That being so, how is it that the Rodney people do not see the advantage in irrigation that you seem to realise in it? I cannot understand how that is so; but I base my opinion on the "figures" that a number of the men who are using the water are making. As to the people who are not using the water, their land is lying idle like ours.
2398. You are satisfied that irrigation is the proper thing under present conditions, so far as the proposed area that is included in the Shepparton Irrigation Trust is concerned? Yes; I am perfectly satisfied about that. I have gone into the matter very minutely, and I am certain that it would pay any land-holder to go in for irrigation.
2399. Do you think the landholders in the proposed area would be prepared to pay for this advantage that you speak of? I feel quite sure that the greater part of them would.
2400. That they would pay whatever was involved? We have brought out a scheme to show what it would probably cost, and from what I hear, a large majority of the farmers are agreeable to pay that cost.
2401. What land do you cultivate? Between 400 and 500 acres.
2402. What is the area of your property? 1,000 acres.
Future irrigation. 2403. What would you be prepared to do, supposing irrigation were possible in your case? I feel sure it would pay me to put down 300 acres of my land in lucerne. I have known the Rodney people buy lambs from us at the end of October, and sell them at the end of February, and double their money out of them.

The Honorable William Orr, M.L.C., Shepparton, sworn and examined:—

W. Orr, M.L.C. 28 June, 1902.

2404. *President.*] What is your name? William Orr.
2405. You are the representative in the State Legislative Council for this district? Yes.
2406. As well as being a land-owner? Yes.
2407. Have you thought over the question of the proposed scheme that you have heard mentioned to-night by former witnesses? Yes; I have given a good deal of attention to it during the last twelve months.
National works. 2408. Will you give us your ideas? First, I say that, unless the Government of this country carry out the national portion of the work—that is, the construction of the main channel from the Murchison weir to the Broken River, at a cost, which Mr. Coane estimates at £115,000, I should certainly oppose the incorporation of this Trust; but if the Government carry out that portion of the work, then the people resident in this area should—and I believe will—constitute this Trust. If the people in this district constitute such a trust, and if they are prepared to borrow this sum of money under the Act at 4 per cent. Interest. interest, and ½ per cent. redemption fund, then it is the duty of the State to construct this national work. I think the scheme placed before you is an ideal one. I *maintain that it is* the duty of the people to constitute trusts as a prior condition, and unless the people resident in the shire of Yarrawonga and Numurkah (which includes an area of 650,000 acres) constitute a Trust on somewhat similar lines to ours, it is not the duty of the Government of this country to join in the construction of the Bungowannah weir, and to carry out the great channels which would be necessary as a national portion of the work. I do not Bungowannah channel. think there is much ground fit for irrigation north of the Ovens River. Therefore, a great main channel will have to be constructed at the national cost from the Bungowannah weir to the Ovens. With regard

W. Orr, M.L.C. 28 June, 1902.

to this Trust, I do think the district is well adapted for irrigation. I think it contains essential conditions—even grade, rich soil, fairly porous, and containing a great deal of lime. The reason why people are found in this district, in spite of disastrous droughts and seasons, is the fact that whenever we get a rainfall of any kind at all it yields a rich fattening grass. With regard to the use to which the land can be put, I think lucerne is the plant which will pay for irrigation, I have about 500 acres laid down; it is not an absolute success, because I have not had a drop of water on it during the last two years beyond the natural rainfall; but if you visited the property I think you would be well satisfied that the land is well adapted for the growth of lucerne. As showing how cheaply lucerne can be grown in this district, with the crop, 10 lb. of lucerne seed can be obtained for 7d. per lb., and with rolling at about 6d., this runs to about 6s. 4d. per acre.

Lucerne a suitable crop.

Area.

2409. *Mr. Murray.*] On ploughed land? Yes. As far as I am concerned, I have about 2,000 acres, and I represent my brother, who has 1,000 acres on the Broken River. I would be quite prepared to irrigate 700 acres. From what I have seen in other parts, and over in Rodney, I am certain that irrigation will mean duplicating, if not triplicating, the produce of the country. It will double the population, and will give a sense of security to the settlers of this country. I feel that the people are doing the right thing by taking a definite responsibility.

Formation of Trusts should precede construction of works.

2410. *President.*] Do I gather that you are not favourable to the diversion of water at Bungowannah, except on certain conditions? I say that, unless the people constitute definite Trusts, with definite responsibilities, to form an insurance for the due use of the water, it is not the duty of the State, prior to that, to construct any head works; but if they do, such as we propose to do, I say we have prior rights to any others.

2411. You are in favour of the eastern channel scheme, in converting the Shepparton Waterworks Trust into an Irrigation Trust? Yes.

2412. You think it will be a financial and commercial success? Undoubtedly.

Ralph Glover, Chairman of the Shire Waterworks Trust, Shepparton, sworn and examined:—

R. Glover. 28 June, 1902.

2413. *President.*] What is your name? Ralph Glover.

2414. You are Chairman of the Shepparton Shire Waterworks Trust? Yes.

2415. And also a landowner in the district? Yes.

Irrigation supply desirable.

2416. You have heard the evidence given to-night in respect to the existing and proposed works;—are you impressed with the benefits that are likely to accrue to the landowners as the result of the change that is proposed? I am quite sure that irrigation would be better than the domestic supply at the present time. As our engineer has told you, we have got about 154 miles of channels, but in the summer time, during the months of January, February, and March—the very hot time of the year here—those channels are dry. If we had water for irrigation purposes we would be certain of a good domestic supply.

2417. Do you expect very great benefits as the result of irrigation? Yes.

Increased values due to irrigation.

2418. Tell us what they are? I knew Rodney over twenty years ago, when land was sold at 50s. an acre; just before there was any irrigation land was worth about £4 an acre, and with irrigation it jumped to £10 right away.

2419. What do you say the value of land in the Rodney irrigation area is now? Land is sold at all prices; from £10 to £15, and as high as £18.

2420. What is the value of the land you spoke of as being worth £4 an acre before the water was installed? I should say from £16 to £18 per acre.

2421. What increased value do you expect to accrue as the result of the initiation of irrigation in the East Goulburn area? I believe it would increase from £2 to £3 an acre right away. Whilst we had a partial supply I have seen land sold in this shire at from £2 to £3 per acre; now, you could not get land under £5, and it would run as high as £10.

James Thorne, landowner, Shepparton, sworn and examined:—

J. Thorne. 28 June, 1902.

2422. *President.*] What is your name? James Thorne.

2423. You are a landowner in the Shepparton district? Yes.

Area.

2424. How much land have you? About 500 acres in this shire that would come within the proposed Trust.

2425. Have you got a stock and domestic supply fairly handy? Yes.

2426. How long have you been there? I have had the property about three years.

2427. You had no experience before you obtained that supply? No; except that I was thoroughly familiar with the conditions on the other side of the river.

Stock supply valuable.

2428. You know the difference between one condition of things and the other? Yes.

2429. You consider that it is of immense value to you to have this fairly regular supply for stock purposes? I do.

2430. Compare the present condition of things with what you believe will result from the initiation of irrigation, so far as you are concerned? In 1900 we had a fair rainfall here, and on that account the return from the grazing of dairy cattle was 17s. 6d. per acre. Last year the season was considerably drier, and the return was only 12s. 6d. per acre. This year it has been worse still, and I shall be surprised if we get 10s.

Probable profits from irrigation.

2431. What do you think it would be, supposing you had irrigation? From the experience on the other side, I would not be at all surprised if we got £2 per acre with grass.

2432. Do you know the Rodney Trust pretty well? I do.

Irrigation a matter of education.

2433. Can you explain why it is, seeing that you seem to be so seized with the benefits that will accrue from irrigation, that more people do not avail themselves of irrigation in the Rodney Trust? Farmers are slow to learn. It is the want of education. I consider from this that irrigation in the Rodney Trust will be rapidly on the increase.

2434. Do you know that irrigation is on the decrease there? I feel quite satisfied that it will now be on the increase.

Malcolm

Malcolm Campbell Fraser, landowner, Shepparton, sworn and examined:—

M. C. Fraser. 28 June, 1902.

2435. *President.*] What is your name? Malcolm Campbell Fraser.

2436. You are a landowner, resident in the Shepparton district? Yes.

2437. How many acres have you? About 530.

Area.

2438. Do you cultivate any of it? I cultivate about 300 acres.

2439. Have you got a fairly good domestic and stock supply of water? Yes; I live on a frontage to the Broken River.

2440. How many years have you been there? I have been here about thirty-eight years altogether; more or less, all my life.

Effect of irrigation.

2441. Have you had any experience of irrigation in the district? Only a very slight experience—from one-quarter of an acre of lucerne which I have irrigated; I have been able to cut that five times this last summer, and it yielded a fairly good crop at each cutting. I have another little paddock of lucerne which I have not been able to irrigate, and I have had to plough it up again; it did grow, but it was not a success.

2442. Do you attribute the difference between the two results wholly and solely to irrigation? Yes.

2443. You are in favour of the conversion of the present Trust into the East Goulburn Irrigation Trust? Most decidedly.

Rainfall insufficient.

2444. You do not regard the rainfall as sufficient for watering the ground? No.

2445. You think, therefore, that it should be supplemented by irrigation? Yes.

James MacGregor, landowner, Kaarimba, sworn and examined:—

J. MacGregor. 28 June, 1902.

2446. *President.*] What is your name? James MacGregor.

2447. You are a resident of Kaarimba? Yes. The majority of the people in the district from which I come are certainly in favour of irrigation. The experience of the last six or seven years has made them very much more in favour of it than formerly.

2448. Owing to the drought? Yes.

Rainfall deficient for stock.

2449. So far as stock and domestic purposes are concerned, you consider the rainfall deficient? Yes. The land in that particular district would lend itself very easily to irrigation on account of its easy gradient, and if any man having 320 acres could lay down 50 acres in lucerne, given an abundance of water to irrigate it, he would practically be independent of the rainfall. Irrigation would have a steadying effect upon the stock market. At the present time we have no fat stock to dispose of in our district, and the result is that excessive prices have to be paid in the Melbourne and other markets on account of the scarcity. If we could irrigate and fatten stock we would be able to participate in the favourable prices which are generally realised for fat stock in the winter. Again, if we could irrigate, our cereals could be put in in better condition, because we could irrigate earlier in the year and get our crops sown in something like a reasonable time, and with a good prospect of getting remunerative returns. With regard to the increased value of land, water, of course, will increase the value, but the land has increased in the Goulburn Valley, to my own knowledge, up to 100 per cent. Not many years ago land could be purchased at £3 per acre and less, now good land cannot be had for less than £6 10s. to £7. It is not so much the prospect of a water supply being available in the near future as the desire of people who have tried other portions of this State and other States to return to the Goulburn Valley. According to Mr. Coane, the tax necessary to cover all expenses in connection with irrigation would only amount to £12 or £16 upon 320 acres. On behalf of myself and others, I can safely say that we would have been very glad for the last six or seven years to have paid £50 for the irrigation of 320 acres.

Effect of irrigation.

Increased land value.

Taxation necessary.

2450. *Mr. Murray.*] You said the people in your district are wholly in favour of irrigation? Chiefly in favour of it. A few are opposed to it; they are afraid of the cost.

2451. Does that apply to irrigation for your own district? It applies to irrigation for the district south of Numurkah. A large portion of the shire of Numurkah would not be in the irrigation area—only that portion south of the Broken Creek.

2452. Is the land owned by the people you refer to as being favourable to irrigation within the proposed East Goulburn Trust? Yes. Those that I speak of as being favourable to the East Goulburn scheme would derive benefit from that scheme.

Joseph Tilley Brown, M.L.A. for Shepparton and Euroa, sworn and examined:—

J. T. Brown, M.L.A. 28 June, 1902.

2453. *President.*] What is your name? Joseph Tilley Brown.

2454. You are the representative in the Lower House for Shepparton and Euroa in the State Parliament? Yes.

2455. You are acquainted with the facts so far as they exist at the present time in the Shepparton Trust? Yes.

2456. You also know what is proposed in regard to converting the Shepparton Trust into an Irrigation Trust? Yes.

Irrigation a necessity.

2457. Will you give us your opinion? There can be no doubt that the experience gained by our neighbours in Rodney has influenced our people to believe that irrigation is not only advantageous, but the late dry seasons have made them feel that it is a necessity.

2458. You are aware, I suppose, that irrigation is not being availed of to any very great extent, comparatively, in the Rodney Trust? Not to the extent that it should have been. That is due, I think, to the fact that a good many people on that side were up in years, and did not care about the trouble. They had made provision which prevented them feeling those pinches of the drought which others have felt, and there was always a doubt in the minds of a number of people that the question of labour would be a great difficulty in the matter. People have now found out that irrigation is a much easier thing than they anticipated.

Irrigation easier than anticipated.

2459. It is a matter of education, like most things? Exactly.

Bungowannah scheme.

2460. You have heard about this proposal to construct a channel from Bungowannah to the Goulburn weir, and then on in a westerly direction towards the Mallee;—what do you think about that? I hold a very strong opinion as regards the Nation's obligation to conserve water. I consider the State or the

Nation

J. T. Brown, M.L.A. 28 June, 1902.

Nation has as much right to conserve water as it has to erect wharfs and other conveniences for the people. Then I think the distribution of the water should be in the hands of local bodies. I think the Talmalmo reservoir and Bungowannah weir are the proper things for the Government to do.

Water conservation preferable to railways.

2461. You think that that is the proper thing to do, so far as Victoria is concerned? I think if we had spent less in railways and more in water conservation, we should not have had the trouble we have had for the last seven years.

2462. *Mr. Murray.*] I understand you to say that you are in favour of the policy that water conservation should be undertaken by the State as a public duty? Yes.

2463. That it is incumbent on the State? Yes.

2464. With respect to the Bungowannah scheme itself, what do you say? I think that should be a joint State matter between New South Wales and Victoria.

Corowa Conference.

2465. As regards Victoria's share, the construction of the channel from Bungowannah to the Goulburn weir? Before the Corowa Conference there was a general feeling that New South Wales would claim a greater right, but I feel sure that the men who represented New South Wales and Victoria there did mean to arrive at a conclusion whereby there should be no jealousies as regards the water. I take it that the water in the Murray now running away to the sea, would, if conserved, largely prevent the troubles we have suffered in the past.

2466. Was it proposed at the Corowa Conference that New South Wales should take a larger share of the water than Victoria? No; it was not. But prior to that, there was such a feeling in our minds, and I think the representative of South Australia, Mr. Gordon, attended the conference with a good deal of diffidence as regards the navigation question. But I am of opinion that all united in one common desire to do something to prevent the disastrous consequences that have attached to the last seven years.

State rights to waters.

2467. Seeing that you think it is the duty of the State to provide for the conservation of natural waters, I wanted to ask whether you do not think it would also be a duty of the State to assert its own right to the water? Yes; I think it should, if it conserves the water to a large extent.

John Sutherland, solicitor, &c., Shepparton, sworn and examined:—

J. Sutherland. 28 June, 1902.

2468. *President.*] What is your name? John Sutherland.

2469. You are a resident of Shepparton? I am a solicitor in Shepparton, and I own land within the area of the proposed Trust.

2470. You have heard the evidence given to-night;—do you agree generally with it? Yes.

Preparation for irrigation. Rainfall.

2471. You have some information which you desire to lay before the Commission? Yes. I should like to say, with regard to certain land-owners within the area of the proposed Trust, that I know they have been making preparations by laying down areas in lucerne with the hope of getting irrigation to keep it going. One land-owner I know has laid down 600 acres. I desire also to refer to the rainfall. I have a statement here of the average rainfall at Shepparton for the last seventeen years. The average has been 18·8 inches; for eight out of the seventeen years, the rainfall has been under that average. In eleven years out of the seventeen the average has been under 20 inches, and in only six years has it been over 20 inches. I tender this evidence as showing the necessity for supplementing the natural rainfall.

Area.

I might state further, that the land-owners in this room represent at the very least 20,000 acres.

John Augustus Kenny Clarke, orchardist and farmer, Shepparton, sworn and examined:—

J.A.K.Clarke. 28 June, 1902.

2472. *President.*] What is your name? John Augustus Kenny Clarke.

2473. Are you a resident of Shepparton? I am.

2474. Are you a farmer? Orchardist and farmer.

2475. What land have you? I have about 120 acres.

2476. You are impressed with the importance of irrigation? Certainly.

2477. So far as you are concerned, are you affected by the want of it? I certainly am. Owing to the want of water, I intend to take out the remaining fruit trees that I have—about 80 acres of trees.

2478. Supposing you get irrigation, will you have to take them out? Yes; and I shall replant new trees.

Daniel Burgess, farmer, Bunbartha, sworn and examined:—

D. Burgess. 28 June, 1902.

2479. *President.*] What is your name? Daniel Burgess.

2480. Are you a farmer? Yes.

2481. Where do you reside? Bunbartha.

2482. Is that within the Shepparton Trust? Yes.

2483. How many acres of land have you? 517.

Area cultivated.

2484. Any cultivated? Yes. The last few years I have not cultivated so much on account of the dry seasons. I suppose I will have 150 acres of wheat in this year.

Benefit of stock and domestic supply.

2485. Have you derived any benefit at all as the result of the water being supplied for stock and domestic purposes? Yes. Before we had any water, I had to drive the cattle 3 miles every day for about three months every year.

2486. You have had an ample supply since? No; I cannot say that I have. Generally, for a month or two in the year, we are short of water.

Irrigation Trust.

2487. Do you not store it on your land? Yes; but it does not last long enough.

2488. What is your idea in regard to the Trust being converted into an Irrigation Trust? My idea is that we will then get plenty of water.

2489. For what purpose? If we do not get it for irrigation, we will use it for domestic use.

2490. Do you not think it will be of value for irrigation? Of course, I do. No one knows the value of water scarcely.

2491. Would you use it if you could get it? Yes.

2492. If you had to pay for it? Yes. I would not grow lucerne altogether; I would grow broom-corn—there is more in that than lucerne. Water is the thing we all want in this district.

2493. And you are prepared to pay for it? Yes; I am prepared to pay for it, and a great many of my neighbours, too.

Phillip

Phillip Miechel, landowner, Tallygaroopna, sworn and examined:—

P. Miechel. 28 June, 1902.

2494. *President.*] What is your name? Phillip Miechel.

2495. You are a resident of ——? Tallygaroopna.

2496. What land have you? 320 acres.

2497. Is that situated within the proposed irrigation trust area? Yes.

2498. Will you be affected favourably if you get irrigation? Yes.

2499. How will it affect you? I shall be able to make a comfortable living, and have stock giving a return in place of having them half-starved as at present.

2500. Is your land suitable for irrigation? Yes.

Irrigation.

2501. Do you propose to cultivate if you get water for irrigation? Yes; I have a vineyard of 27 acres, and should certainly irrigate that. I milk from fifteen to twenty cows in the year, and think, by growing fodder for those cows alone, it would pay me to expend at least £20 per year for irrigation. When we have had a good downpour of rain, I have been able to raise Cape barley to cut for the cattle, but the last few years we have not been able to do so, owing to the want of moisture. The channel for domestic and stock supply overflowed, and watered 3 acres of land.

2502. By accident you got those 3 acres irrigated? Yes; it just flowed over the brim of the gutter, and I have seen the result of irrigation from that. A few years ago, when we used to get the water down the depressions, it irrigated about a quarter of an acre of vines, and I felt the benefit for three years afterwards. I had three times more wine from 3 acres of land in a good season than I have had from 27 acres since.

2503. You think, if you got irrigation, you would get equally good results each season? I think we should be a prosperous people.

George Stickels, landowner, Kaarimba, sworn and examined:—

G. Stickels. 28 June, 1902.

2504. *President.*] What is your name? George Stickels.

2505. You are a landowner? Yes; residing in the parish of Kaarimba.

2506. Does the land you own come within the Shepparton Trust? No; it is within the proposed Eastern-Goulburn scheme.

2507. How many acres have you? About 1,300.

2508. How much do you cultivate? From 400 to 700 acres.

Rainfall should be supplemented.

2509. You find that you want to supplement the rainfall by irrigation? Yes. Going back two years ago, when we had between thirty and forty cows milking, and when we had an early rainfall, our returns were £100 more than they were last year, and they bid fair to be the same this year, owing to the want of moisture. This season I have paid away £50 for carting water. I had three horses and two carts going constantly for over three months carting water, not because there are not sufficient dams to hold the water, but simply because the rain was not sufficient to fill the dams.

Irrigation would increase land values.

2510. Do you strongly advocate, from your own point of view, that this scheme should be carried out? Yes. I think myself that the land in our district, with irrigation, instead of being valued at from £6 to £7 per acre, would probably be worth between £13 and £15. Nearly the whole of our country is particularly adapted to irrigation, more so, I believe, than the Rodney Trust area

Numurkah and Wunghnu.

2511. Have you every reason to believe that, supposing you got irrigation, it would be a success? I am sure it would be. With regard to the Murray scheme, from my knowledge of the people north of the Broken Creek, they would be quite willing to enter into an arrangement under the Water Act for the purpose of getting water there; and I would like to say that the townships of Numurkah and Wunghnu are almost at famine point for want of water this year, and it is necessary that a water supply should be provided, both for domestic purposes and the townspeople. The water obtainable there is practically unfit for use; in fact, at Numurkah it is not fit to wash your face in, and it is therefore necessary that a supply should be brought from somewhere.

2512. Do you think the supply should come from Bungowannah? Either the Bungowannah or the Eastern-Goulburn scheme will supply Numurkah with water.

2513. *Mr. Murray.*] I understand you to say that you are in favour of the Bungowannah scheme? Yes.

2514. As a means of supplying your locality? The only way it could supply my locality would be by bringing the channel down to the point of intersection of the channel that will be made in the Eastern-Goulburn scheme, down across the Broken River. I think, with Mr. Coane, that there is a very large area that cannot be practically supplied with water, except by the Bungowannah scheme.

2515. I understand you are in favour of the Bungowannah scheme as a primary source of supply for the country as far as the Tallygaroopna Valley? Yes; and north of Broken Creek.

2516. Not to supplement the Goulburn weir supply? I am not engineer enough to say if there is sufficient water, but primarily for this country adjacent to the rivers.

MONDAY, 30 *JUNE*, 1902.

[*The Commission met at the Town Hall, Echuca, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Donald Cameron, Town Clerk, Echuca, sworn and examined:—

D. Cameron. 30 June, 1902.

2517. *President.*] What is your name? Donald Cameron.

2518. You are Town Clerk of the borough of Echuca? Yes.

2519. Do you produce a plan of the township? Yes. [*Exhibit* 70.]

Ratable value. Revenue.

2520. What is the ratable value of the property in the borough? The annual ratable value is £24,400.

2521. What is the revenue? The revenue of the borough is £5,000. The revenue of the Water Trust, in addition to that, is £1,600.

Town supply.

2522. The Water Trust is simply for the supply of the town? Yes.

D. Cameron. 30 June, 1902.

2523. What is the population? 4,200.
2524. Is the whole of that population supplied with water by the Trust? Not the whole; about 4,000 are supplied. In the outskirts they are not supplied with water by the Trust.

Navigation important to Echuca.

2525. Could you tell us officially how navigation is regarded by the township? Well, the shipping is considered one of the principal industries at Echuca. The town depends to a great extent on the navigation of the river.
2526. Is it the opinion of the townspeople, so far as you know in your official capacity, that the town is inconvenienced by the fact that the river is not navigable the whole year round? Yes, it is.
2527. *Mr. Burchell.*] Where do you get your town supply from? It is pumped from the Murray River into elevated tanks.

Low river.

2528. How does the low river affect the water supply? It is more difficult to pump with a low river, as the lift is greater.

Quality of water.

2529. Have you ever experienced any difficulty in the quality of the water when the river is low? The water is clearer when the river is low than when it is high, owing to the large amount of silt brought down by the floods in the latter instance.
2530. Would it be an advantage, so far as pumping is concerned, to have the water raised higher? I do not think it would affect our local pumps to any very great extent. I hand in a copy of petition to House of Representatives with reference to the locking of the River Murray (*Exhibit* 71).

Bervin Robert Wilson, Mayor of Echuca, sworn and examined:—

B. R. Wilson. 30 June, 1902.

2531. *President.*] What is your name? Bervin Robert Wilson.
2532. You are Mayor of the borough of Echuca, and a resident of the town? Yes.
2533. You are in business as a produce merchant? Yes.
2534. You formerly owned boats that traded on the river? Yes; on the Murray, Darling, Murrumbidgee, the Wakool, the Edwards, and also the Upper Murray.
2535. How long have you been acquainted with the trade on the rivers? About seventeen or eighteen years altogether.

River traffic

2536. Can you supply any information with regard to the river traffic, inwards and outwards, so far as Echuca is concerned? Yes; the goods shipped and handled at Echuca, from the 6th May until the end of December, 1901, were:—

Wheat (75,000 bags)	8,333 tons.
Dried and green fruits (77,000 packages)	2,213 „
General cargo	7,300 „
Timber for fruit-cases	740 „
Timber	180 „
Sleepers	800 „
Wool (43,000 bales)	7,000 „
Total (inwards and outwards)	26,566 „

Period of navigability.

2537. Does that represent the period during which the river was open for traffic? Yes.
2538. The river was closed prior to the 6th May? Yes; it rarely opens until July. This year it has not been open until just at the present time.
2539. Do those figures represent the trade of the district down as far as Wentworth? Yes; the trade of the Darling, Murrumbidgee, the Edwards, ——
2540. And the district from Wentworth upwards? Yes; the whole district right through.
2541. Any portion of the trade above Echuca? Occasionally some timber and wheat would come down, also some sleepers.
2542. Not in any great volume? Not recently. We think there would be tremendous cargoes of wheat coming down if they had irrigation in the Riverina—for instance, from the Berrigan district. We have had some seven or eight barge-loads brought down at different seasons, but not recently.

Locking.

2543. Do you know what the idea of the town is in regard to the locking of the river? There are a few antagonists; but the big majority are decidedly in favour of it.
2544. *Will you give us their reasons?* We recognise that when the river is closed the town suffers very materially, because the bulk of the £150 per month, which it costs on an average to work each boat, is spent in Echuca.

Effect of permanent navigation.

2545. Do you think the volume of trade would be increased, supposing the river were navigable the whole year round;—would the trade be spread over twelve instead of seven months as at present? It would probably, with the exception of the wool trade—the months during which that product is forwarded would remain practically the same as at present. Storekeepers and station-owners would not have to lay in the big supplies they do now consequent on the river being closed for seven months in the year.

Irrigation.

2546. Will you tell us in what way irrigation will be effected by the locking of the river? We believe that, by locking, the water could be diverted into different natural channels—for instance, there is the Cohuna channel, where there is expensive machinery devoted to pumping the water at a certain level from the river. We consider that, if the river were locked so as to provide 8 feet of navigation way, the water would be diverted into these natural channels, thereby assisting irrigation without having costly pumping plants.

Benefits to Echuca if Riverina irrigated.

2547. Has the town made any proposal with regard to irrigation, so far as the locality round the town is concerned? There is plenty of land round about Echuca suitable for irrigation, but on the Riverina side, in New South Wales, the settlers are all anxious for the water, and both sides are quite agreeable to pay a fair rate for the water, provided it is brought on to what we call "gravitation levels."
2548. So far as the Riverina is concerned, is it not a fact that Echuca would be considerably benefited by any irrigation that might be carried out there? Yes; largely benefited.
2549. Is it not a fact that, so far as the physical conditions are concerned, unquestionably the trade must come in this direction? Yes, undoubtedly.
2550. So that any water used on the New South Wales side for the purpose of irrigation would benefit Echuca, and, in that way, Victoria? *Yes; largely.*
2551. The trade would have to pass down in this direction? Yes; we regard this as the natural avenue for the trade for the whole of Riverina.

B. R. Wilson. 30 June, 1902.

2552. You know of certain lakes where large stores of water could be impounded;—will you tell us about them? There are the Barmah Lakes; the area, as given to me, is from 10 miles in width to 21 miles in length. I understand that they would take an average of 6 feet of water.

Barmah Lakes.

2553. At what level of the river at the Echuca gauge would the water flow into those lakes? I do not think it would flow in until there was about 10 or 12 feet here.
2554. *Your idea is, then, that when the water flows in during flood-time,* regulators should be erected so as to retain the water and impound it in that way until required? Yes. Immediately below Barmah there are two natural banks, and we think if that site was selected for a lock it would retain the whole of the water there. The computation which we made showed that if every other supply was cut off the quantity of water that those lakes would hold would give a 20-foot level for twenty-six days in the Murray; *it would also provide a large volume of water for the Edwards and Wakool.*

Impounding flood-waters.

2555. Is your idea to permanently raise the level of the water in the lakes? Yes; and we could control it every year in the dry season by impounding the water in the Moira Lakes.

Moira Lakes.

2556. Is there any other reason that occurs to you as being of moment, so far as the navigation of the river the whole year round is concerned? The local saw-mills are entirely dependent on the river for their logs; if the river were navigable, they would be able to keep on all the year round instead of working intermittently, as they do now.

Saw-mills dependent on river.

2557. *Mr. Murray.*] You said the amount of the produce handled at Echuca for the year 1901 was 26,566 tons; could you give us the value? The wheat would principally come from down about the Mallee, Swan Hill, Murrabit, Koondrook, and round that district, and the Riverina side. It would average about 8s. or 9s. a ton. The green fruits would average about 12s. 6d. a ton. Timber for fruit-cases would also average about 12s. 6d.

Value of produce handled.

2558. You spoke about the locking of the river as being useful in connection with lifting the water for irrigation? Yes.
2559. Have you any practical knowledge of that question? I have seen the river at different heights, and know the water would run into those different channels.
2560. There is a definite volume, we will say, coming down the river at any particular time; suppose you raise the water-level by locking, and the same volume of water comes down, in what way would it help you? It would help us in this way: we would have almost sufficient water if the locks were judiciously placed to get over the worst bars in the river, and that would ensure navigation.

Effect of locking.

2561. If you withdrew water for irrigation I do not see how you can retain the level for navigation;—I can quite understand how locking would be of value in connection with storage, but you said nothing about storage? We estimate that 60 million gallons flow past here at summer level, and if it were stored by the locks the only water lost would be the small amount that would run through when the boats were going through the locks.

Storage.

2562. If you used the water for irrigation how can you store it for navigation? All above the 8-feet level could be used for irrigation.
2563. *Take a length of the river in your mind—10 or 20 miles—it will hold a certain quantity, and there* is a definite quantity coming down; you do not increase the volume by locking;—if you take it away for irrigation what becomes of navigation? I say that 8 feet should be retained for navigation.

Navigation depth.

2564. Make your locks higher? Yes.
2565. But without storage? I contend you must have a storage combined with locking; that is indispensable.
2566. *Mr. Burchell.*] Do you ever get any fruit from Mildura? Yes.
2567. By steamer? Yes; of the fruit spoken of here, dry and green, the biggest bulk would be from Mildura.
2568. *Do you think if the river were permanently navigable that the adjacent land could be worked with more economy?* Yes: it would increase the value of property, as it has done at Tongala and Merrigum in the Channel country.

Permanent navigation would increase land values.

Joseph Tetlow, Manager for Permewan, Wright, and Company (Limited), Echuca, sworn and examined:—

J. Tetlow. 30 June, 1902.

2569. *President.*] What is your name? Joseph Tetlow.
2570. You are manager for what firm? Permewan, Wright, and Company (Limited).
2571. Have you been long in that position? Seventeen years.
2572. At Echuca? Yes.
2573. Are you, in your official capacity, well acquainted with the trade that is done inwards and outwards at Echuca? Yes.
2574. *Your house does a great proportion of it?* Yes.
2575. Can you speak as to the volume of trade, as to its importance, apart altogether from your firm? I cannot speak as to the trade done by others. Our firm put over the wharf last year about 22,000 tons.

Trade.

2576. Does the fact that you are only able to use the river, say, *half the year, affect your firm?* Yes. We lose a good deal of trade through the river not being navigable.

Loss owing to non-navigability of river.

2577. Will you explain what trade you lose? We lose a good deal on the Murrumbidgee.
2578. In what way? It is taken from Hay by means of the railway to Sydney.
2579. How would having the river navigable benefit the trade? The people would be able to get their goods up the river very much earlier in the season than they do now.

Benefits of navigation.

2580. Would they get more goods? I think they would. I think if the rivers were permanently *navigable it would induce settlement.*
2581. There would not be more produce to bring to Echuca than there is now? I think there would be a good deal of produce, such as wheat, coming up the river to go to Melbourne, or to be consumed by the flour-mills in this district.
2582. You, as representing your firm and as a resident of Echuca, feel very strongly that the river should be made navigable the whole year round? Yes.
2583. Would you bring into consideration the question of what it would cost to secure the result you desire? I think the question of cost should be studied, undoubtedly.

J. Tetlow. 30 June, 1902.

2584. So that, in other words, if the cost was prohibitive, at any rate for the present, you would have to put up with the disability at present existing? Yes; that is only a common-sense way of looking at it.

Steamers and barges.

2585. *Mr. Burchell.*] How many boats have you? We have eleven steamers of our own and eighteen barges. We generally charter another steamer and barge. We used to run sixteen.

2586. Where do they run to? From here to Wentworth, and from there up to Wilcannia on the Darling; on the Murrumbidgee as far as Whitton, and on the Edwards as far as Murga.

Capital value of fleet.

2587. Can you tell us what capital your fleet represents? I suppose between £40,000 and £50,000.

2588. Sometimes that capital is lying idle for four or five months in the year? Yes.

2589. Would it not be a great advantage to have it moving instead of lying idle? Undoubtedly.

2590. Would the producers and consumers be better off if the river were permanently navigable? I think all parties would benefit.

River freights.

2591. What is the freight for bringing wool from Wilcannia to Echuca? From 30s. to 40s. per ton.

2592. Is it any less to bring it from Wentworth to Echuca than from Wilcannia to Echuca? Yes; only about half.

2593. Do you do any road carriage? No.

Road carriage.

2594. Do you know of any produce that is being carried by road at present that might have been carried by the river had it been navigable? Yes; there is a good deal going from Swan Hill to Balranald and places in that vicinity.

2595. Do you know the quantity? No; there is also a good deal going from Koondrook to Moulamein.

2596. What distance is that? About 40 miles by land.

2597. What does it cost by land per ton? I could not say; it varies a good deal, according to the state of the roads.

2598. What does it cost by river? About £1 a ton from here by river.

2599. What is the greatest number of boats you have seen waiting to take produce to and from Echuca? I think about half a dozen.

2600. When the river is falling, do your freights ever rise in price? Very rarely.

2601. Have they done so? Not of late years.

Wool received from Echuca.

2602. What is the greatest quantity of shipping you have known in one year from Echuca? I have no recollection of that. The largest quantity of wool that ever came in in one year was about 90,000 bales; that was in the early 90's.

2603. If the river had been navigable the last three months, could you not have sent a lot of fodder for starving stock forward? Yes.

2604. What quantity? I should say several thousand tons might have gone up the river.

Effect of Mildura railway.

2605. Do you think the railway to Mildura will have the effect of intercepting any of the trade that might come here? I think so. It will take all the green fruit probably.

2606. You spoke of the trade just now going from Hay to Sydney, while the river is low;—do you think that that adds to the cost to the consumer? Yes.

2607. How much more? Probably £1 per ton on some things. Some lines are got from Sydney very cheaply, owing to the low rates by rail.

Wool detained.

2608. Do you know of any wool clips on the Darling, Murrumbidgee, or any other river that have been detained owing to the rivers not being navigable? Yes; there are generally some few bales left over towards the closing of the river season.

2609. Have you ever known a wool clip up the Darling to be detained on account of a low river? I have known of a portion of a clip; but do not remember a case where the whole was left over.

2610. You think generally that if the river were permanently navigable it would induce further settlement? Yes.

Topham Forge, President of the Echuca Agricultural Society, sworn and examined:—

T. Forge. 30 June, 1902.

2611. *President.*] What is your name? Topham Forge.

2612. You are a land-owner in the district of Echuca, and President of the Agricultural Society? Yes.

2613. You know the requirements of the district in so far as irrigation is concerned? Yes.

2614. Do you know of any action on the part of the district as to irrigation? Yes; there is strong agitation in this district for irrigation.

Proposed irrigation area.

2615. Which is the area that it is proposed to irrigate? The country between the Campaspe and the Picanniny Creek, from the Murray down towards Goornong and Mitiamo.

2616. What would be the acreage of the district you have described? I could not give you the exact area; but I am convinced it is sufficient to form an Irrigation Trust.

2617. What is the length in miles? It is 25 miles from Echuca to the Picaninny Creek, and to Goornong it is about the same distance.

2618. Is the ground suitable for irrigation? Yes.

2619. Is there any water supply at all so far as that district is concerned? With the exception of the Campaspe Irrigation Trust area, south of the district I have described, there is no water supply at all.

Source of supply.

2620. Where do you propose to get the supply from? From the main channel from the Goulburn weir and the Waranga basin.

2621. That is the channel between the Goulburn weir and the Mallee country, reported on recently by the Railway Standing Committee? Yes.

2622. I suppose the proposal has not been definitely formulated? The agitation is strongly in favour of the Government making this main channel a national work, and then a distributing Trust to be formed in this particular area of country.

2623. Suppose the Government carry out the Goulburn-Mallee channel in conjunction with the Waranga basin, then you say you would make application? Yes.

2624. But you have no details? No.

How locking would affect natural depressions.

2625. Have you considered the question of locking the river in its relation to irrigation? Yes; a little.

2626. What do you think would be the effect, so far as irrigation is concerned, if the river were locked? In my opinion, if the river were locked, it would fill all the depressions, such as the head of the Edwards in New South Wales, the Guelpha and Moira Lakes; and on this side the Kow Swamp and other works would be greatly benefited by it, provided the water was kept at the requisite height. There has been no water in the Kow Swamp head works for the last four months until last Thursday, when it commenced to run in.

T. Forge. 30 June, 1902.

2627. You have heard what the Mayor said in reply to Mr. Murray, that it would be necessary to have storages, in order to get irrigation? I take it that if the water were impounded in the natural storages, of which there are so many, there would be a good supply of summer water for irrigation.

2628. You realise that, however high you may lift the water by means of locks, unless you have the water to pass on to the land, the mere raising of the level of the water would be of no benefit, so far as irrigation is concerned? Yes.

2629. You have heard of the Corowa Conference? Yes.

2630. Will you tell us what the general feeling in the district is in regard to the resolutions that were passed there? There seems to be a unanimous feeling in favour of the resolutions.

2631. *Mr. Burchell.*] Do you pay any interest on the national works? No.

Anthony James O'Dwyer, Chairman of the Echuca Water Trust, sworn and examined:—

A. J. O'Dwyer. 30 June, 1902.

2632. *President.*] What is your name? Anthony James O'Dwyer.

2633. You are Chairman of the Water Trust of Echuca? Yes.

2634. Your Trust supplies the town? Yes.

2635. Anything over and above that? No.

2636. We have been told by your secretary that he estimates 4,000 persons are supplied? Yes; about that number.

2637. Have you any records of the quantity of water used for any given period? No; we have no official records.

Quantity of water used at Echuca.

2638. Could you give us an estimate for the year ending 30th June, 1902? We estimate that in June, July, and August we use, on an average, 150,000 gallons every twenty-four hours; that amounts to 13,800,000 gallons for the three months. In September, October, and November we estimate that we use about 250,000 gallons every twenty-four hours; that amounts to 22,750,000 gallons for those three months. In December, January, and February, the hottest months, the average would be 400,000 gallons in the twenty-four hours, making a total for the three months of 36,000,000 gallons. In March, April, and May we estimate 250,000 gallons as the consumption every twenty-four hours, giving a total for the three months of 23,000,000 gallons.

2639. So that you estimate you use about 95,000,000 gallons per annum? Yes.

2640. That is taken from the Murray? Yes.

2641. You are a councillor of the borough of Echuca? Yes.

2642. As such, you are acquainted with the action taken by the council in respect to the locking of the river? Yes.

Petition.

2643. Will you tell us what has been done? We have caused petitions to be sent throughout the country traversed by the rivers Murray, Murrumbidgee, and Darling, in the States of New South Wales, Victoria, and South Australia, and those petitions are at present being signed throughout the three States. [*Copy of petition handed in; Exhibit No.* 71.]

2644. Who are the petitions addressed to? The Federal House of Representatives.

2645. *Mr. Burchell.*] Have you any knowledge of petitions being sent from another State to you, asking your assistance in regard to the locking of the river? I do not remember it.

Levee banks.

2646. *President.*] You know that levees are being constructed in the vicinity of Shepparton and below, towards the mouth of the Goulburn River;—what do you say as to that? We feel, if they come any nearer Echuca, that it is increasing the danger of flooding, not only to Echuca itself, but also the country between Echuca and the mouth of the Goulburn River. We think the levee banks should be continued past Echuca on the Murray.

Permanent navigation.

2647. Are you impressed with the importance of having the river navigable the whole year round? Yes; it would greatly benefit the mills, owing to the increased facilities for obtaining produce; the shipping companies, as far as freight is concerned; and the town itself.

Duncan Sinclair, captain of river steamer, Echuca, sworn and examined:—

D. Sinclair. 30 June, 1902.

2648. *President.*] What is your name? Duncan Sinclair.

2649. You reside in Echuca? Yes.

2650. For how many years have you known the river traffic? About forty-five years.

2651. You have been Captain of one of the river steamers for how many years? About twenty-five years.

2652. You are, therefore, well acquainted with the requirements of the districts bordering on the rivers Murray, Murrumbidgee, and Darling? Yes.

Inconvenience of non-navigability.

2653. You think that the settlers in the towns are greatly inconvenienced owing to the fact of the river not being navigable the whole year round? Yes.

2654. In what way? The Murrumbidgee is slightly different to the Darling, because the rains that supply the Murray feed the Murrumbidgee also. It is only when tropical rains fall that the Darling has anything like a fair volume of water. That river may be low for three consecutive years.

2655. Too low for navigation? Yes; and they have always run out of produce and stores of every kind, so that famine prices prevail.

2656. What about the Murrumbidgee? Those on the Murrumbidgee are not so hardly pressed, because they have the railways within reasonable distances; but, of course, they have to pay heavier freights by rail as compared to water carriage.

2657. What about the Murray? It is identically the same. They have to lay in tremendous stocks at the beginning of the year. You could get almost any prices at Mildura lately.

Railways.

2658. The effect of what you say is that the railways do not serve the people effectively? No.

2659. And that they are not served unless the river is navigable? No. The railways only serve a certain section of the rivers. To a great portion there is no railway communication at all, and those people have to get along the best way they can.

2660. *Mr. Burchell.*] You say you have had forty-five years' experience? I have been here forty-five years, and I have had twenty-five years' experience on the rivers.

D. Sinclair. 30 June, 1902.

2661. Do you know the whole of the stations and towns between Lake Victoria and Bourke? Yes.
2662. How did the settlers get their produce to and from the stations in the first place? By steamer.
2663. *Have they* been maintained ever since they have been established by a navigable river? Yes.
2664. What would happen if it were taken away, and no railway given to them? They would die out.

Alfred Andrew Rouvray, Custom House Officer, Echuca, sworn and examined:—

A. A. Rouvray. 30 June, 1902.

2665. *President.*] What is your name? Alfred Andrew Rouvray.
2666. You are a Custom House officer, resident in Echuca, for the State of Victoria? Yes; and for New South Wales.
2667. Have you the tonnage of vessels, inwards and outwards, at Echuca for the year ending 30th June, 1902? Yes. 26,642 tons inwards, and 24,158 tons outwards.

Tonnage of vessels, Echuca.

2668. That represents the tonnage of the vessels? Yes.
2669. *Not* necessarily the trade? No, but as near, approximately, as can be obtained.

Andrew William Henry White, auctioneer, Echuca, sworn and examined:—

A. W. H. White. 30 June, 1902.

2670. *President.*] What is your name? Andrew William Henry White.
2671. You are an auctioneer, resident in Echuca? Yes.
2672. For how long have you been here? Nineteen years.
2673. You are, therefore, acquainted with the requirements of the town and district so far as navigation and irrigation are concerned? Yes; particularly with regard to irrigation.

Navigation.

2674. First of all, as to navigation, are you impressed with the inconvenience of not having the river navigable for a longer period than it is? Yes. In addition to being an auctioneer, I am also a director of one of the local flour-mills.
2675. In what way does it affect you? Very often we purchase wheat at Swan Hill and Murrabit, and on the Murray banks further down, and we are unable to get it up until too late for our purpose, except by means of the railway, and of course the railway freight in most cases is prohibitive.
2676. Then, are your operations limited in any way owing to the non-navigability of the river? Yes, at times; and we are placed at a disadvantage in competing with other mills.
2677. The wheat is bought and sent on, *via* Swan Hill, to Melbourne, otherwise it would come to Echuca? Yes. If we could get the wheat down from Swan Hill to Echuca we could sell flour at a lower rate than if we are forced to buy it and bring it here by rail.
2678. When you cannot get it by the river, where do you get it from? We go south. We have to pay freight on the wheat from Rochester or Tatura, and then freight on the flour—if sold for Melbourne or export.
2679. On the other hand, if you could get the wheat by the river, what would be the condition of things? We would be at a considerable advantage, but I am not able to give the exact figures.

Irrigation.

2680. As to irrigation, what do you say? We are situated here in Echuca, between two of the principal Irrigation Trusts in the Colony, the Rodney Trust and the Cohuna Trust, and we know that the condition of the producers residing in those Trust areas has materially improved, more especially during the recent drought, as the result of irrigation; whereas on lands of somewhat similar character, unsupplied with water, the population has steadily declined, and the land has gone down in value.
2681. To what land do you refer? I refer now to six of the parishes to the west of Echuca, in the county of Gunbower more especially. I find in Milliwa, nearest to Echuca, there were fifty original selectors, and there are only four left; in Wharparilla there were sixty-six original selectors, and there are only fifteen resident owners now; in Torrumbrry there were 114, and there are only twenty now; in Torrumbrry North there were 185, and there are only twenty-four now; in Terricks East there were 165, and there are now only twenty-five; and in Patho, originally there were 120, and there are only fifteen now. Out of a total of 700 original selectors there are only about 103 remaining. We think, if that district was supplied with water, the population would increase, and the properties, which cannot now be properly worked in small areas, would be cut up and subdivided.

Diminution of settlement.

2682. What has been the reason for the diminution in settlers that you speak of? Failure of crops owing to drought—inability to hold stock during the long periods of dry weather.
2683. Is the land suitable for irrigation purposes? Yes.

Land suitable for irrigation.

2684. Are you of opinion that, if a Trust were formed covering the area that you have described, settlement would again take place? Yes. I know the land of similar quality about Macorna and Mincha, which has gone ahead on account of a good water supply.

Source of supply.

2685. Where do you propose to get the supply from? From the Goulburn River through the Waranga basin, to be ultimately augmented by a supply from the Murray.
2686. The area you speak of being converted into an Irrigation Trust is dependent on the national channel and Waranga basin? Yes; and probably other storages.
2687. The supply must come from that direction? I think so.
2688. *Mr. Burchell.*] Was there any wheat down the river this year that you were unable to get up on account of the river not being navigable? I do not think there was any this year. Production in all this district has been very poor this year.

Hugh McKenzie, auctioneer, Echuca, sworn and examined:—

H. McKenzie. 30 June, 1902.

2689. *President.*] What is your name? Hugh McKenzie.
2690. You are an auctioneer, resident in the town of Echuca? Yes.
2691. And also a member of the Borough Council? Yes.
2692. As such you are acquainted with the requirements of the town and district? Yes.
2693. You understand the importance of the trade? Yes. I have a good knowledge of the trade of the district.

Navigation.

2694. Will you tell us what you think about the navigation of the river;—are you under any disability, so far as present conditions are concerned? So far as my own business is concerned, the navigation of the

H. McKenzie. 30 June, 1902.

river does not affect it so directly as the irrigation question; but still, as a townsman, I recognise the disadvantages in not having the river navigable all the year round.
2695. How would you state the case for the disadvantages? A very big plant, about which you have already had evidence, is lying idle for five or six months every year, and as a result a very large number of the men employed in connection with that plant are thrown out of employment. There are also the disadvantages which people labour under by reason of their not being able to get their supplies during the months when the boats are not running.
2696. You heard what Mr. White said in regard to the area which he thought it was desirable to form into an irrigation trust? Yes.

Benefits of irrigation.

2697. *Do you agree*, generally, with what he said? I think the particular area which Mr. White referred to would derive especial benefit if the proposal was given effect to. I have land in the Rodney Trust, and know that it has advanced in value fully 100 per cent., whilst land, equally good, but in the dry areas, has not advanced. As an instance, plain land that I sold for £2 per acre some ten or twelve years ago, before water was brought on to it, is now being utilised by the present owner sowing the seed with a drill and manuring at the same time; in consequence of that he is producing four or five bags per acre; whereas, when we had it, we could never produce more than one and a half to two bags.
2698. You regard that result as being due to sowing manure with the seed, in conjunction with irrigation? I certainly think it is an advantage to sow the two together, especially on the plain land; but, of course, the water must be there.
2699. That is a necessity to make it a success? Yes.

Land values.

2700. What effect has that had on the value, per acre, of the land you speak of? I sold at 37s. 6d. per acre, and now I suppose it would bring £3 10s. at least.
2701. Are we to understand that, in your opinion, land such as you have described in the Rodney Trust area has doubled in value, as the result of water for irrigation being supplied? Yes; taking the area within the Rodney Trust to be of an average value of £2 10s. per acre before channels were constructed, I think I am under the mark in saying it is now worth £5 per acre.
2702. You know pretty well the area comprised in the Rodney Trust? I know there is a considerable area.
2703. Nearly 300,000 acres? I suppose so.
2704. Are you aware to what extent irrigation is availed of by the settlers? I know that it is not so considerable as would be expected; but it is increasing yearly.
2705. We have it in evidence that last year irrigation was only availed of so far as 37,000 acres were concerned? I am surprised to hear that.
2706. Does that modify your ideas in regard to the area that you speak of as being desirable to form into a Trust? No; I still think it is desirable. Of course, the decrease in the water used might be affected by some special rainfall during a certain month, so it would be scarcely fair to take, perhaps, two consecutive years. The rainfall affects the quantity used very materially during one year as against another.
2707. You still believe in irrigation? Yes; I believe it is the staple of the country.

Isaac Braund, farmer, near Echuca, sworn and examined:—

I. Braund. 30 June, 1902.

2708. *President.*] What is your name? Isaac Braund.
2709. Are you a resident of Echuca? I am a landowner and farmer within 4 miles of Echuca, on the banks of the River Murray.
2710. How much land have you? From 1,000 to 1,100 acres of freehold.

Area.

2711. What leasehold? We have a little leasehold on the river frontage.
2712. What stock have you? We have very little stock now, on account of the drought.
2713. How many acres have you under cultivation? About 100 acres.
2714. What do you grow on it? Wheat.
2715. Do you irrigate at all? No.
2716. Is any of your land low-lying? Yes, about 150 acres.
2717. Bordering on the Murray? Yes.

Flood level.

2718. How much above summer level is the low-lying land? It would not be flooded until it is 20 feet above summer level at Echuca.
2719. When the river rises above 20 feet, the water flows on to your land? Yes.
2720. Does it do you any damage? Yes, a good deal.
2721. How long does it remain on the land? From six weeks to two months.

Storage above Albury.

2722. What do you propose as the remedy? I propose as a remedy that a large reservoir should be constructed above Albury.
2723. You favour the storage of the flood waters above Albury, because in that way your land and other land similarly situated would not be flooded? Just so.

TUESDAY, 1 *JULY*, 1902.

[*The Commission met in the Shire Hall, Rochester, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq., | FREDERICK N. BURCHELL, Esq.

William Telford Webb, Chairman of the Campaspe Irrigation Trust, sworn and examined:—

W. T. Webb. 1 July, 1902.

2724. *President.*] What is your name? William Telford Webb.
2725. You are chairman of the Campaspe Irrigation Trust? Yes; and a farmer, residing at Rochester.
2726. You were formerly Minister of Agriculture in Victoria? Yes; I own land in the Rodney, Echuca and Waranga, and Campaspe Trusts, also in the territory between the Campaspe River and the Mount Hope Creek and the Tragowel Irrigation Trust. I have been associated for the past sixteen years with water

W. T. Webb. 1 July, 1902.

water conservation and waterworks trusts, and have had numerous opportunities of judging the respective values of water and works for irrigation and for stock and domestic supplies. I have not irrigated any land in Rodney Irrigation Trust, but have had numerous opportunities of observing results. I have irrigated about 200 acres for the past eight years in the Campaspe Trust, which have produced an average of 22 bushels per acre, as against 8 bushels from land not irrigated. The past year was a most unfortunate one during seed time, consequently the crops came up very thin, and while I irrigated as usual the return was only 17 bushels per acre, but the crop which was not irrigated only gave 2 bushels per acre. I have also irrigated grass land during the same period, with very good results; but in the Campaspe Trust, water is not to be had in sufficient quantity to enable the best results to be obtained. The best results are got by irrigating between the middle of February and April; if the land is irrigated at that time, one further watering between the 1st and 31st October will ensure a full crop, bar accidents, such as rust or smut. Under such circumstances, the result will be from 35 to 40 bushels per acre of wheat. I find the most economical method of irrigating in this district is with a flow of about 500 cubic feet per minute, and with that flow I find I can irrigate an area of 30 acres in twenty-four hours. In the Rodney Trust, where they have a larger supply of water, they irrigate about March and October for grain, but the value of water in Rodney, and the results obtained there, are not to be compared with the value and results which would accrue to the west of the Campaspe, owing to their necessities being so much greater. The Rodney district is one in which the people can live and thrive without water. The value of land in that district, without water, rose to £6 per acre, while land in Rochester, west of the Campaspe, is not valued at more than £2 per acre, with the exception of about 50,000 acres close to Rochester. The yields without water in Rodney for five or six years average 10 bushels per acre, while in the Gunbower and Loddon district the yield for the same period only averaged 3 bushels, with the exception of the good land near Rochester, the produce from which brought the average for the whole district up to 5 bushels per acre. Rodney land will keep four sheep to 3 acres much better than this district will carry two sheep to the same area, and while the Rodney people do not make full use of the water available, if water were available between the Campaspe and the Loddon—no matter what quantity—the whole of it would be utilised; in fact, the necessities are so great in this district, that water absolutely cannot be done without. Mr. Garson is reported to have said that the present supply to the Echuca and Waranga Trust was 3,500 cubic feet per minute, and that 10,200 acres of land were irrigated—that may be so, but much of the water goes to waste, as a large amount of water is put on swamp land, on which from 1 foot to 18 inches would be run, and if the land had been properly levelled and prepared, two or three times the area could be irrigated with the same amount of water. Mr. Garson also stated that if 10,000 cubic feet per minute were available, 30,000 acres could be irrigated. I have a good knowledge of that district, also of the duty of water, and consider that if the quantity named were available, the area which could be irrigated would be not less than 60,000 or 70,000 acres. The reason a larger area is not irrigated, is that you cannot now depend on getting water when it is required.

Irrigation.

Campaspe Trust.

Rodney Trust.

Land values.

Yield.

Carrying capacity.

Echuca and Waranga Trust.

Irrigable area.

2727. We have it in evidence that so far as Rodney is concerned, the irrigated area has decreased since 1896, and the tendency is to decrease still further;—could you give any reason for that? I do not agree with the conclusion; but there are great difficulties to be overcome, some of which at least could easily be got rid of by a little management—for instance, instead of the Trust making arrangements to have repairs carried out during the off season—say, from May to August—that work is generally carried out at the very time when the water is most wanted. This also applies to the Echuca and Waranga Trust.

2728. You wish to show that, owing to the want of better management, irrigation is not increasing as it should? Yes; some few years since I went to the trouble of subsoiling and planting 20 acres of lucerne, but could only obtain water once during the year, and had to let it die in consequence. If water were available as required, I should probably have had 200 to 300 acres of lucerne, instead of which not only I myself, but others also are deterred from making the attempt again; and I would like to add that a limited supply of water is really more injurious than none at all; a reasonable supply must be provided in any scheme of irrigation to be successful.

Limited water supply injurious.

2729. Do you consider that the value of irrigation is greater west of the Campaspe than in the Eastern Trusts—Echuca and Waranga, and Rodney? Yes; on account of the difference in rainfall, and the land being principally plain land, requiring more moisture. Taking Torrumberry, Wharparilla, and Terrick Terrick, those districts are entirely unsuitable, in the absence of irrigation, for growing lucerne or corn, and even for grazing, it is poor country, and will only carry about one sheep to 3 acres; but what grass there is, is good. In regard to a scheme for stock and domestic purposes only, I consider the expenditure for such a purpose is not worth incurring, and the people in the district west of the Campaspe will not accept any liability, or countenance the construction of such a work, as each landowner has made provision for his own requirements. I am not speaking now for myself only, but for the people of the district, and may say that we had a conference at Bendigo recently, where there were about sixty representatives present, and only two out of that number—and these were from the Mallee—were in favour of a scheme for stock and domestic purposes only, as suggested by the Railway Standing Committee. Such a scheme will receive no support from the district west of the Campaspe.

Stock and domestic supply.

Requirements of Rochester.

2730. You do not favour the construction of the Goulburn-Mallee scheme? Not for a stock and domestic supply only. What we want is the present channel from the Goulburn weir continued, and the construction of the Waranga basin reservoir. The National channel from the Goulburn weir for about 19 miles is now constructed with a carrying capacity of 103,000 cubic feet per minute, and the Railway Standing Committee has recommended the continuation to the basin. This would leave available from the basin westward 83,000 cubic feet per minute, and as Echuca and Waranga would take 10,000 off their 20,000 the channel to the Campaspe would require to have a carrying capacity in the mean of 70,000 cubic feet per minute, crossing that river with about 60,000 cubic feet per minute. The territory between the Campaspe and Mount Hope Creek is not quite so large as that of the Echuca and Waranga Trust; but the need of the water is greater, and a larger quantity would be made use of. That territory would require an additional carrying capacity in the channel of, say, 25,000 cubic feet per minute. The country between Mount Hope and the Loddon would require a similar amount, and that would leave only 13,000 cubic feet per minute to go to the Mallee, not allowing for evaporation. I am aware that this quantity of water is not available from the Goulburn weir at all times; but it would be sometimes, and then it could be made use of. If the Murray were controlled at the place suggested a channel could be made, to connect at the Goulburn weir, large enough to provide, say, 55,000 cubic feet per minute. These works would then be fairly

Echuca and Waranga.

Mount Hope Creek.

Mallee.

Goulburn weir.

fairly supplied with water, and it would no doubt pay the settlers handsomely to use it irrespective of what the charge would be. With the water—no matter at what price—people would make more money than under existing circumstances. In reference to the proposal considered by the Railway Standing Committee as to the construction of the larger scheme, I may say that every practical man in the district considers the works are on a very expensive scale. If we read the recommendations aright, it is proposed that the whole of the channel from the Waranga basin shall be in excavation, and the cost is put down at 9d. per yard, whereas we find that the excavation of dams can be carried out for 4d. to 6½d. at the outside. The question will arise as to whether farmers will be prepared to pay interest on the cost of works and also maintenance; but, I think, it would be most unfair to ask them to do so when we take into consideration the immense benefits to the State generally which will accrue.

W. T. Webb. 1 July, 1902.

Recommendation of Railway Standing Committee.

Farmers prepared to pay interest.

2731. It is your opinion that continuing the Goulburn-Mallee channel, and the construction of the Waranga reservoir are national works, and should be paid for by the Government, and not by the people directly interested? Yes; it would be wise in the interests of all concerned, and only a fair thing; but I almost despair of getting it recommended; we are, however, prepared to pay anything in reason in order to get the work done.

National works.

2732. But not sufficient to cover the whole of the interest? I do not think so. It will be said that if so large a quantity of water is diverted navigation will be destroyed; but I think there is sufficient water available for both, if, however, there is not, there is no comparison to be drawn between the advantages of navigation and irrigation. Navigation above the Darling never was and never will be worth encouraging to any great extent, it can only exist under the most illegitimate conditions, and at great sacrifice to Victoria, and, I think, New South Wales also, such as leaves it almost valueless. In order to maintain traffic above the Darling, Victoria had to sacrifice freights to such an extent that they had to carry goods for less than would pay for axle-grease. Wool was the principal freight, and in order to get it it was carried from Echuca to Melbourne for 2s. 3d. per bale, as against a charge to the settlers in the neighbourhood of Echuca of 6s. 6d. The Victorian Railways charged 2s. 9d. per bale, and then returned 6d. to the agent who canvassed for the wool; and the same thing applied to other goods. Then they carried goods to Echuca from Melbourne, if for the Darling, sugar, for instance, at 11s. per ton, as against 50s. to those this side of Echuca; that applied generally. This was only justifiable while the States were at rivalry. Under the Commonwealth it is wholly unjustifiable.

Advantages of navigation compared with irrigation.

Differential railway rates.

2733. Then may we take it your view, is that trade should find its legitimate and natural outlet? Certainly.

Trade should find its natural outlet.

2734. Where would the trade of the Darling go, supposing Victoria and New South Wales did not make special sacrifices in regard to freight? To South Australia, I think; if the trade were carried on legitimately, *i.e.*, if proportionate rates were charged. Since the time I speak of the river has been tapped at Swan Hill and Koondrook, so that the traffic of the river is only competing with the railways, and irrigation would be much more profitable.

2735. Will you give us your opinion as to the construction of the proposed Bungowannah-Goulburn channel;—you know it is proposed to construct a weir across the river at Bungowannah, in order to divert water into Victoria and New South Wales? I think the scheme a very feasible one.

Bungowannah and Goulburn channel.

2736. Where do you think the water diverted into Victoria should be used? On the upper east of the Goulburn, between the channel from Bungowannah and the Goulburn weir north to the Murray River, and west to the Mallee.

2737. Do you know that the proposal is to divert 40,000 cubic feet per minute? That is a reasonable proposal; but I should say 55,000 feet would be required, and hope it will be considered.

2738. You know there is also a proposal to construct a dam across a valley of the Upper Murray at Cumberoona or Talmalmo for storing rain water for irrigation and navigation purposes? Yes; and I recommend that the channels be constructed of such a size as will carry all the waters that we may anticipate storing, so that they may not require to be enlarged within a reasonable time. The people of this country are slow to move, but when moved they rush at everything, and I believe everyone who can obtain water will not only take it, but be quite willing to pay for it, and it is unwise not to give men water when it is wanted, or allow them to decline it when they do not want it. The Trust should say, "We will give you so much water, and you must pay for it, whether you use it or not."

Cumberoona or Talmalmo storages.

Water should be paid for whether used or not.

2739. Do you think that would be the the cure for the difficulty at Rodney? Yes. If the Rodney farmers were told there was water available up to a certain quantity, if they would take it for a term of say, five years, every farmer in Rodney would be quarrelling as to who should have it. Now, they think there is no need to take it, because they can get it when they like, consequently there is a big demand at one time, and all cannot be supplied together. August and September is the time when water should be largely used to secure a crop; but people hold off in the hope that it will rain, and wait till October. The water should be allotted for a definite period, and paid for, every drop of water would then be utilised.

2740. We have it in evidence that there is an enormous quantity of water unaccounted for after allowing liberally for irrigation, evaporation, and seepage; could you offer any explanation as to what becomes of it? We all irrigate in very large areas; the channel is opened, and the water allowed to flood the whole area; if there is a depression the water accumulates there, and will take, say, 2 feet of water; or, if a light open soil, will absorb a foot of water without injury.

Losses due to defective methods of irrigation.

Grading.

2741. You think grading is the remedy? Yes; with measurement of water.

2742. *Mr. Murray.*] I understood you to say that one of the disadvantages of irrigation in this district is that you cannot always get water when it is wanted? I did, for the reasons specified.

2473. Could you suggest a way of supplying all the settlers with water at the same time? It is utterly impossible to do so.

2474. How would you deal with the difficulty? Regulate the supply of water—allow each man to have what is available, but not to take it one time and refuse it another. The people all wait as long as possible for the rain, and only when absolutely obliged to, do they apply for the water.

Regulation of supply.

2745. You think the fault, if there be a fault, lies with the users of the water? To a great extent.

2746. *Mr. Burchell.*] Why do the Governments make such concessions in the way of carriage for wool and wheat, if, as you state, it is not worth having? Because there was rivalry between the States at the time.

W. T. Webb. 1 July, 1902.

2747. That does not clear up what you said about its not being worth having? It is not worth having at the price paid for it, and the effect upon us was that in this district we had to pay enhanced rates for carriage to keep the railways going.

Irrigation and navigation.

2748. You recognise that the river is a great feeder of the railways at the points where they tap the river? What I meant was: to draw a comparison between water for irrigation and navigation, I say that navigation should not be put before irrigation, as irrigation is more valuable.

2749. Do you know anything about the river freights? I know most of them.

2750. Do you consider them exorbitant? No; too low.

2751. Do you think the river steamers carry goods at a loss? No.

2752. You think the railways do? Yes.

2753. Do you think cheap river carriage a great boon to the producer? Yes, to those who are in a position to avail themselves of it.

2754. Would not the land adjacent to the river be greatly enhanced in value if the river were permanently navigable? *No doubt.*

2755. Would it not be a great advantage in regard to irrigation if the level of the water were permanently raised? Yes; but irrigation by pumping, except at short lifts, is unprofitable.

2756. How do you know that? I have pumped myself.

2757. Have you been to Mildura or Renmark? No.

2758. Do you know that the cost of pumping there is about £1 per acre? Irrigation costs 3s. to 4s. in the Goulburn Valley, by gravitation.

2759. But you pay no interest on the head works, and only on part of the channels? Interest is paid on the reduced liability of the Trust works, but not on the cost of the national works.

2760. Then your comparison is not a fair one? I think Mildura is certainly not very prosperous.

Increased land values.

2761. *President.*] Can you give the Commission any information as to the increase of value of land in Rodney? Yes. I had an offer of £5 per acre for a farm within 1 mile of the Merrigum railway station about five years ago, and was offered £10 per acre a few days since. About £2 to £3 is the average increase.

Robert McKee, President of the Echuca Shire, of near Rochester, sworn and examined:—

R. McKee. 1 July, 1902.

2762. *President.*] What is your name? Robert McKee.

2763. You are President of the Echuca shire? Yes.

2764. Is there very much irrigation done in your shire? Not a great deal.

2765. Have you been impressed with the advantages of irrigation? Yes. I have had some experience in the Koondrook district; but it would be very much better if they had cheaper water; pumping is very expensive.

Irrigation and navigation.

2766. What is your opinion of irrigation *versus* navigation? I think they should go hand in hand; but I would rather have irrigation than navigation. If, however, the river is kept high enough for navigation, irrigation would also be possible.

2767. Are you quite sure of that? Yes.

2768. Have you considered the question of the level of the water in relation to the land? No.

2769. Would not levels have to be taken very carefully before you could say positively that irrigation by gravitation could be carried out as the result of locking the river for navigation purposes? We know the levels from the overflow of the river at various times.

Mitiamo.

2770. At what level does the river flow out on to the land? *Only at flood times; and I would like to* add that the people are gradually leaving the district, owing to the want of water for irrigation. This is particularly noticeable between Echuca and Mitiamo.

Stock and domestic supply.

2771. Do you favour a supply for stock and domestic purposes only? No; most of the settlers conserve sufficient water in dams for those purposes, and scarcely ever run out.

2772. You think that when a large expenditure has to be incurred, in order to provide a supply for stock and domestic purposes, the work should not be carried out? I think it would be better to add a little more to it, and go in for irrigation as well. That is the objection to the scheme recommended lately by the Railway Standing Committee—the channels are too small. I would like to say that I am sure the people are all willing to pay interest on the money which may be expended in carrying out works for irrigation purposes.

Koondrook.

2773. You have a pumping scheme at Koondrook? Yes.

2774. What is the area of it? 13,000 acres.

2775. Is it all irrigated? Not all; the pumping scheme is too small to allow of it.

2776. What height do you pump the water? From 6 to 20 feet, according to the level of the river.

2777. What area do you irrigate? Only a small amount.

2778. What depth of water do you use? The whole of the land is covered; I could not give the number of inches used.

Produce.

2779. What fruits do you grow? Apricots, peaches, nectarines, oranges, lemons, vines, and almost every kind of fruit.

2780. Do they all do well? Very well.

2781. Is any fruit exported? No.

Carrying capacity.

2782. How many sheep can you carry on irrigated grass? I have known 20-acre plots of artificial feed (thoroughly irrigated) fatten 200 sheep in one season, when the same ground, without irrigation, would have been practically worthless.

J. Crawford. 1 July, 1902.

John Crawford, landowner, residing in the Echuca shire, between the Campaspe and Piccaninny Creek, sworn and examined:—

2783. *President.*] What is your name? John Crawford.

2784. You are a landowner? Yes.

Area.

2785. Where do you reside? In the Echuca shire, between the Campaspe and the Piccaninny Creek.

2786. What land have you? 3,000 acres.

2787. What area do you cultivate? 350 to 400 acres.

2788. Do you irrigate any of it? No; the Campaspe scheme is not large enough to allow of it.

J. Crawford. 1 July, 1902.

2789. How would you put the case for irrigation? I have seen the results of irrigation, and thus been able to compare them with those of our district, where we have none. Some years ago we grew crops up to 20 bushels per acre; but the yield has gradually come down, and last year I had only one bag to the acre. The land without water this exceptionally dry year, will only carry one sheep to 5 acres, and they would die at that; in average years we carry one sheep to two acres. On irrigated grass land they carry two sheep to the acre.

Railway Standing Committee's proposal.

2790. Do you know what the Railway Standing Committee have recommended with regard to the extension of the Goulburn main channel towards the Mallee country? I have lived here twenty-nine years, and do not consider such a supply worth having. I have never suffered from the want of water for stock and domestic purposes. It is not on account of the want of water, but on account of the want of feed that the stock suffer. We must have irrigation, or the water would be of no benefit.

2791. What you say applies to the settlers in the neighbourhood in which you live;—would the same remarks apply to those who live further west? It would apply to all the better country between the Loddon and the Campaspe, perhaps not to the Mallee country itself.

Mallee country.

2192. Is not water for domestic and stock purposes very difficult to obtain in the Mallee country? I believe so.

Patrick Doherty, Commissioner of the Campaspe Irrigation Trust, Rochester, sworn and examined:—

P. Doherty. 1 July, 1902.

2793. *President.*] What is your name? Patrick Doherty.

2794. You are a Commissioner of the Campaspe Irrigation Trust? Yes.

2795. You are a land owner? Yes.

2796. Have you had any experience of irrigation? A little, in the Campaspe Irrigation Trust.

Irrigation.

2797. Are you impressed with the advantages which accrue as the result of irrigation? Yes; and am quite satisfied with the result.

Limited water supply.

2798. I understand the supply of water in this Trust is so limited that irrigation is not carried on to any great extent? That is so. I sowed 40 acres of lucerne two consecutive years, and could get no water; the consequence was that though the seed came up one year it died off afterwards. I irrigated 40 acres of crop last year.

Carrying capacity.

2799. Have you had opportunity of comparing the carrying capacity of irrigated land with land which is not irrigated? Yes; one irrigated acre is worth from 2 to 3 acres unirrigated.

Extension of Goulburn scheme to Mallee.

2800. You have heard of the proposal to extend the Goulburn scheme to the Mallee country? Yes; but I do not agree with it at all. It would be of no benefit whatever to the settlers from the Campaspe to the Loddon, and I do not think they should be taxed for a scheme from which they derive no advantage. The only country that would benefit from that scheme would be the Mallee. I own land there, and, therefore, have an interest in it. What we want is the scheme suggested by Mr. McGregor.

2801. What is that scheme? To run a large channel from the Waranga Basin on to the Loddon route. We could then irrigate all this area, and be in as good a position as the Rodney and Deakin shires. I speak for the principal people here, the Council, and the Trust. With irrigation, we could grow from 2 to 2½ tons of hay per acre, as our land is particularly suitable for irrigation.

2802. *Mr. Burchell.*] Do you know the estimated cost of that scheme? The cost is not so great as the benefits which would result.

Henry Mountjoy Ham, landowner, Pannoomilloo and member of the Echuca Shire Council, Rochester, sworn and examined:—

H. M. Ham. 1 July, 1902.

2803. *President.*] What is your name? Henry Mountjoy Ham.

2804. You are a member of the Shire Council, a landowner, and a resident of the shire? Yes.

2805. How much land do you own? Nearly 600 acres.

2806. Do you work it yourself? Yes.

2807. Is it cultivated? Yes.

2808. Is it possible to irrigate your land? Not at present; but the proposed channel will pass our property, and it will be possible to irrigate then.

2809. Are you in a position to speak as to the advantages of irrigation? No.

Stock and domestic supply.

2810. As a representative of the district you can, perhaps, tell us what is the general feeling of the settlers in regard to the proposal for supplying water merely for stock and domestic purposes, and also the feeling in regard to the proposal for supplying water for irrigation? The people in my district are against the proposal to supply stock and domestic requirements only, as they are already provided for. What we want in that district is a channel large enough to allow of irrigation, and are generally quite prepared to pay a fair thing for the water for that purpose, but not for a stock and domestic supply only.

Thomas Watson, President of the Tennyson Farmers' Association, of Tennyson, sworn and examined:—

T. Watson. 1 July, 1902.

2811. *President.*] What is your name? Thomas Watson.

2812. You are here as the representative of the Tennyson Farmers' Association? Yes.

2813. Where do you reside? At Tennyson.

Area.

2814. Are you a landowner? Our family holds 2,500 acres.

2815. Is that land used for grazing purposes only? Partly for grazing; 1,000 acres are cropped.

2816. Do you irrigate? No.

Wells.

2817. Have you a sufficient water supply for stock and domestic purposes? Yes. Most of the people have wells, and the shire has provided them for those who have not.

Proposed scheme too small.

2818. Would the proposed scheme for stock and domestic purposes, which has been mentioned this morning as having been recommended by the Railway Standing Committee, be of any advantage to you or not? We consider it too small; it would be useless to us.

2819. You consider irrigation of prime importance? Yes.

Water for irrigation.

2820. So far as your district is concerned, unless you can have water for irrigation you would not be satisfied? We are better as we are, unless we can get water for irrigation. Every farmer in the Tennyson district has water for stock and domestic purposes.

THURSDAY,

THURSDAY, 10 *JULY*, 1902.

[*The Commission met at the "Royal Exchange Hotel," Boort, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Farmer Slatter, Chairman of the East Boort Irrigation Trust, of Boort, sworn and examined:—

F. Slatter. 10 July, 1902.

2821. *President.*] What is your name? Farmer Slatter.
2822. You are Chairman of the East Boort Irrigation Trust? Yes; also a farmer.
Trust area. 2823. What is the area of the Trust? About 30,000 acres.
Irrigable area. 2824. What portion of that area is it possible to irrigate by gravitation? Nearly the whole of it could be irrigated; but the ground is not all suitable.
2825. What area did you irrigate for the year ending 30th June last? 140 acres of grass, 22 acres of crop, and filled twenty-six dams. The revenue derived was £25 6s.
Insufficient water supply. 2826. Will you explain how it is, seeing that you have so large an area suitable for irrigation, and capable of being irrigated, that only so small an area is irrigated? We have not sufficient water. Last year, when we finished up the season, there were applications for 522 acres which we were not able to supply, although the water had been paid for.
2827. What quantity of water did you use last year? I could not say exactly, but it is calculated at 3 inches per acre. Water for 888 acres has been applied for this year, but not supplied.
Cost of works. 2828. What was the original cost of the works? £21,000.
2829. What has it been reduced to? £6,700.
Revenue. 2830. What was the revenue for last year? Sales of water, £209; rates, £235 = £444.
2831. Have you had any experience yourself—apart from your experience as Chairman of the Trust—of the value of irrigation? Yes. Prior to the formation of the Trust I used the flood-waters, since then I have irrigated every year, and I find it pays to do so.
Water charges. Rate. 2832. What is paid for each watering? Sixpence per inch, or 1s. 6d. for crop, and 1s. for grass.
2833. What rate do you collect? One shilling and sixpence in the £ on the Shire valuation.
2834. Is that rate uniform throughout the Trust? Yes.
Effects of irrigation. 2835. Do you regard irrigation as of very great value? Yes. Take last year,—I had about 90 acres of irrigated crop, and 70 un-irrigated: the irrigated oats went eight bags to the acre, the un-irrigated only one.
Rainfall. 2836. Do you think if more water were available, occupiers of land within the Trust area would avail themselves of it? We could sell twice the quantity we do at present. We never get sufficient rainfall to give a good crop. I speak after twenty-four years' experience. Last year we had only a little over 8 inches; the average is supposed to be from 12 to 15.
Goulburn-Murray scheme. 2837. In what way would you be affected as a Trust by the Goulburn-Murray proposal? If a channel large enough to give us a fair supply of water were constructed, I consider we should be able to pay our liabilities without striking a higher rate, and could afford to pay a little more for the water than we are doing at present.
2838. You advocate that the water should be conveyed by channels sufficiently large to augment the waters of the Loddon? Yes; and without that supply the people will be compelled to leave the land.
Depth of irrigation. 2839. *Mr. Murray.*] Can you tell us how much water is used in irrigation on the land in this Trust? From 5 to 6 inches per acre on some land, from 4 to 5 inches for first watering on an average.
2840. How much do you pay for it? One shilling and sixpence.
2841. Is there any method of measurement? No, we have no engineer at present.
2842. *Mr. Burchell.*] What was the £21,000 spent on? On the weir, 45 miles of main channelling, 6 miles of branch channelling, bridges, stops, drops, and fluming.
Fernihurst Weir. 2843. What is the name of the weir? Fernihurst, on the Kinypanial Creek.
Interest. 2844. Do you know what interest you are paying on your present liabilities? Four per cent., and a half per cent. sinking fund.
2845. What were you paying on the original amount? Four and a half per cent., interest, and 1½ sinking fund.
2846. What do you think you can afford to pay for wheat and other crops? It depends upon the season. In dry seasons such as we have been getting lately, I consider we could pay 2s. or more, in addition to our present rate.
2847. Could you not pay more than that? If only a fair price is charged it encourages the people to use water.
Carrying capacity. 2848. How many sheep, per acre, will the land carry? In its natural state, about two sheep to 3 acres.

Matthew Barnes, Commissioner of East Boort Irrigation Trust, and landowner, of Boort, sworn and examined:—

M. Barnes. 10 July, 1902.

2849. *President.*] What is your name? Matthew Barnes.
2850. You are a Commissioner and landowner of the East Boort Irrigation Trust? Yes.
Area. 2851. How many acres do you cultivate? One hundred and ten acres.
2852. Do you make a practice of irrigating? Yes.
Irrigation. 2853. To what extent? I irrigate as much as I can get water for.
2854. What did that amount to last year? Fifty acres.
2855. Do you regard irrigation as of value? Yes.
2856. What difference does it make to you? Last year I cut a ton of hay per acre off the ground I irrigated early, while I could not cut any off the ground I did not irrigate. The hay was worth £4 per ton.
Water charges. 2857. Do you agree with the last witness, that you could afford to pay 2s. per acre for water? If we could get the water as we want it we could afford to pay 3s.
Rate. 2858. Not more? There are many other things which have to be taken into consideration. There is a rate of 1s. 6d.

M. Barnes. 10 July, 1902.

2859. But you have to pay that whether you irrigate or not? Yes. I may say that land fit for irrigation is worth, say, £1 per acre more than ground which is not fit to irrigate.
2860. Even though you had to pay 3s. per acre for irrigation? Yes.
Land value. 2861. *Mr. Burchell.*] What is the present value of land in the Trust, without irrigation? About £2 per acre for rough country, and £3 to £4 for land suitable for irrigation.
2862. Do you run any stock? Yes.
Carrying capacity. 2863. What do you reckon the carrying capacity of the ground? My ground is liable to be flooded; it is, therefore, naturally irrigated in ordinary seasons, and will carry three sheep to 2 acres.
2864. How many sheep would it carry if it were irrigated artificially? I could not say.
Wells brackish. 2865. Are there any wells in the country? Yes.
2866. What is the quality of the water? Very brackish.
2867. What depth are the wells? Fifteen to 30 feet.
2868. What is the nature of the ground—is it in gravel or rock? Rough sand.
2869. Does that extend all over your Trust? There is generally a drift at that depth.
2870. Do you find any difference in the quality of the water in the wells? I know of two wells containing water which is fit for domestic use.

Christopher Sutton, landowner in the East Boort Trust, sworn and examined:—

C. Sutton. 10 July, 1902.

2871. *President.*] What is your name? Christopher Sutton.
2872. You are landowner in the East Boort Trust? Yes.
2873. What land do you own? 1,610 acres.
2874. Do you cultivate the whole of it? I cultivate 220 acres.
Irrigation. 2875. Have you resort to irrigation? Yes; I irrigate as much as I can get water for.
2876. How much did you irrigate last year? Twenty acres, early in the season; the remainder I could not get water for until it was too late, and so got poor results.
Produce. 2877. What were the results on the part you irrigated? I got eight bags of oats on the part I irrigated in October, and scarcely one bag from the remainder.
2878. How many waterings? Only one.
2879. For which you paid 1s. 6d. per acre? Yes.
Value of irrigation. 2880. What do you reckon irrigation was actually worth to you in that instance? I suppose that it was really worth £1 per acre; but there is, of course, additional expense in the way of watering and harvesting. It is not fair to estimate the cost of water only. We have to employ additional labour in applying the water.
2881. You are of opinion that if you could get water for 3s., it would pay you to use it? Yes; if we could get it at the proper time.

Donald Kennedy, Chairman of the North Boort Trust, sworn and examined:—

D. Kennedy 10 July, 1902

2882. *President.*] What is your name? Donald Kennedy.
2883. You are Chairman of the North Boort Trust? Yes.
2884. What is the area of the Trust? 12,620 acres.
Irrigable area. 2885. What proportion of it is suitable for irrigation and capable of being irrigated by gravitation? 9,000 acres, approximately.
2886. What area was irrigated for the year ending 30th June last? 932 acres of crop, and 65 acres of grass.
2887. Can you tell us the quantity of water used? It is estimated at 3 inches per acre.
Depth of watering. 2888. Can you say what is the actual quantity put on the land? No.
2889. Could you give us an estimate? It would be more than 3 inches, perhaps 4.
2890. Would more irrigation be practiced if water were available? Yes, we could use twice the quantity.
Revenue. 2891. What is the revenue derivable from rates? Sales of water £111, rates £99 13s. 6d.=£210 13s. 6d.
Rate. 2892. What is the rate? One shilling and sixpence in the £ on the Shire valuation.
Charge. 2893. What is the charge for watering? One shilling and sixpence.
Cost of works. 2894. What was the original cost of the works? North Boort weir, on the Kinypanial Creek, £800; 20 miles of channelling, &c., making a total of £7,000.
2895. Have you had any of your debt remitted? Yes; our liability has been written down to £2,000.
Diversion. 2896. Have you any idea what quantity of water is diverted into your channel? When the Laanecoorie weir discharges 3,000 cubic feet, our allotment is 80 cubic feet; when it is 10,000, our allotment is 332.
Goulburn-Mallee scheme. 2897. In what way are you interested in the Goulburn-Mallee scheme? If we got an allotment of water from it we should be in a better position than at present. It is a very hard matter to keep going under existing conditions.
2898. If you could get water to supplement the Loddon you think you would be able to sell it for irrigation, and thus derive more revenue? Yes. At the present time we have seventeen applications for water which cannot be supplied.
Price of water low. 2899. Do you not think that, apart altogether from the rates, the price paid for water is very low, as compared with the advantages gained by the use of it? Under favourable circumstances it is; but, on the other hand, there are many times when the water is no use to us, and then the price is quite high enough.
2900. But would water be used by irrigationists when it is of no use to them? If the water is applied for it must be used or the money forfeited.
2901. *Mr. Murray.*] You say you do not know how much water your Trust receives? Not exactly.
2902. Are no measurements made by your officers? No.
Water not measured. 2903. Are any measurements made of the water delivered by the Trust, for irrigation? No.
2904. You can see it is very necessary for the Minister to know what water can be used in the various localities, before deciding upon any scheme? We could utilise three times the quantity we get now.
Require-ments. 2905. But you cannot tell what quantity you get now? No.
Output at Laanecoorie. 2906. Then can you suggest any means of ascertaining the quantity used now and, therefore, the quantity which should be supplied in future? No, unless you take it from the output of Laanecoorie at the 10,000;—we could certainly use much more than our allotment of 332 cubic feet.

D. Kennedy. 10 July, 1902.

2907. Are you aware that the outlet is reduced by evaporation and soakage before it comes down here? Yes.
2908. *Mr. Burchell.*] Do I understand that there are seasons when you could do without water for irrigation? There has only been one such during the last twenty years.
2909. How long have you had irrigation? About fourteen years.

Price of water.

2910. What could you afford to pay for an assured supply between August and October? I suppose double the present price of 1s. 6d.
2911. What could you grow without the water at that time of the year? Very little; wheat crops go 5 to 6 bushels per acre without irrigation.

Results of irrigation.

2912. And what do they give with irrigation? Double, or perhaps more. On an irrigated patch last year I grew, from 16 acres of wheat, a yield of sixty bags; from portion of the same paddock, without irrigation, only six bushels per acre.

Depth of watering.

2913. How much water did you use? One watering of—say, 4 inches.
2914. Was that sufficient? I could not get more; but it would, doubtless, have been the better of a second watering.

William Richard Roscholler, Commissioner of the North Boort Trust, sworn and examined:—

W. R. Roscholler. 10 July, 1902.

2915. *President.*] What is your name? William Richard Roscholler.
2916. You are a Commissioner of the North Boort Trust? Yes.
2917. Also a landowner in the district served by the Trust? Yes.
2918. How much land do you own? 320 acres.

Area.

2919. What portion do you cultivate? 120 acres.
2920. How many acres did you cultivate last year? Forty.
2921. What portion did you irrigate? About 36 acres.
2922. Only one irrigation? Thirty acres had a second watering.

Result of irrigation.

2923. Were you satisfied with the results? Yes. I was one of the first to irrigate, as I applied early for the water, and consequently required it again later on. I find oats will stand a second watering, but wheat will not.
2924. Were you satisfied with the yield of oats? Yes; I had seven bags of oats per acre.
2925. *What do you reckon you would have had without irrigation?* Perhaps a bag.
2926. A difference of six bags to the acre? I think so.
2927. What was it worth per bag? Ten shillings.
2928. £3 per acre difference in the yield as the result of irrigation? Yes.

Price of water.

2929. You heard the evidence already given as to what landowners and farmers generally could afford to pay for the water;—do you agree with it? Yes; but when the price of wheat and oats is low, the water is not worth so much. In years like the past seven or eight we could afford to pay it, but I have grown better crops without irrigation when the seasons have been good, though the price is lower then.
2930. Do I understand you to say that in a dry year you could afford to pay 3s., but that in a wet year irrigation would not be of sufficient service to warrant your spending that amount? Yes.
2931. *Mr. Murray.*] Is not the purpose of irrigation to secure a crop? Yes.
2932. If you get a crop by natural rainfall your profit would be the same as if the ground were irrigated? The price is generally lower in good years. Irrigation enables us to grow good crops in bad years, when prices are high. I think the price of water should be on a sliding scale; if you have dry years you can afford to pay more for it.

Wells brackish.

2933. *Mr. Burchell.*] What is your experience with regard to wells in the district? You may have to sink from 40 to 50 feet, and then the water is so brackish that sheep will not drink it.
2934. Are they all alike? Yes; as far as I have had experience.
2935. How about the quantity? We did not test it, the water was too brackish?

William Henry Odgers, Secretary to the Shire of Gordon, and the Murray-Goulburn League of Durham Ox, sworn and examined:—

W. H. Odgers. 10 July, 1902.

2936. *President.*] What is your name? William Henry Odgers.
2937. You are Secretary to the Shire of Gordon and the Murray-Goulburn League? Yes.
2938. Could you give us the number of settlers in the East Boort Irrigation Trust? Thirty-three or thirty-four.

Population.

2939. What is the population of the Trust? About 130 or 140.
2940. Could you give us the same information with regard to the North Boort Trust? Twenty-seven ratepayers, and a population of, say, 100.

Goulburn-Mallee scheme.

2941. Will you tell us the views of the league in regard to the Goulburn-Mallee scheme? They think it should be a comprehensive water supply scheme to take all the water that may be our share, and available, to the westward, from the Murray and the Goulburn. The objects of the league at present are to carry out what is known as the Goulburn scheme, and to watch our interests in regard to what is known as the Murray scheme.

Bungowannah.

2942. Is it the view of the league that any water which may be diverted from Bungowannah and brought across to the Goulburn, should be diverted in a westerly direction in order to supplement the waters of the rivers to the West, as well as to supply the Mallee country? Yes.
2943. Your attention has been devoted entirely to the Goulburn and to the country to the west of the Goulburn? Yes. We suppose there will be a supply sufficient to satisfy the landowners on the East, and that the whole of the Goulburn will be diverted in this direction, *i.e.*, that East Goulburn will be supplied from the Murray.
2944. *Mr. Murray.*] You have personally followed the discussions in regard to the Murray-Goulburn Mallee scheme? Yes.
2945. You know the views of your league in regard to the matter? Yes.
2946. Can you tell us how they view the question as to the amount of water they are likely to get, and the use it which it will be put? The league are not satisfied to have small channels; they want to convey a large quantity of water, from 80,000 cubic feet per minute upwards from the west of the Waranga Basin.

W. H. Odgers. 10 July, 1902.

2947. Have you any idea personally how much water is used for irrigation in this district? It has never been measured, so far as I know.
2948. Some of the witnesses said they were not aware that any attempt had been made to measure the water; but you must be aware that instructions were issued by the Department that the water was to be measured? I have no knowledge of any such instructions.
2949. *Mr. Burchell.*] Do I understand that it would be a great advantage to you if you could arrest any of the streams, and put the water on to the land? Yes.

Requirements.

2950. Including the water diverted at Bungowannah? Yes; all the water from the Goulburn and from Bungowannah as well.
2951. Do you not think that other settlers have rights in regard to the water as well as yourselves? We do not wish to interfere with such.

David Chalmers, Councillor of the Shire of Korong, landowner of Mysia, sworn and examined:—

D. Chalmers. 10 July, 1902.

2952. *President.*] What is your name? David Chalmers.
2953. You are a councillor of the shire of Korong? Yes.
2954. Also a landowner? Yes.

Area.

2955. How much land do you own? 3,000 acres.
2956. Is any portion of that irrigable? Yes, the whole of it.
2957. From what Trust? We are not in any Irrigation Trust.
2958. Where could it be irrigated from? The Goulburn-Murray channel.
2959. In that way you are interested in the scheme? Yes.

Goulburn-Murray scheme.

2960. Will you tell us your views with regard to it? We have been for the past twenty-eight years residing about 10 miles out of Boort. The last seven years have been very dry, and I think we have only had 3 inches of rain during the last six months. We know that at times there is too much water in the Goulburn and Murray; but are aware that it is not sufficient to irrigate the whole of the northern portion of Victoria. We want a channel of sufficient capacity to take the flood-waters of those rivers as far west as possible, so that our reservoirs may be filled and water provided for winter irrigation to some portion of the land.

Stock and domestic supply.

2961. You are more concerned with getting a water supply for stock and domestic purposes than for irrigation? *If we could have sufficient water for irrigation it would be valuable to us.*
2962. *Mr. Burchell.*] With regard to the construction of a large channel for taking the flood-waters, do you think it would be sufficient to make provision for the minimum flood discharge? No.
2963. Do you know the flood maximum is three times the minimum flow of the river? Yes.
2964. And you propose to construct a channel large enough to carry the maximum? I would favour the construction of a channel to carry away the water when it was there, the benefit would warrant the cost of the work.

FRIDAY, 11 *JULY*, 1902.

[*The Commission met at the Macorna Hall, Macorna, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Herbert Crowther, Engineer and Secretary to the Tragowel Plains Irrigation and Water Supply Trust, Mincha, sworn and examined:—

H. Crowther. 11 July, 1902.

2965. *President.*] What is your name? Herbert Crowther.
2966. You are Engineer and Secretary to the Tragowel Plains Irrigation and Water Supply Trust? Yes.
2967. How long have you been in that position? Since January, 1901.

Trust area.

2968. What is the area of the Trust? The net area is 179,000 acres.
2969. What is the area suitable for irrigation? 150,000 acres.

Length of channels.

2970. What is the total length of the channelling in the Trust? 350 miles.

Area commanded.

2971. What area would those channels command? 90,000 acres.
2972. What is the condition of the works at the present time? They are in fair order, and likely to remain so under existing circumstances for ten or eleven years.

Allotment of water to Trust.

2973. What is the allotment for the Trust in question from the Laanecoorie weir? Seven-tenths of the discharge, after deducting an allowance of 2,232 cubic feet per minute for compensation and riparian rights, &c.; but as we have recently had 12,000 acres excised from the Trust, which area was considered incapable of irrigation, the allowance may be reduced in future.

Quantity received.

2974. What is the maximum supply you get? When the Laanecoorie output is 10,000 cubic feet per minute, we get 5,724 cubic feet per minute; but we did not get anything like that last year.
2975. What was the maximum you got for the eight months of the year from April to November? I could not say exactly; the supply is a variable one, from 1,500 cubic feet per minute to 4,000 cubic feet per minute. The average may be stated as 2,500 cubic feet per minute for eight months of the year.
2976. What did you get in 1901? 1,520 cubic feet per minute for 174 days, and a variable supply increasing to 4,500 cubic feet per minute for twenty-six days, or an average of 3,500 cubic feet per minute for twenty-six days.
2977. On that basis, then, for 1901, 512,000,000 of cubic feet entered the channel of the Trust? Yes.

Water acreage.

2978. What was the water acreage treated throughout the Trust from November, 1900, to November, 1901? Wheat 12,593 acres; oats, 5,935 acres; fodder crops, 419 acres; grass, 7,539 acres; a total of 26,486 acres. The area actually irrigated was 17,120 acres; thirty-nine waterings of gardens, and 539 tank fillings.

Depth of watering.

2979. What depth of water do you put on each watering? *It varies from 3 to 20 inches in depth,* according to the position, quality, and suitability of the land for irrigation. The average may be taken as 8 inches for the first watering, and 6 inches for the second.
2980. Do you not regard that as excessive? Yes; but if the land were properly dealt with, and prepared for irrigation, these quantities could be reduced.

H. Crowther. 11 July, 1902.

2981. Have you formed any opinion of the quantity which should be allowed per acre for stock and domestic purposes? I have no data as to that.

Evaporation and seepage.

2982. What do you regard as the loss due to evaporation and seepage? I have no reliable figures, the land varies so much in quality. There is the grey soil, known as "the Loddon country," in which the seepage is enormous; and there is a red, hard, plain, land, in which the loss is very small.

2983. According to the evidence, you receive 512 millions cubic feet per annum, and the quantity used for irrigation alone is about 742 millions of cubic feet, without taking into consideration any losses from evaporation, soakage, and seepage, and no supply for domestic and stock purposes;—how do you explain the discrepancy? The figures on which the estimate for 742 million feet are based is not a fair average for the whole area of the Trust.

2984. How did you arrive at the average you have given? I took three blocks of land in the Loddon country, and three of the light loamy soil in the red country.

Demand for water.

2985. Is the demand for irrigation greater than you can supply? Yes; almost three times greater.

2986. Have you any rule limiting the supply for irrigation to the settlers? The Trust's rule is, that no holder shall receive water for more than one-tenth of his area when the supply is limited.

Stock and domestic supply.

2987. I suppose there is sufficient water for stock and domestic purposes, apart from that required for irrigation? It is good, and always has been, except perhaps in dry seasons at the end of March and April.

Capital cost.

2988. What amount has been spent from capital account on the Trust? £135,000.

Present liability.

2989. Has that amount been written down? Yes; it has been written down to £35,585 11s. 11d., and since then a further amount of £1,100 has been written off in respect of land excised.

Water rate.

2990. What is the amount of the water rate in the Trust? A differential rate of 1s. 6d., 1s., and 6d. in the £. The 1s. 6d. rate is on land capable of irrigation; the 1s. rate is on land that could be irrigated but is not supplied with channels; the 6d. rate is on land which it is impossible to irrigate, and also includes township allotments within the area.

Charge.

2991. What do you charge for sales of water? At the present time for crops—first watering 1s. 3d. per per acre; second watering, 1s. per acre.

Water not measured.

2992. What do you regard as included in the term "a watering"? A full irrigation over the ground under cultivation. The quantity of water used cannot be given, as no measurements are taken.

2993. Do I understand that you allow a farmer as much water as he requires for each watering, irrespective of the quantity used? Yes.

Revenue.

2994. What revenue do you derive from water rates? It varies within small limits, and may be taken as £1,500.

2995. What, from sales of water? It varies. In 1900, it was £1,451 1s. 6d.; in 1901, it was £1,401.

2996. Would those two amounts fairly represent the revenue derivable from that source? No.

2997. What would be the minimum? In 1892 it was only £645 16s.

2998. What was the maximum? In 1896 it was £1,729 12s.

Value of water per acre.

2999. Supposing you had a plentiful supply of water, what do you think would be a fair price per acre to charge for irrigation? I regard the present price as a fair one; but, at the same time, irrigation for cereals will pay up to as high as 3s. per acre per annum, and for fodder up to 5s. per acre per annum, because in the latter case landowners will only require to irrigate small areas.

3000. Would that price be in addition to the general rate? Yes.

Land value.

3001. What is the value of the land in the Trust? It ranges from 30s. to £4 per acre.

3002. Supposing you had a plentiful supply of water, what would be the effect on the land values? It would raise them at least £1 per acre all round.

3003. How do you arrive at that conclusion? By comparing the value of land in the Tragowel Plains Trust with that in Macorna, where values range from £4 to £8 per acre owing to the permanency of the supply.

3004. Is the land in your Trust similar to that in the Macorna Trust? The whole of the Loddon country is exactly similar.

3005. You put in a plan showing the Tragowel Plains Trust area, also the channels and other works? Yes. (*Exhibit* 72.)

Quantity of water received by Trust. How used. Depth of watering. Loss.

3006. In view of the discrepancy in the figures as given by you, will you be good enough to send to the Commission, as soon as you can, a statement showing the amount of water supplied to the Trust, and used—giving the figures themselves and the results? Yes. [*The witness subsequently supplied the following*]:—The total quantity of water received for the year 1901 was 1,240 millions of cubic feet, which was apportioned approximately as follows:—For stock and domestic supply, 70 millions of cubic feet; for irrigation, 1,170 millions of cubic feet. Depth of water used:—1st irrigation, 8 in., 2nd irrigation, 6 in., average 7 in. This would account for 670 million cubic feet, showing a loss of 570 million cubic feet in distribution.

Charles Edward Mann, Commissioner of the Tragowel Plains Trust, of Mincha, sworn and examined:—

C. E. Mann. 11 July, 1902.

3007. *President.*] What is your name? Charles Edward Mann.

3008. You are a Commissioner of the Tragowel Plains Irrigation and Water Supply Trust? Yes.

3009. Also a resident in the Trust area? Yes.

3010. Do you practise irrigation on the land you occupy? Yes.

Area irrigated.

3011. To what extent? I irrigated 100 acres last year.

3012. Was the result satisfactory? Fairly so.

Depth of watering.

3013. How much water do you think you put on the land you irrigated? We reckon to get 3 or 4 inches, in order to flood the land all over.

Crop.

3014. What did you grow on the irrigated area? Oats and wheat.

Yield.

3015. What was the yield? About three bags of wheat and six bags of oats.

3016. What would you have had without irrigation? Where I had no water there was no crop.

3017. Would you use more water for irrigation if you could get it? Yes.

3018. How many acres have you? Six hundred and forty; and if I could get sufficient water I would irrigate every acre of it.

Proportion irrigated.

3019. What is the rule of the Trust as to the proportion of land which can be irrigated? Originally we were informed we should be able to water one-third of it, but it has now been reduced to 10 per cent., and it is difficult to get even that.

3020. You are in favour of irrigating as much land as you can get water for? Yes

---

Thomas

Thomas Curlett, Commissioner of the Tragowel Plains Irrigation and Water Supply Trust of Tragowel, sworn and examined:—

T. Curlett. 11 July, 1902.

3021. *President.*] What is your name? Thomas Curlett.

3022. You are Commissioner of the Tragowel Plains Irrigation Trust? Yes.

3023. How much land do you own in the Trust? 1,420 acres.

3024. What portion did you irrigate last year? About 300 acres.

Crop.

3025. What did you grow on the irrigated portion? Twenty-two acres of wheat and 20 acres of oats; the rest was grass. The wheat did not come up, as I did not get water until the middle of August.

3026. It was not altogether a success, then? Without irrigation I should have had nothing at all.

Murray-Goulburn scheme.

3027. Could you tell us the view of your Trust in regard to the Murray-Goulburn scheme? They are in favour of it; *it is the only thing of any use to us. We have depended upon the Loddon water for* thirteen or fourteen years, and up to the present it has been a kind of failure. At the best, we can only irrigate a few acres, and do not get what we expected. We are wholly dependent upon irrigation for existence.

Loddon water insufficient.

3028. Do I understand you to say that the Loddon water is insufficient, so you desire it to be supplemented either from the Goulburn or the Murray? Yes.

Irrigated crop.

3029. *Mr. Burchell.*] What quantity of hay did you get off the area you irrigated? Over a ton to the acre.

3030. What did you get off the balance of the land? Nothing at all; it was grass land.

3031. In this Trust, the total area of which is 179,000 acres, only 17,120 acres is actually irrigated;—what is grown on the balance? Chiefly grass. Some of it was cultivated last year, but there was no rain to bring the crop on.

3032. Does that apply to last year only? No, the same thing has occurred many years.

3033. What was grown previously? The general average of wheat crops is from two bags upwards; the highest I have ever known was seventeen bags of oats.

3034. What is the carrying capacity of the land for sheep, without irrigation? About 1½ acres per sheep.

3035. What for cattle? I have heard of twenty cattle on one block of 340 acres.

Ardill Brien, Commissioner of the Tragowel Plains Irrigation and Water Supply Trust, of Macorna, sworn and examined:—

A. Brien. 11 July, 1902.

3036. *President.*] What is your name? Ardill Brien.

3037. You are Commissioner of the Tragowel Plains Irrigation and Water Supply Trust, also a land-owner? Yes.

3038. To what extent? I own 640 acres, and rent 1,400 acres.

3039. Have you tested the value of irrigation on your land? Yes.

Irrigated area.

3040. How many acres did you irrigate last year? About 200.

Crop.

3041. What did you grow? Wheat and oats.

3042. Was the yield good? No.

3043. How was that? I could not get water in time.

3044. Did that cause a complete or only a partial failure? Very nearly a complete failure.

3045. Did you cut any hay from the land you irrigated? I got about 20 tons of hay.

3046. Did it pay you on that occasion? No; but I also got about 25 bags of oats and the same quantity of wheat.

3047. Supposing you could get a sufficient supply of water, do you think the land in the Tragowel Plains Trust is suitable for irrigation? Yes.

3048. Do you think the water would be used to any great extent? Yes.

Proportion to be irrigated.

3049. Supposing you take a block of 320 acres as the usual holding, what proportion do you think would be irrigated? I should say about 25 per cent. of the whole.

3050. *Mr. Murray.*] I think you said that the land in the Trust is suitable for irrigation, and that it would be irrigated if water were available;—is that reply to be taken as commendatory of the proposed Goulburn-Murray scheme? Yes.

3051. Have you any idea of the amount of land that could be irrigated if that scheme were carried out? No.

3052. You think you would irrigate a larger area if you had the water;—how much more do you think? About 70 acres out of each 320.

Value of water.

3053. *Mr. Burchell.*] What do you consider would be the value of water for wheat if you could get it as required? I think 2s. is sufficient.

3054. Is that all it would be worth to you? Yes; considering the amount of labour required for the preparation and watering of the land.

David Nicholson, land-owner, Tragowel Plains, sworn and examined:—

D. Nicholson. 11 July, 1902.

3055. *President.*] What is your name? David Nicholson.

3056. You are a land-owner within the Tragowel Plains Irrigation Trust? Yes.

3057. How many acres do you own? 320.

Irrigated area.

3058. How many acres did you irrigate last year? Thirty.

Crop.

3059. What did you grow? Oats.

3060. Was the crop a success? No.

3061. For what reason? Owing to the want of water; I could only get [illegible] once.

3062. What was the yield? 10 cwt. of hay per acre.

Value of water.

3063. Do you, therefore, regard it as of importance that you should get more water than you can under present conditions? Yes.

3064. Will you tell us what you consider an adequate supply would be worth to you? Three waterings per year would be worth 3s. per acre.

3065.

TAMIL NADU ARCHIVES UNIVERSITY 31288 ESHORE MADRAS-600 008

R
D2-56-PIM
No2

D. Nicholson. 11 July, 1902. Goulburn-Murray scheme.

3065. You have heard what previous witnesses have said about the Goulburn-Murray scheme;—do you agree generally with them? Yes; it is an absolute necessity that we should get a better water supply. I might also point out that all those in the Tragowel Trust have always been under the impression that we should get water for 100 acres, and we reckon that we have been badly treated by the Government in that respect as we have been put to great expense in preparing the land, and then never got the water.

3066. We had it in evidence, when making inquiry into the conditions of the Rodney Trust, that only a small proportion of the land within the Trust was irrigated, and that the tendency was for the area irrigated to be reduced; they have a good supply of water in that Trust;—what difference is there between yourselves here and those at that Trust? We have always been exceedingly anxious to get the water, and have made good use of what we could get. We have found it profitable to use it, and should continue to do so.

3067. Are the conditions different in your Trust to those in the Rodney Trust? I know nothing about the Rodney requirements, and, therefore, cannot draw any comparison.

George Welch, land-owner, in the Tragowel Plains Trust, of Macorna, sworn and examined:—

G. Welch. 1 July, 1902. Irrigated area. Crop. Proportion to be irrigated.

3068. *President.*] What is your name? George Welch.
3069. You are a landowner in the Tragowel Plains Irrigation Trust? Yes.
3070. What area of land do you own? 1,200 acres altogether.
3071. How much did you irrigate last year? A total of 110 acres.
3072. What proportion of that did you cultivate? About 90 acres.
3073. What did you grow? Hay and wheat.
3074. What was the yield? Three bags of wheat to the acre.
3075. How much hay did you get? About 25 cwt. per acre. I got the water early in the season.
3076. Were you satisfied with the result? Yes.
3077. Your experience of irrigation is favourable, then? Yes.
3078. Do you regard as sufficient the 30 acres allowed by the Trust as the proportion to be irrigated in each 320 acres? No; we should have at least 160 acres out of each 320. We could then afford to pay for the water.
3079. What do you think should be paid per acre per annum for cultivated land? Say, 2s. 6d.

Donald McIvor, land-owner, Tragowel Plains, sworn and examined:—

D. McIvor. 11 July, 1902. Insufficient supply. Effects of irrigation.

3080. *President.*] What is your name? Donald McIvor.
3081. You own land in the Tragowel Plains Irrigation Trust? Yes.
3082. How many acres? About 1,250, and a reserve of about 107 acres.
3083. You also own land in the Macorna North Trust? No, I am renting about 320 acres.
3084. You irrigate land in both Trusts? Yes.
3085. Do you get enough water for all purposes in the Tragowel Plains Trust? No; not a quarter.
3086. Do you get sufficient in the Macorna North Trust? Yes.
3087. Could you compare the results of irrigation in the two Trusts? Yes. It has been impossible to carry on dairying profitably on the Tragowel Plains Trust since 1894, and cropping has been a comparative failure also; but in the Macorna North Trust you can nearly always depend on getting some returns—say, 2½ to 3 bags of wheat and from 7 to 8 bags of oats per acre. Then, in regard to dairying, I may say that the yield from my sixty cows in the Tragowel Plains dropped to 50 gallons per day; but when I shifted them to the Macorna North Trust it rose in three days to 130 gallons, and in a fortnight to 160 gallons. The time when irrigation is profitable is during the hot dry weather, as with its aid we can then grow fodder crops. I think it would be profitable to pay 3s. per acre, or even more, for the water if we could get it as required.

Hugh Sutherland, Commissioner of the Twelve-mile Irrigation Trust, sworn and examined:—

H. Sutherland. 11 July, 1902. Irrigated area. Insufficient supply. Carrying capacity.

3088. *President.*] What is your name? Hugh Sutherland.
3089. You are a Commissioner of the Twelve-mile Irrigation Trust? Yes.
3090. How many acres of land do you own in that area? 320 in the trust, and I also hold 220 acres on an unusual tenure. I also rent 200 acres in the Twelve-mile Trust, and own 309 in the Tragowel Plains Trust.
3091. What area did you irrigate last year? About 70 acres of crop and 30 acres of grass in fair time, and 17 acres more, too late to be of much use. I put in 100 acres of crop, but could not get water for the whole of it, consequently some of it did not even sprout.
3092. You experienced great inconvenience and loss as the result of not getting the water at the right time? Yes; practically nothing grew which was not irrigated. The land irrigated early went about 40 bushels of oats per acre. That which I could only get late water for gave 16 bushels per acre; the land I got no water for yielded no return at all.
3093. Do you regard it as of great importance to the landowners in the Trust that they should have a proper quantity of water available at the right time? Yes.
3094. Under those conditions, you think irrigation would be a success? Yes.
3095. What do you say about irrigation in the Twelve-mile Trust and the Tragowel Plains Trust under present conditions? It is not quite a failure, but very nearly so. It strings us on in hope, but we get no satisfaction out of it, owing to the insufficient supply of water.
3096. What is your experience as to the carrying capacity of the land in the Tragowel Plains Trust? When we got a better water supply we carried 150 to 200 breeding ewes on a block of 320 acres; now we can only carry 140 on 1,400 acres, but this is the worst season we have ever known.

THURSDAY,

THURSDAY, 17 JULY, 1902.

[The Commission met at the Offices of the Commission, Modern Chambers, Collins-street, Melbourne.]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

William Thwaites, M.Inst.C.E., Engineer-in-Chief, Metropolitan Board of Works, Melbourne, sworn and examined:—

W. Thwaites, M.Inst.C.E. 17 July, 1902. Melbourne water supply. Cost of supplementary works. Acheron River. Watts River. Protests from Trusts. Proposed diversion. Conditions regarding diversion.

3097. *President.*] What is your name? William Thwaites.
3098. You are a member of the Institute of Civil Engineers and Engineer-in-Chief of the Melbourne Metropolitan Board of Works? Yes.
3099. Will you tell us what the Board desire to do in regard to the proposed diversion from the Acheron River? We have a very fair water supply to Melbourne, and a fair gathering ground; but as population increases we are getting towards the limit of the available supply. Any large extension of the water supply must be obtained from the Upper Yarra. We have had detailed surveys made, and find the levels of the upper reaches of the river very low, consequently the works would be very long and very expensive. The smallest expenditure for which works to supplement the present supply could be carried out would be not less than three-quarters of a million pounds. As a source of supply for the immediate future, the attention of the Board's officers has been drawn to the valley of the Acheron, which covers an area of about 13,000 acres at a level of 1,640 feet above the sea. The Acheron forms one of the branches of the Goulburn, and is an upper tributary of the Murray. Until the last few years that portion of Victoria was looked upon as being in the valley of the Yarra, and it was only by accident that Mr. Dowden, Superintending Engineer for Water Supply, discovered it was not so. At the present time the water supply of Melbourne is drawn from 85 square miles of the watershed of the river Watts. In giving evidence previously before the Forests' Commission, I explained that we wanted water to help us through the summer; but I was misunderstood. In giving their decision on the question, the Commission reported that: "Subsequently there arose serious opposition to the Board's project in the shape of written protests to the Water Supply Department from the Nagambie, Tatura, and Shepparton Urban Water Trusts. They advanced general grounds for their action, viz., that the proposed diversion would diminish the flow of the Goulburn, already low enough at certain periods of the year, and to a certain extent affect the supplies required for irrigation and domestic purposes. On this aspect of the question we sought information from Mr. Stuart Murray, C.E., the Chief Engineer for Water Supply, who expressed the opinion that, while the diversion of even 20,000,000 gallons a day from the Acheron during the wet season would not in any practical way be injurious to the settlers along the course of that stream and in the Goulburn Valley district, the withdrawal of a much less volume in summer might be so." I quite agree with that statement; but what I recommended my Board to ask for was: "That the maximum capacity of the channel be not more than 10,000,000 gallons per day." On page 8 of the same report Mr. Stuart Murray advises that "any grant of water for the purpose proposed should be subject to a condition that there should be no diversion when the natural discharge of the Acheron falls to 6,000 gallons per minute." All I ask for is that the 6,000 gallons be increased to 7,000 gallons, and that we then be allowed to take 10,000,000 gallons instead of 8,640,000 gallons per day. The next sentence in the report reads, "Further, that when the discharge exceeds 6,000 gallons per minute, that volume at least be allowed to go down the river." My second suggestion is, that if that be allowed, it should be on the following conditions:—"That if, in the opinion of the Engineer-in-Chief of the Victorian Water Supply, the water be required for the use of the settlers in the Goulburn Valley, no water be taken from the Acheron during the months of December, January, February, and March. I suggested that the maximum capacity of the channel should be not more than 10,000,000 gallons per day, and that if the water were required for the use of the settlers during the summer months, we would, on written notice from the Department, cease taking it. By thus using the Acheron supply during the winter, we should help our summer supply. Mr. Murray, in his subsequent remarks, did not appreciate the tenor of my evidence. On the same page Mr. Murray is said to give his final opinion, as follows:—"I now know for the first time what it is that the Board desire from the Acheron; that is, to divert the small stream that flows in summer down that river, so as to save taking the water from their own storage during summer. That means that the Board desires to take the water of the Acheron; and the argument could be, and, I think, would be, extended to other streams sooner or later, that the summer water of those streams, which is the only water flowing into the Goulburn in summer, should be diverted. That would mean that the Government, or the authority supplying water to the northern country, must provide further storage for the Goulburn Valley and the country dependent upon the Goulburn, in order to save the metropolis from increasing its storage to save winter water. From that point of view I object, on the part of the Water Supply Department, to the diversion involved from the Goulburn." That is an entire mistake of the meaning of my evidence. We use as little water as possible from the Yan Yean storage reservoir in the winter, and by that means keep up the level in the reservoir, drawing from the Maroondah in the winter time, and thus using the surplus water from that system. We propose to use the water from the Acheron in the same way, and thus keep back the winter water in the main reservoir for use in the summer time. This is what I was trying to explain to the Forests' Commission, but it was not quite appreciated. This scheme would only cost £40,000 or £50,000, and would give 10,000,000 gallons per day extra for eight or nine months of the year.

3100. Did you not propose originally to divert 20,000,000 gallons per day during the half-year from May to October? No.

3101. Did you propose to divert 10,000,000 gallons per day through the year and 20,000,000 gallons per day from May to October? On page 35 you will see my evidence, which reads, "The way the Board would utilise the supply is this: we would take the water that we would be allowed to take. Our suggestion is to have an aqueduct to carry 10,000,000 gallons. Then we could not take any more than that aqueduct would hold; every other drop of water would go down the Acheron. The only difficulty I felt was the fixing of the minimum of 8,000,000 gallons." How the misconception rose has always been a mystery to me.

W. Thwaites, M.Inst.C.E. 11 July, 1902.

3102. Do I understand that the proposal of your Board is to divert a maximum of 10 million gallons per day, with a minimum of 8 millions between the months of April and October? We should have the right to divert 10 million gallons from April to October; but I would leave the amount to be diverted during the period between November and March entirely to the discretion of the Engineer-in-Chief of the Victorian Water Supply, and if he so desire would shut the water off altogether, provided the Board could get 10 million gallons druing the other months.

3103. Would you be able during the months of October and April, to divert the water into the mains direct, without storing it in a reservoir? Yes.

Upper Yarra scheme.

3104. What quantity of water could you get from the Upper Yarra, supposing you were not allowed to do as you wish in regard to the Acheron? The whole of the Upper Yarra is sufficient to supply a population nearly as great as that of London.

3105. I understand the desire of the Board is to make a diversion, so as to supplement the Melbourne supply in a cheap manner? Yes. There are two watersheds in question,—one of 81 square miles on the extreme portion of the Upper Yarra, which is equal to 35 million gallons per day; the other is on the O'Shaughnessy,—it contains about 50 square miles, and is equal to a supply of 25 million gallons; or a total supply from both catchments of 60 million gallons per day. But in order to get that water it would be necessary to construct about 6½ miles of open aqueduct, with a radius of 4 feet, and slopes of 1 to 1, to bring the 35 million gallons from the Upper Yarra,—then syphon it across to the O'Shaughnessy Valley, and then bring it a further distance of 37¾ miles by channel having a radius of 5 feet, with slopes of 1 to 1, until we reached a point whence we should have to contour the Maroondah Hills, to the proposed Maroondah Dam. From that point 51-inch pipes would be required for a distance of 9¼ miles, and thence 19 miles in 42-in. pipes to Surry Hills Reservoir, and as far as I can see at present three-quarters of a million would have to be spent before you could get any supplementary supply from the O'Shaughnessy, and £1,200,000 for the full supply from the Upper Yarra. Whereas, if the desired arrangement can be come to, we could obtain 10 million gallons for £50,000.

3106. The position is, supposing your suggestion is adopted, that you would be able to get 10 million gallons per day at a cost of £50,000; that would be at the rate of £5,000 per million gallons; whereas if you go to the Upper Yarra, you would get 60 million gallons per day at a cost of £20,000 per million gallons? Yes; but before we could get a drop of water there must be such a large capital expenditure, interest on which would of course have to be borne by the present population, whereas the benefit would be more for the future.

3107. There is also this aspect of the question: the waters of the Goulburn River can be utilised for irrigation, and stock, and domestic purposes, in the drier portions of your State, whereas the waters of the Upper Yarra cannot,—therefore if you trespass to any great extent upon the Goulburn waters you take from the people who cannot get the Yarra water, that which they could use to profit; whereas you can use the Yarra water? Of course, we can obtain it by a sufficiently large expenditure; but 10 million gallons per day would only represent 1 1 per cent. of the lowest gaugings at the Goulburn weir, viz., 1884.

3108. Have you the gaugings before you when you give those figures? Yes.

Daily consumption.

3109. *Mr. Burchell.*] What is your average daily consumption? Sixty-one gallons per head for a population of 497,000; a total of 30 million gallons per day.

3110. Ten million gallons per day would only increase your supply by 30 per cent.? Yes.

3111. While the supply from the Upper Yarra would more than double it? Those two water-sheds added to our present supply would, I think, on our present basis, supply a population of over 1½ million, but we have not the means to pay for so large a scheme.

3112. But it would provide for all future requirements? If you launch out into such a large expenditure for a population non-existent, the present population has to finance it.

3113. The 10 millions would not be adequate? It would be of great benefit, and would provide for an increase of 30 per cent. on the present population, by which time we should be in a better position to undertake the larger scheme.

William Dowden, Superintending Engineer of Melbourne Water Supply, Melbourne, sworn and examined:—

W. Dowder. 10 July, 1902.

3114. *President.*] What is your name? William Dowden.

3115. You are Superintending Engineer for Melbourne Water Supply? Yes.

3116. You have heard the evidence given by Mr. Thwaites;—do you agree generally with it? Yes; but I would prefer to have the proposed channel large enough to carry 20 million gallons instead of only 10 million gallons.

Size of channel.

3117. You are aware that there is a proposal to construct a large reservoir at Waranga, in connection with the Murray-Goulburn scheme, and that the surplus winter water from the Goulburn will therefore be required to fill that reservoir for use in the summer months? Yes.

3118. Therefore the winter water will, to some extent if not wholly, be utilised in that way? There will always be a lot of water wasted in the winter time.

3119. Taking these facts into consideration, you still see no objection to increasing the channel so that it will carry 20 million gallons per day? No.

FRIDAY,

FRIDAY, 18 *JULY,* 1902.

[*The Commission met at the Shire Hall, Swan Hill, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

John Gray, Councillor of the Shire of Castle Donnington, and Secretary to the Swan Hill Irrigation Trust, sworn and examined:—

J. Gray. 18 July, 1902.

3120. *President.*] What is your name? John Gray.

3121. You are a Councillor of the Shire of Castle Donnington, and Secretary to the Swan Hill Irrigation Trust? Yes.

Trust area.

3122. Have you a plan showing the area of the Trust, &c.? Yes. [*Exhibit* 73.]

3123. What is the area of the Trust? 15,000 acres.

Irrigable area.

3124. What portion of that is irrigable? About 12,000 acres.

3125. Could you tell us what was irrigated from the 1st July, 1901, to the 30th June this year? Approximately, 6,000 acres; from 1st January to 30th June this year, 2,305 acres.

3126. Does that mean one or two irrigations? One.

Crops.

3127. What crops were grown? 458 acres wheat, 524 oats, 242 barley, 349 lucerne, 66 sorghum, 645 grass, and 21 orchard.

3128. What do you estimate that you put on each irrigation? I have not got the remotest idea.

Depth of irrigation.

3129. Do you not take any measures at all to arrive at the quantity? No; it is supposed to be 3 inches, but I expect it would be nearer 1 foot.

Revenue.

3130. What was the revenue of the Trust last year? About £1,200.

3131. How was that made up? About £600 in rates, at 7s. in the £; and the balance in charges for water. The water is sold at the rate of 3s. per acre for the first watering, if pumped; 3s. per acre for the second watering, if pumped; if by gravitation, 2s. per acre.

Pumps.

3132. What pumps have you? Two 15-inch.

3133. Have you any idea what quantity you pump during the year? No.

Lift.

3134. What is the lift? The greatest lift is 15 feet.

3135. That is under the most unfavourable circumstances? Yes.

3136. At what level do you discontinue the pumping? I understand it is 9 ft. 6 in. on the old river gauge here; but what that is on the new gauge I do not know.

3137. What is the zero of the old gauge? Summer-level.

Gravitation level.

3138. At what level will it gravitate? 9 ft. 6 in. on the old gauge.

3139. Do you experience any scarcity of water? No.

3140. You always get as much as you want? Yes.

3141. You irrigate, therefore, as much as you can? Yes. Of course, it is more expensive to lift when the river is very low; but there has been no shortage so far.

Total expenditure.

3142. *Mr. Burchell.*] What is the total cost of the whole of the Trust works? I could not say. The total expenditure has been £24,800; but that is not the works alone.

Amount written off

3143. Has any of that been written off? Yes, £19,000. There was some £7,000 interest written off in addition to that.

Fuel.

3144. What fuel do you use in connection with the pumping engines? The ordinary local wood.

3145. Where do you get it from? Some by steamer from down the river, and some locally, within 7 or 8 miles of the town.

3146. How far does the steamer bring it? About 25 or 30 miles.

3147. What is the difference in the cost? There is practically no difference.

3148. Is the local wood getting scarce? Yes.

3149. Have you any idea how long it will last? As time goes on it will become more scarce. I should say three or four years hence the wood would be far more expensive.

3150. If you could get it up by river, do you think there would be the same fear of it becoming more expensive? No; but you would have to lay it all in when the river was high.

3151. Do you think water carriage would be a consideration to you? If the river were locked, water carriage would be provided for, and we could then get our water by gravitation.

3152. Are you in hopes of getting the river locked? Yes; it would do away with pumping altogether.

Ratepayers.

3153. Would you be prepared to pay part of the interest on the capital cost? Yes.

3154. How many ratepayers are there in the Trust area? Fifty-two.

3155. Are they all irrigationists? With perhaps one or two exceptions. Some of the land is too high; but everyone who can use the water does so.

Irrigation and navigation.

3156. How does Swan Hill as a township regard the questions of irrigation and navigation? Irrigation is of far greater importance to the town and district than navigation.

3157. Is navigation of any benefit to the town? A little.

3158. To what extent? To the extent of getting produce away, such as chaff.

3159. Have you any land of your own? Not on this side of the river; none within the Irrigation Trust.

Yield.

3160. Can you tell us anything about the yield of the crops which have been watered? The yield varies from the first year the ground is flooded. There have been such yields as eighteen bags of oats to the acre, twelve and thirteen bags of barley, and eight or nine bags of wheat, on the irrigated land.

3161. What amount of water do you estimate was put on? One foot; perhaps more.

3162. Is that ground prepared for the water in the way of being graded? No; but it is fairly level. It is cut into small allotments by check banks.

3163. What is the largest area of wheat or barley that one settler is likely to water? I could not say definitely; some 200 acres, and some more. It varies from 50 up to 360 acres.

3164. Of wheat? A man with 300 acres would have part wheat, part barley, and part oats.

3165. What would be the result without irrigation? Nothing at all. All the land inside this Trust would grow nothing without water, except in a very exceptional season, which might happen once in ten or twelve years.

J. Gray. 18 July, 1902.

3166. How many sheep to the acre would this land carry in its natural state? I do not think it would carry one sheep to the acre.
3167. How many sheep do you think it would carry on native grass land, with irrigation? About two and a half.
3168. With lucerne? I should think it would carry five sheep to the acre.

John Adams, engine-driver to the Swan Hill Irrigation Trust, sworn and examined:—

J. Adams. 18 July, 1902.

3169. *President.*] What is your name? John Adams.
3170. You are the engine-driver employed by the Swan Hill Irrigation Trust? Yes.
3171. We have been told that there are two 15-inch pumps? Yes.

Lift of pumps.

3172. What would be the minimum and maximum lift? From 8 feet to 15 ft. 3 in.
3173. How many months in the year do you work the pumps? Three or four, as a rule.
3174. How many hours a day? Twenty-four.

Gravitation.

3175. How many months do the gravitation channels run? It all depends on the river. Last year they ran something like four or five weeks.
3176. Would that be a fair average? No; I think an average year would be about ten weeks.

Capacity of pumps.

3177. Have you any idea what the pumps throw? Yes; with a 15-feet lift, 11,000 gallons a minute.
3178. Can you give us the maximum? Up to 17,000 gallons a minute.
3179. Do you know what passed through the three gravitation channels? I could not say.

Robert Hastings, Commissioner of the Swan Hill Irrigation Trust, sworn and examined:—

R. Hastings. 18 July, 1902.

3180. *President.*] What is your name? Robert Hastings.
3181. You are a Commissioner of the Swan Hill Irrigation Trust? Yes.
3182. Can you tell us the size of the gravitation channels?

Size of gravitation channels.

No. 1.—Gravitation channel is 17 feet wide, and takes off when the river is 10 feet above Summer-level at Swan Hill (old gauge). The channel leading from this is 10 feet wide in the bottom, with a 2 to 1 slope.

No. 2.—Gravitation channel offtake is 15 ft. 6 in. wide, and takes off at 9 ft. 6 in. above Summer-level at Swan Hill. The channel leading from this is 20 feet wide, with a 2 to 1 slope. This channel has for the last six years supplied about 80 per cent. of the water used in the Trust by gravitation.

No. 3.—Gravitation channel is 8 feet wide, and takes off about the same level as No. 2, and the water diverted by it is of a limited quantity. The pumps when working throw about 14,000 gallons per minute, and irrigate 50 acres in twenty-four hours.

Areas irrigated.

3183. Can you give us the areas irrigated for the last two and a half years? Yes.

Swan Hill Irrigation and Water Supply Trust.

	acres.
Irrigated in 1900—	
First watering...	6,135
Second „	2,328
Total...	8,463
Irrigated in 1901—	
First watering...	3,815
Second „	1,751
Total...	5,566
Irrigated in 1902 up to 30th June—	
First watering...	2,473
Second „	166
Total...	2,639

The crops irrigated three times are so few that they have been included under the head of "Second Waterings."

Water supply.

3184. Do you find that you are labouring under any disability in regard to the quantity of water that you require? No; there is no scarcity of water yet, but if the river had been 9 inches lower than it was this Summer we could not have pumped at all.
3185. What amount of water is put on the land each irrigation? It is impossible to say.

Depth of watering.

3186. Could you give us any idea? There are not two blocks that would take the same quantity of water. In some cases there would be quite 12 inches; in others, perhaps, only 2 inches.
3187. Would last year be a fair criterion of the area irrigated each year? It could scarcely be called a fair criterion, as in many cases it took three waterings to get a crop on.
3188. We are told by the Secretary that 6,000 acres, or thereabouts, were irrigated last year;—does that comprise land that was irrigated more than once? Some of it was irrigated twice, and some three times.

Benefits of irrigation.

3189. What has been your experience as to the benefit to be derived from irrigation? There is no question as to the benefits of irrigation. The land in this Trust would not have yielded 1 acre of crop for the last eight years had it not been for the water put on artificially.

Charge for water.

3190. What do you think would be a fair charge, over and above the rates that you pay, for land that is irrigated? Taking into consideration the general rate of 7s. in the £, in conjunction with the rates charged for the water, I think it is as much as the ratepayers can afford to pay.
3191. *Mr. Burchell.*] Is it 3s. per acre for the first watering? Yes.
3192. That is by pumping? Yes.
3193. What is the charge for the second watering by pumping? Three shillings.
3194. And what for the third? The same.

3195. That would be 9s. for the three waterings, if by pumping? Yes. The cost is so high that it prevents the extension of irrigation in the Trust. R. Hastings. 18 July, 1902
3196. If you could get three irrigations by gravitation, what would the charge be? The first watering 2s., and the second 1s.; that is as far as cultivated land is concerned, but surplus water is allowed to flow over grass land for 6d. an acre.
3197. Supposing you wanted a third watering for crop land, by gravitation, what would the charge be? 1s. per acre.
3198. Do you consider it is worth that amount? Yes; I think that is a very reasonable charge.
3199. You consider it worth 9s. an acre? We have had to pay that; it is better to pay 9s. than to have your stock starve.
3200. Would it not be worth quite 9s. to have such yields as 18 bags of oats to the acre, 12 bags of barley, &c., rather than have no crop at all? Yes.

Richard Bloomfield Rees, landowner, Swan Hill, sworn and examined:—

R. B. Rees. 18 July, 1902.

3201. *President.*] What is your name? Richard Bloomfield Rees.
3202. You are a property owner of Swan Hill? Yes; and a farmer at Lake Boga.
3203. I understand you were present at the Conference held at Corowa some months ago? Yes; I attended that Conference on behalf of the Shire of Castle Donnington and the Swan Hill Agricultural Society.

Bungowannah Conference.

3204. So far as the interests that you represented are concerned, what do you regard as being the dominant feature? Undoubtedly the dominant feature is the conservation of the waters of the Murray at flood-level all the year round. At that Conference there were certain proposals for the diversion of the waters of the Murray at Bungowannah into New South Wales and Victoria. The total diversion proposed there was 80,000 cubic feet per minute into two main channels. It was also proposed to construct a storage basin at Talmalmo, with a capacity of 11,000,000 cubic feet.

Weirs and locks.

3205. What phase of the case were you deputed to represent? It was clear to us that this big diversion at Bungowannah, on the Upper Murray, would destroy our flood river, and I was there to urge that either the river should be weired and locked, or that that diversion should not take place.
3206. In what way will the locking of the river affect the interests that you represent? If our river is not kept up a banker here, the enormous flooding of the adjacent country during the flood period would not take place; the lakes would not be filled, and all our gravitation schemes would be of no avail. Therefore, it was absolutely necessary that we should have a full river at any rate, as at present, during the flood period.
3207. Is there any other reason, so far as Swan Hill is concerned, why the river should be locked? The primary reason, of course, is irrigation; the secondary, the navigation of the river the whole year round, so that we would be able to send goods from here into other parts of Victoria, towards Mildura, and into New South Wales.
3208. You are aware, I suppose, that the mere raising of the surface of the water is not water conservation? In one sense it is not, and yet in another it is. If we raise the surface of the water by means of weirs, provided there is enough compensation water sent down from the head works, we would be able to water by gravitation all the year round.
3209. The effect of raising the level of the water would be simply to facilitate irrigation;—is not that what you mean? Yes.

Lake Boga scheme.

3210. You have had something to do with the pumping scheme at Lake Boga? Yes. I have a plan here (*produced*) of the lakes at Boga, and of the proposed diversion, showing the area to be served by that pumping scheme—600 square miles of mallee country.
3211. The particulars of that pumping scheme are given in the Parliamentary Standing Committee's report on the question? Yes. The proposal is to pump about 1,500 gallons per minute for 200 days in the year, but we are going for an extension of that scheme, in order to make it an irrigation project, which will involve pumping all the year round, and probably double the volume of water, as proposed by the Railway Standing Committee.
3212. What quantity of water would that be? Six hundred times 350,000 gallons per annum. It would be double that if we had the full scheme working.

Effect of Bungowannah scheme on river level.

3213. Supposing the diversion as proposed at Bungowannah takes place, would you be affected, as far as the lakes are concerned? Yes. The proposed diversion would reduce the flood-level of the river by about 5 feet. The sill of the lakes is about 2 ft. 6 in. below flood-level, so that if the proposed diversion is carried out the river will be practically 2 ft. 6 in. below the in-take of the lakes, and the lakes would never fill. The river at Swan Hill is 365 feet wide; 1 foot deep means a flow of somewhere about 40,000 cubic feet per minute, so that for every 40,000 cubic feet diverted on the Upper Murray it means a reduction of 1 foot in the flood-level of our river here, and the proposals before the country now in New South Wales and Victoria really involve a diversion of nearly 200,000 cubic feet per minute, which would mean a reduction of at least 5 feet in the level of our river.

Proposed rate.

3214. *Mr. Burchell.*] How do you feel disposed towards the recommendations of the Railway Standing Committee in regard to the rates to be levied in connection with the extension of the pumping scheme? We thoroughly endorse it here, and think it would be a very equitable proposal. If the whole of the country served with a stock and domestic supply contributed ½d. per acre per annum, I think that would be sufficient to pay working expenses and interest.
3215. Do you think they could pay 2d. per acre? I think 2d. per acre would pay for more than the whole scheme—that is, supposing the locking of the Murray cost £3,000,000.

Mildura railway.

3216. With regard to Swan Hill as a port on the river, how do you think the Mildura railway will affect it? At present it will reduce the trade of the port to a certain extent.
3217. It will go to Melbourne? The perishable products will go undoubtedly by rail.

Permanent navigation.

3218. Suppose the river were permanently navigable to Echuca, do you think the bulk of the trade, so far as non-perishable goods are concerned, would go by the river? I think it would, unless there were differential rates on the railways. Water carriage is so much cheaper than rail. I think, if the river is locked down to Victor Harbour, the bulk—that is, the heavy trade—will go from here to South Australia.

R. B. Rees. 18 July, 1902.

3219. You base that opinion on your past experience of the river? My past experience is that water is cheaper than rail carriage.
3220. Is the river unusually late in its opening this year? Yes; it only opened last week. I find it often opens in May and June.
3221. How do you account for that? Owing to the drought; no rainfall on the upper reaches.
3222. Do you think the diversions on the upper part of the Murray have had anything to do with it? I think so. The enormous diversion at the Murchison weir must have had a great effect on the river this year. There have been one or two freshets on the Goulburn this year, and they have not made any difference in the Murray.
3223. Where do you usually send goods to from this port? I think most are sent from Echuca through this port to the Murrumbidgee, the Darling, and the Edwards.
3224. Do you know anything of the carting that has been done to any of the interior stations? This year the carting has been very heavy; about 100 tons a week have been sent from Swan Hill to Balranald and the Wakool country by one firm of carriers, and there are numbers of private teamsters.
3225. What does it cost per ton? 1s. per ton per mile.
3226. What would it cost by steamer? About 10s. a ton to Balranald.
3227. What is the distance from Swan Hill to Balranald? 60 miles by road.

John Healey Stewart, Councillor of the Shire of Castle Donnington, Swan Hill, sworn and examined:—

J. H. Stewart. 18 July, 1902.

3228. *President.*] What is your name? John Healey Stewart.
3229. You are a councillor of the shire of Swan Hill? Yes.
3230. Are you an irrigator? Only on a small scale—40 or 50 acres.
3231. Did you irrigate last year? About 20 acres only.
3232. What did you irrigate? Lucerne and a little barley.
3233. How many irrigations did you have on the 20 acres? Only one.
3234. Did you find it an advantage? I did.

Effect of irrigation.

3235. How would you state the advantage that accrued to you? There was a fair return from the portion I got the water on to, but from the portion I could not water there was no return at all.

Locking.

3236. How do you regard the question of the locking of the river? If the proposed diversion above Albury is carried out, as suggested, the life of this district and the prosperity of the people would depend wholly and solely on the weiring and locking of the river.
3237. In what way? The proposed diversion would lessen the quantity coming down; but if the level of the water were raised by locks and weirs a large quantity of land could be watered by gravitation, and hundreds of thousands of acres put under profitable cultivation.
3238. As I understand you, you say that the effect of the diversions, as proposed, would be, first of all, to lower the level of the river, and after that to deprive you of water which you are now privileged to use, and consequently the land that at present can be irrigated by gravitation could not be irrigated? That is so.
3239. You think if locks and weirs were put in it would have the effect of commanding more land by gravitation than under present conditions? That is my impression.

Land values.

3240. What do you estimate the value of land that can be irrigated as compared to unirrigable land? A very large portion of the land round Swan Hill is of very little value without water. I consider that land at the present time, which is not worth more than £3 per acre, would be worth from £5 to £6 were it watered.
3241. What do you think it could pay per acre for the water? It depends a good deal as to what it is used for.
3242. You heard the evidence to the effect that there had been about £25,000 expended on the Swan Hill Trust;—do you think it is possible for the Trust to pay interest on that amount? No.

Mistakes in construction.

3243. In how many years do you think it would be possible, assuming you go on as you are now? The money was not expended in the best way. Had it been expended in the light of further experience and knowledge which we have gleaned since, we would have had a better return, and I am satisfied it would have paid from the start. It was an engineering blunder from the beginning, and the money was wasted.

Capital wasted.

3244. In what way was it wasted? Through the channels being too small at the inception, and they became silted up. In some portions the channels run through soil all crab-holes, and it will not hold the water. There are some hundreds of miles of channels, and while a man may be looking after one portion another portion will have broken away. If they started *de novo*, and only spent one quarter of the money, it would make a better job.
3245. Do you think one-third of the amount could have been saved in the construction? I think more than that. I believe one-half of it could have been saved.
3246. In the light of present experience, you believe if the channels had been properly carried out, it would have been possible to pay interest? Yes.

David Johnston, Manager of Murray Downs Station, New South Wales, sworn and examined:—

D. Johnston. 18 July, 1902.

3247. *President.*] What is your name? David Johnston.
3248. You are manager of Murray Downs Station, New South Wales? Yes.
3249. What is the acreage of that station? About 90,000 acres.

Stock.

3250. What sheep do you carry at the present time? About 44,000 sheep, 350 cattle, and 44 horses.
3251. I suppose you sometimes carry more than that? Yes; in good seasons.

Locking.

3252. How would you be affected on your station by the locking of the Murray? It would suit the station if the locks were sufficiently high to permit of the flooding of the lands that are subject to inundation annually.

Flooded land.

3253. How much flooded land have you? Approximately 10,000 acres.
3254. What height in the river is it flooded at? A full river.
3255. Each year? Yes.
3256. Was it flooded last year? Yes; but not the whole 10,000 acres.

3257.

D. Johnston. 18 July, 1902.

3257. Do you irrigate at all? We do; but it is naturally flooded land. We have some lucerne in, and a portion under cultivation.
3258. Do you pump on to the irrigation area? Yes, when we cannot get water by gravitation.
3259. How many acres of lucerne do you irrigate? About 500 acres.

Locking.

3260. From the statement you have handed to me, it would appear that you regard it of considerable moment that before any diversion takes place a system of locking should be carried out? Yes.
3261. I suppose your reason for that is that, unless the surface of the water is kept up by locks, if the water is diminished the flooding of the land will not take place? Yes.

Ana-branches.

3262. What effect would the locking of the river have on the ana-branches of the Murray? It would supply them with water permanently.
3263. At what level do the ana-branches get their supply? A full river.
3264. So that, unless the locking is effected, the ana-branches would cease to exist? Exactly.
3265. How far do they extend back from the Murray? About 40 miles, roughly.
3266. Is there much settlement on the ana-branches? Yes.
3267. Do you think that, if the water did not find its way along these ana-branches, settlement could not exist? I do.
3268. *Mr. Burchell.*] What do you grow your sheep for? Wool chiefly.
3269. Do you send any to market at all? Yes; fats.
3270. How do you send them? By rail from Swan Hill, and we often sell on the place.
3271. Where do you send your wool? To Echuca.
3272. Is that cheaper than by rail from Swan Hill to Melbourne? Yes, and more convenient.
3273. Supposing the diversions were so extensive as to render the river unnavigable, would it be a disadvantage to you? Yes, we would have to use the rail.
3274. Would that be more costly? Yes.
3275. Does that apply also to other settlers and stations on the river away from the railway? Yes; certainly.

Frederick Edmund Vandeleur, Inspector of Station Properties for the Australian Mortgage, Land, and Finance Company, Melbourne; and Manager of Canally Station, on the Murray and Wakool Rivers, sworn and examined:—

F. E. Vandeleur. 18 July, 1902.

3276. *President.*] What is your name? Frederick Edmund Vandeleur.
3277. You are an inspector of station properties for the Australian Mortgage, Land, and Finance Company, Melbourne? Yes.
3278. You also manage Canally station, which has a double frontage to the Murrumbidgee and a frontage to the Murray and Wakool Rivers? Yes.
3279. You have had experience elsewhere? Yes. I have had over thirty years' experience.
3280. You have prepared a statement on the subject remitted to us for inquiry? Yes.

Locking.

3281. Will you read it? I am of the opinion that the river requires locking, both for the purpose of navigation and irrigation; irrigation is the more important of the two. Canally is situated between Balranald and the junction of the Murrumbidgee and Murray Rivers, and it depends greatly on the Murray whether our frontage lands on the Murrumbidgee get flooded or not. If the Murray is low the water has too much get-away and does not rise high enough to inundate much of our country, and, if the waters of the Upper Murray are diverted, our case will be still worse. I believe the Yanco cutting has robbed us of about 2 feet of water—a very serious matter. I look on the low-lying frontage as valuable land if inundated annually, but of little value otherwise, and consider it an injustice that the water should be diverted elsewhere. This water is not only used for stock, but for irrigation also, by the residents on the Yanco and Billabong, and what is not required by them is allowed to run away into the Edwards, and then into the Murray. I would suggest that flood-gates be put at the entrance to the Yanko Creek, and that no water be allowed to go down that creek until the river has fallen within its banks at Balranald, or until the river has risen to the level of the old original bar of the Yanko Creek, when the top waters might be allowed to go down. When the present work of widening the Yanko Cutting from 9 to 15 feet is finished, according to a Departmental report, a 9-foot flow in the Yanko will mean one-ninth of the whole stream being diverted from the Murrumbidgee, and so on in proportion. This will make our position worse than at present. We require the top of the flood to inundate our country. If the water is allowed to flow down the Yanko Creek, as at present, or as is proposed, I consider, to compensate us, the river should be locked from the junction of the Murray to a point between Narrandera and Hay. Mr. Surveyor Granter estimates that only six locks would be required between the junction and Hay, at a cost of from £15,000 to £20,000 each. If the proposed lock at Toogimbie is carried out, without locks being made lower down, our position will be still more serious. With reference to the waters of the Murray, which irrigate a large area of land all the way down the river, if the upper waters are diverted, the low-lying lands will not get inundated in ordinary floods, and, instead of being highly valuable, they will be of little use. We have purchased much land on Poon Boon, and other land-owners have done the same, simply because it gets naturally inundated, but none of us would have done so had we thought our water supply would be cut off. The diversion will also prevent our lakes getting filled, and thus deprive us of much of our water supply for stock. On Kulkyne there are several lakes which the Murray fills, but if the water is diverted they will probably become dry. If the rivers were locked, and a good supply of water stored, I feel certain large areas of artificial feed would be grown, and the lives of thousands of stock saved in times of drought. The rainfall is too light to grow feed otherwise than by irrigation. I consider also that the river requires locking for navigation. With permanent navigation we would have the choice of markets, instead of being nearly altogether dependent on Victoria for our supplies, as at present. I have been artificially feeding 16,000 sheep, and had to purchase the fodder in Victoria, rail it to Swan Hill, and then cart some of it as far as 50 miles at an enormous expense. With navigation the fodder could have been landed on the bank of the river at a much smaller cost, and other settlers would have been able to feed their stock also (which they could not do owing to heavy land carriage), and thousands of sheep thereby saved. I consider we require direct water communication with Victor Harbour, which is the natural outlet for our produce as well as that of the Darling.

Yanco cutting.

Toogimbie.

Kulkyne.

Navigation.

3282. *Mr. Burchell.*] How many years have you been on the rivers? Since 1870. I was on the Darling principally.

3283.

F. E. Vandeleur. 18 July, 1902.

3283. You are acquainted with most of the sheep stations by name? I know a great many of them.
3284. *Do you know them from South Australia up the Darling?* Yes; from Wentworth to Wilcannia, and up to Bourke, and also on the Lower Murray.
3285. In the early days, by what means did the settlers get the necessaries of life to their stations, and their wool to market? By steamer.
3286. What would be the effect if *the river were rendered unfit for navigation along the frontage to their holdings?* They could not live on them.
3287. What do you estimate as the number of sheep and the area of land that would be practically useless if there were no navigation? I do not think any of the land on the Darling would be worth living on.
3288. Have you any idea of the value of the stock that is being grown on stations abutting the river? It would run into some millions.
3289. I understand from you that the navigable river is the means by which the settlers have been *maintained?* Since I can remember, they got their produce by steamer.
3290. Supposing that were taken away? You would take away their means of transit altogether.

Allan James Bruce Waugh, Manager of *Poon Boon Station*, Murray and Wakool Rivers, New South Wales, sworn and examined:—

A. J. B. Waugh. 18 July, 1902.

3291. *President.*] What is *your name?* *Allan James Bruce Waugh.*
3292. You are Manager of Poon Boon Station? Yes.
3293. Have you prepared a statement bearing on *the subject remitted to us for inquiry?* Yes.
3294. Will you read it? Poon Boon holding is situated on the Murray and Wakool Rivers, the Murray being the principal frontage. Area of Crown lands, about 63,127 acres; freehold lands, 48,454 acres; total area, 111,581 acres. About 2,900 acres of Crown and 10,700 acres of freehold land, being Murray frontage country, are more or less inundated annually, and comprise the best land on the run. This flooded land was some of the first purchased, being considered more valuable owing to its annual inundation. Without flooding, the country is of no more value for grazing purposes than other freehold lands within the holding, the carrying capacity of which is a sheep to 4 acres. The river at Swan Hill requires to be 11½ feet above Summer level for two weeks to flood all low-lying land fronting the Murray, and the water should remain on the land from 15th July to 15th December to make the country at its best for grazing. To fill Lakes Wollare, Gonimur, Talpile, Poomah, Poon Boon, and Genoe, the river would have to stand at 11½ feet for six months. Twelve feet 6 inches will fill the lakes mentioned, and run into the Wakool River, if at that height for three months. Lakes Poomah and Poon Boon are the principal ones to water the country back from the river, and unless *these lakes are replenished yearly, there is great* danger of them becoming dry if the water is diverted higher up. Most of the freehold land around these lakes was bought on account of the water frontage, and, if not replenished yearly, other provision in the way of tanks at a large cost would have to be made. Owing to the uncertain rainfall, they would, perhaps, be dry and useless for years at a time, and when rain did fall would most likely be valueless, owing to their being filled with drifting sand. I consider that before the water is diverted, the locking of the river should be gone on with.

Area. Flooded land. Lakes. Water frontage Locking.

3295. You give 12 ft. 6 in. as being necessary to fill certain lakes;—to what gauge do you refer? Twelve ft. 6 in. at Swan Hill, above Summer level.
3296. Which is *zero on the gauge?* Yes.
3297. How many sheep do you carry on your run? 20,000 or 30,000.
3298. You give the *carrying capacity of the ordinary freehold* land as one sheep to 4 acres;—what do you say is the carrying capacity of the flooded land? Five or six sheep to the acre from December to March.
3299. I gather from your statement it is your opinion that, if *water is diverted to any very great extent*, the effect on your property would be disastrous, unless locking were resorted to, so as to keep up the level of the water in the river? Yes.
3300. Do you irrigate at all on your station? About 120 acres for hay.
3301. *Mr. Burchell.*] What depth of water is there on that land when it is flooded? It varies from 1 to 12 inches.
3302. What becomes of it? What the land does not absorb is drained on to grass land.
3303. How long does it remain on the land? Six hours. Sometimes the river will come down in May, and it will remain on until November—this on river flats, not irrigated land.
3304. Where do you ship your wool to? It goes to Echuca, and from there to Melbourne.
3305. Where from? From a landing below Swan Hill.
3306. How far is it from your landing to *Echuca?* 231 *miles.*
3307. Do you think that settlement would be largely increased along the river if it were permanently navigable? I think so.

Stock. Carrying capacity. Area irrigated.

Patrick Martin Monahan, grazier, New South Wales, and also butcher at Swan Hill, Victoria, sworn and examined:—

P. M. Monahan. 18 July, 1902.

3308. *President.*] What is your *name?* *Patrick Martin Monahan.*
3309. You are a butcher at Swan Hill, and also a grazier in New South Wales? Yes.
3310. How many acres do you graze in New South Wales? 6,000 *odd.*
3311. In connection with your business as a butcher? Yes.
3312. What has been the effect of the want of water and the drought *generally, so far as your experience* goes? It has been disastrous.
3313. How has it affected you in regard to the 6,000 acres that you speak of? As far as grazing is concerned, it is absolutely worthless at the present time.
3314. Even supposing you have water for your stock to drink, there is no grass for them to eat? No.
3315. Supposing the surface of the water of the Murray were raised by locking, would it affect you at all? Yes; it would be of great benefit.
3316. In what way? Some of my land has a frontage to very deep channels, which at the present time are almost dry—just a chain of waterholes. If the level of the water were raised it should have the effect of filling those channels.

Effect of drought. Locking.

P. M. Monahan. 18 July, 1902.

3317. What benefits do you think would be likely to accrue as the result of the locking of the river? It would be a great benefit to the settlement on the Edwards and Wakool, and the ana-branches—Merran, Yarran, Neimul, Mallan, Coobool, and Bullock Hide.
3318. All those creeks would be affected by the locking of the Murray? Yes.
3319. *Supposing the works that* you have referred to were carried out, would you be prepared to pay part of the cost in the way of a tax, or something of that sort? Yes.

David Wiltshire, Sub-Collector of *Customs*, Swan Hill, sworn and examined:—

D. Wiltshire. 18 July, 1902. Shipping.

3320. *President.*] What is your name? David Wiltshire.
3321. You are *sub-collector of Customs for the port of Swan Hill?* Yes.
3322. You have prepared a return of the tonnage of vessels, inwards and outwards, at Swan Hill? Yes. [*Witness then handed in the following return.*]

Arrivals.			Departures.		
Year.	No. of Ships.	Tonnage.	Year.	No. of Ships.	Tonnage.
1896	220	25,784	1896	218	26,367
1897	160	26,127	1897	161	25,812
1898	195	28,615	1898	196	28,498
1899	230	35,592	1899	226	35 338
1900	250	41,715	1900	249	40,550
1901	287	42,427	1901	289	43,171
Total	1,343	200,260	Total	1,339	199,736

John Adams, engine-driver to the Swan Hill Irrigation Trust, further examined:—

J. Adams. 18 July, 1902.

3323. *President.*] You wish to supplement the evidence which you gave in reference to the quantity of water used in the Trust area? Yes. The pumps discharge a volume of 15,000 gallons per minute working continuously seven days in the week for nine months every year, in order to supply the 13,000 acres of the Trust with water for irrigation, stock, and domestic purposes.

Richard Bloomfield Rees, landowner, Swan Hill, further examined:—

R. B. Rees. 18 July, 1902.

3324. *President.*] How many private pumps of the same description and size as Mr. Burton's, near the punt at Pental Island, are working in the Swan Hill district? Seven or eight.
3325. What area does Mr. Burton irrigate? 4,860 acres; but he has 6,820 acres of irrigable land.
3326. Is the land between the Swan *Hill* Irrigation Trust and the Murrabit Irrigation Trust being irrigated privately? Yes; the whole of it, by pumping and gravitation.
3327. Where is Lake Boga supplied *from—the Murray or the Little Murray?* It is fed direct from the Little Murray.

Lake Boga supply.

3328. Are there any regulating gates on this lake? *No; but the Shire Council propose to put them in,* similar to those at Lake Baker.
3329. At what level, referred to the Echuca gauge, does the water flow into Lake Boga? It used to flow in at 14 feet; but, owing to diversions at *Kow Swamp, Deep Creek, and other places*, the water has now to stand at 16 feet on the Echuca gauge before it flows in.
3330. Is the intake to Lake Baker independent of Lake Boga? Yes; and is controlled by regulating gates.
3331. Where do Long Lake and Round Lake receive their supply from? From Lake Baker.

SATURDAY, 19 JULY, 1902.

[*The Commission met at the Mechanics' Institute, Kerang, Victoria, at 3 p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. *BURCHELL, Esq.*

George Henry Morton, President of the Kerang Agricultural Society, sworn and examined:—

G. H. Morton 19 July, 1902

3332. *President.*] What is your name? *George Henry Morton.*
3333. You are President of the Kerang Agricultural Society? Yes.
3334. You also own land on the Murray, in Victoria? Yes.
3335. How much? About 1,000 acres.
3336. Is any of that land flooded? The whole of it is subject to floods.
3337. Annually? Yes, periodically.
3338. As a consequence, I suppose, you would be interested in the question of locking? Very much.

Locking.

3339. What is your view? The views I hold are similar to those held by *South Australia*, as stated in the *South Australian Register* of the 24th February last:—"If the huge irrigation works that have recently been proposed in Victoria are to be carried out, the least which South Australia (and I might say the people along the Murray Valley) *can demand with due regard to its own interests is that a series* of locks should be established along the course of the river." These locks, I consider, should be of sufficient frequency and height to furnish a supply of water for irrigation by gravitation.

G. H. Morton. 19 July, 1902.

3340. You are aware that the mere locking of the river will not necessarily provide you with water? Yes.
3341. So that, if the water is diverted at Bungowannah in the direction of the Goulburn River, although the river may be locked, and the surface of the water in that way raised, if there is no storage it would have no effect so far as you are concerned? I am aware of that.

Annual flood.

3342. Supposing you are deprived of the annual flood, what would be the effect? The whole of the Murray Valley would be depreciated in value to the extent of 50 per cent.
3343. Where is your place? Near the junction of the Loddon River, in the parish of Benjeroop, Victoria.

Irrigated area.

3344. How many acres did you irrigate last year? I irrigated the whole of my area in the months of October and November. The cost of my irrigation in the month of March last year amounted to 7s. per acre.

Pump.

3345. What does your pump lift? It is a 12-inch pump, with a 60-lb. pressure of a 10-h.p. engine.
3346. At what lift? In March, 12 feet.

Channels.

3347. Is the irrigation you speak of carried out by means of properly-constructed channels? Yes; I have gone to great expense in reticulating the whole of my land with channels.
3348. How many miles of channels have you? Six.

Navigation.

3349. In what way will the navigability of the river affect you? The lessening of the navigable period of the river will prove serious in the matter of transport of produce. We look to a navigable river to take our fodder, such as chaff and oats, down to Mildura and up the Darling and Murrumbidgee in November. If the river falls, we lose that market entirely. In December we look to the river to take our cereals to Echuca; and if we lose the river, it means that we have to cart those cereals to the nearest railway station.
3350. Supposing navigation is continued as at present, say, for six months of the year, does that answer all purposes? If we have to rely on the natural flow of the river, at times we will manage to get our produce away, and at other times we will not.
3351. So that, as a matter of fact, the present conditions do not meet the case? No; we would require a system of locks to assist us in navigation as well as irrigation.

Irrigation.

3352. As one who has had experience in irrigation, will you tell us what your opinion is? I have been an irrigator for some sixteen years, and the result of my experience is that without irrigation we can do nothing whatever with the Murray soils.

Yield.

3353. What would be the average yield of produce per acre with irrigation? We can grow 20 bushels of wheat to the acre, 30 to 40 bushels of oats, and 30 bushels of barley.

Depth of watering.

3354. Will you give us the amount of water which, in your opinion, it is necessary to put on the soil in the vicinity of the river Murray to bring about the results that you have given us? In the first instance, it would require up to 12 inches of water. If the waterings follow the first with proper frequency, I think 5 to 6 inches would be sufficient.
3355. How many waterings do you think necessary in the year? At least four.
3356. In other words, you think 30 inches should go on in the year? Yes.
3357. Can you give us the result of irrigation, so far as it affects stock? In October and November last year I irrigated the whole of my land by gravitation, and as a result I have been able to send down consignments of fat stock up till the middle of May this year. As a contrast, my neighbours back from the river have had to buy produce to feed their stock to keep them alive.
3358. *Mr. Burchell.*] What does it cost you per acre to irrigate by gravitation? I merely have the cost of labour in turning the water on to the land, and that only amounts to a few pence per acre.
3359. Do you think, if the river system were permanently navigable throughout, it would increase settlement? Decidedly.
3360. How do you think the stations that are dependent on the river to get their wool away would be affected if the river were unnavigable? The cost of carriage would make wool-growing unprofitable in many instances.

John Williams Dennis, grazier, Gonn Station, Murray River, New South Wales, sworn and examined:—

J. W. Dennis. 19 July, 1902.

3361. *President*] What is your name? John Williams Dennis.
3362. You are owner of Gonn station, on the Murray, in New South Wales? Yes.
3363. What is the extent of your holding? About 40,000 acres freehold; about 15,000 acres leasehold.
3364. What stock have you? About 38,000 sheep.
3365. Any cattle? Scarcely any.
3366. Have you got any low-lying land on your station? Yes, about 15,000 acres.

Annual flood.

3367. Is that flooded annually? Yes.
3368. Have you taken any artificial means of diverting the water on to those flats? No; I depend on the natural rise of the river.

Flooded land.

3369. When the river recedes, the water on the flats recedes with it? Yes; but the 15,000 acres are only flooded in a good flood; 10,000 acres are flooded on an average. The water remains on the land usually from six weeks to four months. If it does not remain six weeks, I do not get much grass. The grass practically grows in the water. It is a couch grass, and it will not grow unless the water is on the land.
3370. Have you noticed any difference in the level of the flood waters in recent years as compared with former years? Yes; we get more flood water in wet years, but in dry years we get less, disastrously less.
3371. Are you suffering any inconvenience as the result of the diversions up above? In dry years I suffer a good deal of inconvenience and very great loss indeed.

Land values.

3372. What is the low-lying land worth, as compared with the other land on your station? For purely grazing purposes, I consider, three times as much.

Carrying capacity.

3373. How many sheep to the acre will it carry the whole year round? On one paddock of 2,500 acres, all flooded, I put 10,000 sheep; they ran there for six months, and I have now 5,000 on it. The carrying capacity, therefore, of this particular paddock is four sheep to the acre for six months, and two sheep to the acre for the remaining (say) four months, until flooded again.
3374. What is the carrying capacity of the other portion of your station? It would only be 3 or 4 acres to the sheep in its present partially improved state.

3375.

J. W. Dennis. 19 July, 1902.

3375. Do you agree with the evidence given by Mr. Morton in respect to the value of the locking? Yes.
3376. How does the navigation of the river affect you in getting your supplies to the station, and your produce away? The present annual rises suit for that purpose.
3377. You are not inconvenienced? No, not as yet.

Effect of diversions.

3378. What do you think in regard to the diversions that have been made? I think the diversions in the dry seasons which we experience have lowered the height of the Murray, and represent a distinct loss to the valley of the Murray.
3379. Has it affected you to any appreciable extent? It has; instead of getting the full 15,000 acres flooded, in a season that is a little dry we only get one-third.
3380. I suppose you know, in a general way, what quantity has been diverted? I have a rough idea.
3381. Are you satisfied with what has been done? I would rather it had not been done. I consider it a distinct loss.

Flooded country.

3382. Have you any idea of the quantity of flooded country on the Murray, as far as the junction of the Murrumbidgee in New South Wales? Approximately, my own 15,000 acres; Milool, 8,000 to 10,000 acres; Murray Downs, 18,000 to 20,000 acres, and Poon Boon, 5,000 to 10,000 acres; that would bring us within about 15 miles of the junction of the Murrumbidgee.

Frederick James Taverner, Secretary, Marquis Hill Irrigation Trust, sworn and examined:—

F. J. Taverner. 19 July, 1902.

3383. *President.*] What is your name? Frederick James Taverner.
3384. You are Secretary to the Marquis Hill Irrigation Trust? Yes.
3385. What is the area of the Trust? 13,060 acres.
3386. What portion of that is irrigated? The total area irrigated last year was 7,607 acres gross.

Irrigated area.

3387. Can you give us the net? Approximately between 4,000 and 5,000 acres.

Expenditure.

3388. What has been expended on your works? £14,476.

Written off.

3389. What has been written off? £9,076.
3390. How much interest has been written off? £5,466; total written off, £14,542.

Source of supply.

3391. Where do you get your water from? From Kow Swamp through the Macorna Channel.
3392. What quantity do you get? We do not keep a record of the quantity. The overseer of the Macorna Channel keeps the record.
3393. Will you supply the quantity of water which you ordered to be sent down your channel between the 1st July, 1901, and the 30th June, 1902? Yes; I will supply that. [*Not received.*]
3394. Have you any reliable means of knowing the quantity of water that you put on the land at each irrigation? No.

Revenue.

3395. What was the revenue of the Trust last year? £391 2s. 6d. A rate of 3s. in the £, produced £192 15s; and the balance, £198 7s. 6d., represents water charges.

Charges.

3396. What do you charge per acre for irrigation? 1s. 6d. for crops, 1s. for green crops, and 6d. for grass.

David William Williamson, Secretary to the Wandella Irrigation Trust, and also to the South Kerang Irrigation Trust, sworn and examined:—

D. W. Williamson. 19 July, 1902.

3397. *President.*] What is your name? David William Williamson.
3398. You are Secretary to the Wandella Trust, and also to the South Kerang Trust? Yes.
3399. Taking Wandella first, what is the area of that Trust? 23,694 acres.
3400. What portion of that is irrigated? 12,303 acres were irrigated during the year 1901–1902.

Expenditure.

3401. What has been the cost of the works? Between £29,000 to £30,000.

Written off.

3402. How much was written off? £19,769; and interest, £8,280.
3403. *What length of channels have you? About 50 miles.*

Source of supply.

3404. Where do you get your water from? From two sources; one from the Loddon—the Laanecoorie weir, and the other from the Kow Swamp scheme.
3405. Can you give us the quantity you get from the Laanecoorie weir? No; I cannot.
3406. Can you give us the quantity you get from the Kow Swamp? No.
3407. Have you got any records of the orders you have given? No; Mr. Southern is the only man who could give you that.

Depth of watering.

3408. *What quantity do you put on each irrigation?* I think, on an average, about 4 inches; for some of the red plain land, 2 inches would be a good watering.
3409. How many irrigations does the land receive a year? Two.

Revenue.

3410. What is the revenue of the Wandella Trust? The revenue for last year was £630 19s. 2d., £248 16s. of which was made up of a rate of 2s. in the £; and the balance, £382 3s. 2d., from the sale of water.

Irrigation.

3411. *Mr. Burchell.*] I suppose you have derived substantial benefits as a result of irrigation in the Trust? Yes.
3412. *How long has the Trust been in existence?* Since 1889.

Loddon scheme.

3413. How do you account for such a large amount being written off? The first reason is that we did not get the anticipated supply of water. The Loddon scheme practically failed.
3414. Do you think you could pay interest on the original cost now? No.
3415. How many years do you think it will be before you can pay interest on the cost? The settlers would have to go in for a different system of cultivation altogether before they could pay off the interest; they would have to go in for intense culture.
3416. Has the money been well expended? I think so.
3417. *Do you think you could ever pay interest?* Yes; *with increased population.*

Proposed extension.

3418. *President.*] Is it proposed to extend the Wandella Trust? Yes; there is a large petition, now being signed, to be presented to the Trust at its next meeting, asking for the inclusion of about 7,000 acres within the Trust district. They are people whose land abuts on the Trust area, and they propose to make their own channels.
3419. The only difference would be the increased quantity of water required? Yes.

3420.

D. W. Williamson. 19 July, 1902.

3420. The quantity of water required for the 7,000 acres would be proportionate to what you are using now for your present area? Yes.
3421. Coming now to the South Kerang Trust, what is the area? The present area is 1,277 acres; but this week an Order-in-Council has been passed increasing the area by 1,323 acres, so that the total area will be 2,600 acres.
3422. What portion of the original area was irrigated last year? A portion of the original and a portion of the new area.

Area irrigated.

3423. What was the area irrigated? 1,553 acres gross.

3424. What would be the net? About half of that.

Revenue.

3425. What was the revenue of the Trust last year? The revenue from the sale of water amounted to £38 or £40, and that was devoted to the payment of the interest, maintenance, and working expenses.
3426. What you have stated, in reply to the questions which were put to you in regard to the quantity of water diverted and quantity of water put on the land in respect to the Wandella Trust, applies also to the South Kerang Trust? Yes.

Donald MacKenzie, Chairman of the Wandella Irrigation Trust, sworn and examined:—

D. MacKenzie. 19 July, 1902.

3427. *President.*] What is your name? Donald MacKenzie.
3428. You are Chairman of the Wandella Trust, and also a land-owner in the Trust area? Yes.
3429. Do you endorse what the secretary has said in regard to the Trust? Yes.
3430. Is there anything you wish to add? No; I do not think so.
3431. What area of land do you own? 360 acres; and I am renting nearly 500 acres.
3432. To what extent do you resort to irrigation? Between 400 and 500 acres each season, for grass; I do very little in cultivation.
3433. How many times do you irrigate? Usually twice.
3434. Have you formed any opinion as to the quantity of water you put on the land? No. In preparing estimates we reckon 3 inches for the plain land and 4 inches for the rougher country.
3435. Tell us what you do, supposing you want to irrigate one of your paddocks? If it is rough land I cut it up into small sections; if it is plain land, it requires very little banking. When the plain is nicely covered I shut the water off.
3436. Do I understand, then, that you merely cover the land with the water and then turn it off? Yes.
3437. To what extent do you cover it? On some portions of the rough land there may be 2 feet, whilst on others not 2 inches.
3438. *Mr. Burchell.*] What do you consider is the increased value of the land as a result of irrigation? The land in our district is worth nothing without it.

Land values.

3439. What is it worth with irrigation? It has increased the value from practically nothing to £1 and 30s. an acre.

Water value.

3440. What could you afford to pay for sufficient water? From February on till May it is worth 1s. 6d. to 2s. an acre.
3441. What could you afford to pay for water for crops? You could not pay any more for crops, but for growing feed you could pay up to 3s. an acre.
3442. Do you know how many settlers there are within the Trust? About fifty.
3443. On the 23,000 acres? Yes.

John Cullen, M.L.A. for the Gunbower Electorate, of Kerang, sworn and examined:—

J. Cullen, M.L.A. 19 July, 1902.

3444. *President.*] What is your name? John Cullen.
3445. You are the representative of the Gunbower electorate in the State Legislative Assembly? Yes.
3446. And also Chairman of the South Kerang Trust? Yes.
3447. Do you endorse the evidence given by Mr. Williamson in regard to the South Kerang Trust? Yes.

Resolution—Kerang League.

3448. You have a resolution that you wish to bring before the Commission, passed at a meeting of the Kerang District Municipal and Irrigation Trusts League, held at Kerang on the 14th instant? Yes. [*Witness then handed in the following copy of the resolution referred to*]:—

> That this meeting of representatives of the various irrigation and water supply trusts, and other local bodies, desires to bring under the notice of the Interstate Royal Commission on the River Murray the absolute necessity for carrying out a system of locking the Murray River simultaneously with the proposed weiring of the upper portion of the river, so as to maintain and ultimately improve the supply of water to the irrigation trusts in the district.

3449. Does that represent your opinion in regard to the question at issue? Yes.
3450. Have you had any experience as an irrigationist? Not very much personally; but I have been connected with trusts and leagues for the last eighteen years.

Irrigation.

3451. Are you prepared to make a statement as to how irrigation has affected the district? I am prepared to say that irrigation has been the means of keeping the people on the land. During the last ten or twelve years the population in the districts outside the irrigation area has fallen off considerably, in some cases 50 per cent.

Navigation.

3452. How do irrigation and navigation compare in your mind? There is a necessity for navigation to serve the settlers on the banks of the river, where there are no railways. In some cases they have to cart their produce 20 to 25 miles. The difficulty in regard to navigation is that settlers usually take off their crops in January and February, and during those months water carriage is not available. To get their produce to market, they often have to wait several months for the river to rise, or else cart it to the nearest railway station—a much more costly process than water carriage. At the same time we consider irrigation the first consideration. In a district like this, where the annual rainfall is only about 9½ inches, without irrigation there would be no produce to take away, even supposing the river were navigable.
3453. *Mr. Burchell.*] Do you concur in what Mr. Morton and Mr. Dennis said in respect to the navigation of the river? Yes.

Thomas Peel, Secretary to the Macorna North Irrigation Trust, sworn and examined:—

T. Peel. 19 July, 1902.

3454. *President.*]. What is your name? Thomas Peel.
3455. You are Secretary to the Macorna North Irrigation Trust? Yes.
3456. What is the area of your Trust? 31,000 acres.

3457.

T. Peel. 19 July, 1902.

3457. What portion was irrigated last year? For the twelve months ending November, 1900, 16,851 acres gross.
3458. What was the net? That divided by three would be about the net.

Crops.

3459. Will you give us particulars of the cereals and other produce grown by irrigation? Wheat, 1,562 acres; oats, 1,588 acres; barley, 741 acres; grass, 11,584 acres; sorghum, 592 acres; amber-cane, 105 acres; and lucerne, 679 acres. In addition, there were twenty-two tanks filled.
3460. What quantity of water did you receive into your channel? We have no means by which we can gauge the quantity at all.
3461. Do you know approximately the amount of water put on the land at each irrigation? No; it varies with the quality of the land. Plain land does not require nearly so much water as the crab-holed land.

Depth of watering.

3462. Can you give us an estimate? I think, for a first watering of cultivation land, it would take 2 inches—that is, on the plain land; whereas the rough land would take 4 inches. The second watering would be about half.

Expenditure.

3463. What has been the total expenditure in your Trust? Our Trust was originally part of the Tragowel Trust. There was an amount of £14,275 transferred from that Trust for the channels already made in the area. We also had a loan authorised of £5,000.
3464. How much of that has been spent? At the present time we have a balance due to us of £198 4s. 6d.
3465. What was your total indebtedness to the Government before the question of reducing the amount was decided? £19,082.

Written off.

3466. What portion of that was written off? £8,082.
3467. What interest in addition? £4,337.
3468. That leaves your indebtedness? Something over £11,000. Since then there has been another portion written off on behalf of No. 11 Joint Channel.
3469. What is the present indebtedness? £10,496.

Revenue.

3470. What was the revenue for last year? For irrigation, £543 16s. 2d.; receipts for outlets, £36; rates, £373 17s. 6d.

Rate.

3471. What is the rate in the £? 3s. for land supplied with water, and 1s. 6d. for land not supplied with water.

Water charges.

3472. What are the water charges? For cultivation land, 1s. 6d. per acre for the first watering; 1s. for the second, and 6d. for subsequent waterings; for grass land during the winter months, 4d. per acre; during the Summer months, 6d. per acre; for fodder crops, 9d. per acre for the first watering, and 6d. for any subsequent waterings.

Ratepayers.

3473. What are the number of ratepayers in the Trust area? 60.
3474. *Mr. Burchell.*] How many miles of channels have you in the Trust? Approximately, 50.
3475. What could you afford to pay for water for the irrigation of wheat, oats, and barley? I think the charges I have given are quite as much as can be paid.
3476. Do you think the capital has been well spent? We did not get full value for the works taken over from the Tragowel Trust. The ordinary contract price when the channels were constructed, was 6d. per yard; since our Trust has been constituted the price would have been 3d. Besides that, the £5,000 which we borrowed was to restore the channels to the condition which they were in when they were first completed.
3477. Do you think the expenditure has been warranted, having regard to the benefits that have been derived from irrigation? Not up to the present; but if we had a permanent supply the expenditure would be warranted.
3478. If you could get as much water as you require, could you pay interest on the total expenditure of the Trust? No.
3479. How many years do you think it would be before you would be able to pay interest on the total amount expended, under present conditions? I have no idea.

Martin Peacock, President of the Kow Swamp League, and Chairman of the Kerang East Irrigation Trust, sworn and examined:—

M. Peacock. 19 July, 1902.

3480. *President.*] What is your name? Martin Peacock.
3481. You are President of the Kow Swamp League, and Chairman of the Kerang East Irrigation Trust? Yes.
3482. You know that there are a number of irrigation trusts supplied with the water that is diverted from the Murray through the Gunbower Creek, the Kow Swamp, and then along the Macorna Channel? Yes.

Macorna Channel.

3483. As president of the League, have you formed an opinion as to the adequacy or otherwise of the volume of water provided through the Macorna Channel? Yes. Although Kow Swamp holds a large supply of water, the increasing demand made on it renders it inadequate for the requirements of the different Trusts which draw their supply from this source. As a result, the Trusts have to strike a rate sufficiently high to meet their liabilities, and this, in view of the small amount of water available for each landholder, is a great burden. The only relief, in our opinion, is the locking of the Murray. Whilst we do not oppose the Murray-Goulburn scheme, the works proposed will have the effect of considerably reducing the present supply. The Murray at our off-take is about 8 feet deep and 5 chains wide; but in the absence of some means of raising the surface of the water, it is flowing away to the sea, whilst the stock in the Trust's area are perishing, and the seed sown in the ground for crop is rotting for want of sufficient moisture. In view of the fact that it will be some considerable time before the locking of the Murray shall have been effected, it has been suggested that a temporary structure should be put in, so as to raise the water high enough for a portion of it to be drawn off, and our engineer will report on the feasibility of such a scheme. We would earnestly urge you to include this scheme in your report, with a recommendation to the effect that permission be given to the various Trusts concerned to construct it.

Murray-Goulburn scheme.

Temporary weir.

SATURDAY,

SATURDAY, 19 *JULY*, 1902.

[*The Commission met at the Mechanics' Institute, Kerang, Victoria, at 7·30 p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Patrick John O'Donnell, landowner, Kerang, sworn and examined:—

P. J. O'Donnell. 19 July, 1902.

3484. *President.*] What is your name? Patrick John O'Donnell.
3485. You are a resident of Kerang, and a landowner in the district? Yes.
3486. In which Trust? I am not within a Trust area, with the exception of the urban Trust of Kerang, to which I do not think it necessary to refer.
3487. How much land have you? 500 acres approximately.
3488. How much do you cultivate? From 100 to 250 acres.
3489. Where do you irrigate from? The Loddon River.
3490. Do you gravitate or pump? I pump.

Pump.
3491. What is the size of the pump and the engine? Twelve-inch pump, and 10 horse-power engine.

Lift.
3492. What is the pump able to lift? 4,000 gallons per minute, or 5,760,000 gallons per twenty-four hours.
3493. How much land will that irrigate? About 12 acres the first watering in the year; the second will be less, about half that quantity.
3494. And the third? There would be very little difference between the second and third waterings.

Irrigation.
3495. What has been your experience as an irrigationist? I regard it as an undoubted success. Pumping is the most costly way of putting the water on; but even then it pays under suitable conditions.
3496. What does it cost you to irrigate? From 2s. 6d. to 3s. per acre—that is, without considering the value of my own plant.
3497. How many Trusts are there in the district? There are ten irrigation Trusts in this district whose territory entirely depends on the water of the Murray.
3498. Can you tell us whether there is any scarcity of water in those Trusts? Yes; in some years a very great scarcity.

Gravitation.
3499. For what period is the Murray water available by gravitation through the Kow Swamp channel? Taking an average run of years, the Murray fails to be of any use to the Kow Swamp storage about the end of November, or the beginning of December.
3500. So there are certain months of the year when you cannot draw off from the river by gravitation? Yes; January, February, March, and April, and those are the months during which the farmers can turn the water to the most profit.

Kow Swamp storage.
3501. Is it not a fact that the Kow Swamp storage enables you to get water for irrigation and other purposes after the water ceases to flow along the Gunbower Creek into the Kow Swamp? Yes; that is so.
3502. What effect would the storage then have on the months you have named? It is of partial benefit, but does not give the supply we want.
3503. How long does it last? Until the end of March.

Locking.
3504. How do you propose that should be remedied? I think the only way is the locking of the River Murray.
3505. What would be the effect of doing that? It would largely augment the supply available in Summer. From computations that have been made, there is something like 50,000 cubic feet per minute passing down in Summer time, and from what I know of the country between Kerang and Deniliquin there are large natural reservoirs in the way of creeks, swamps, and I might say rivers, which are filled by the Murray in flood time. As the river recedes about the end of November or December, these swamps and creeks immediately flow back into the river and are lost. If the river were locked they would keep the supply up for a considerable time longer; probably the whole of the Summer, and perhaps the following Autumn.
3506. Do you propose to divert the summer flow in the Kow Swamp channel by locking? Yes.
3507. What would be the effect of that? It will keep the storage full all that time, and serve the people who are dependent on that scheme.

Area of irrigation Trusts.
3508. What is the total area of the irrigation Trusts within the shire? 226,383 acres.
3509. What was the capital cost of initiating those Trusts? £325,657.
3510. Of that amount, how much has been written off? £236,395.
3511. Supposing the river were locked, what is your opinion as to the effect it would have on the financial aspect of the case? I think, owing to the increased prosperity that would accrue to the State, that instead of that £200,000 being, as it is now, a dead loss, it would be turned into a profit.
3512. Do you mean that over and above the locking of the river you should get the 50,000 cubic feet per minute that passes down the river in Summer? I think that quantity would be available if the river were locked and it was fed by the reservoirs.
3513. In other words, if you were given the 50,000 cubic feet per minute, you think certain results which you have indicated would follow? Yes.

Private irrigation.
3514. Apart from the ten Trusts within the Shire that you have spoken of, what private irrigation is carried on? From my own holding (which is just near the Kerang weir) down to the junction of the Loddon with the Murray, I suppose there would be between forty and fifty private irrigators, whose land abuts on the Loddon, who are entirely dependent on pumping.
3515. What area would they irrigate per annum on an average? About 100 acres each. All those persons I speak of would be entirely dependent on the Kow Swamp scheme, because that part of the Loddon is dependent on the waters obtained from Kow Swamp.
3516. Are we to understand that those private irrigators comprise the whole of the private irrigation that is done in the district? No; there are a great many others along the banks of the Murray.
3517. Where is their land situated? Between the point where the Loddon enters the Murray and the township of Koondrook.
3518. *Mr. Burchell.*] You say your pump will lift 4,000 gallons per minute every twenty-four hours? Yes.

3519.

P. J. O'Donnell. 19 July, 1902.

3519. You put that on 12 acres? Yes.
3520. Is it enough? Yes, ample.
3521. Is the whole of it absorbed? The greater part of it.
3522. How much do you think would be put on? From 6 to 8 or 9 inches.
3523. Would you be surprised to learn that it is 21 inches? Well, no. It will take it in twenty-four hours without any going to waste.
3524. You were saying you required 50,000 cubic feet per minute to completely supply the Trusts in this district, and you thought that that would be enough to cover 364,000 acres? I did not mean that it would be enough to supply the district—I meant that it would water 364,000 acres with a 3-inch watering twice over.
3525. Do I understand you to say you require 50,000 cubic feet per minute for the whole year? No, for 110 days only.
3526. From your experience as an irrigator, what do you consider is lost in conveying the water to the land by the channels? That would all depend on the distance. If the distance was 2 or 3 miles, instead of 12 acres a day being irrigated, I doubt if you could irrigate 10.
3527. What distance was the water conveyed to the 12 acres you speak of? One mile.
3528. What do you consider was lost in that case? I should say 25 per cent.
3529. What is the size of your channels? About 8 feet on the bottom.
3530. What depth of water? Twelve or 15 inches.
3531. Do you not think that 25 per cent. is an extraordinary loss for a short channel like that? It is a good loss. You can water a section close up against the pumping plant with much greater ease than a place 1 mile distant.
3532. That is one-fourth of the watering? Yes.

George Adams, ironmonger, &c., Kerang, sworn and examined:—

G. Adams. 19 July, 1902.

3533. *President.*] What is your name? George Adams.
3534. You are a resident of Kerang? Yes; I am senior partner in the firm of George Adams and Sons, machinery merchants and ironmongers.
3535. How many years have you resided in Kerang? Thirty years.
3536. You know the condition of things in the district before the initiation of irrigation? Yes.
3537. Will you compare the past with the present, from the commercial point of view? In the ten years between 1876 and 1886 we were favoured with a very good rainfall, and during that time the settlers on the Murray were in a very favourable position. All those settlers who have received a good supply from the irrigation channels are in a better position now than those who are not so favourably situated. In many seasons the storekeepers have had to help those who have not been fortunate enough to have a water supply. As an instance of the effect of bad seasons, so far as commercial circles are concerned, I might state that during the last seven or eight years the amount of machinery imported into the district has been very small as compared with former years. Irrigation has, up to the present, been a partial failure through landholders being unable to obtain water when the crops required moisture, whereas a permanent and ample supply would command perfect success.

MONDAY, 21 *JULY*, 1902.

[*Taken at the "Royal Hotel," Koondrook, Victoria.*]

George Vains, Secretary to the Koondrook and Myall Irrigation and Water Supply Trust, Koondrook, sworn and examined:—

G. Vains. 21 July, 1902.

3538. *President.*] What is your name? George Vains.
3539. You are Secretary to the Koondrook and Myall Irrigation Trust? Yes.
3540. What is the area of the Trust? 13,100 acres.

Irrigated area.
3541. What portion of that was irrigated last year? About 2,206 acres, made up of 1,387 acres of cereals, 640 acres grass, 100 acres lucerne, 56 acres amber-cane, &c., and 23 acres orchards.
3542. Is that the gross irrigation or the net? Net; some of the land was irrigated twice. The gross would be approximately 50 per cent. more.
3543. What quantity of water do you divert into the channels? I could not say.

Pumps. Lift.
3544. What is the size of the pumps? Two 15-inch.
3545. What is the lift? At Summer level we have a 16-foot lift; at the present time it is about 15 feet.
3546. What is the capacity of the pumps? They were supposed to throw 10,000 gallons per minute, but they may throw half of that.
3547. How many days in the year do you work the pumps? About 200, at twenty-four hours per day.

Off-take.
3548. What is the height of the off-take from the river? 20 feet above Summer level, referred to the gauge at Echuca.
3549. When was the last time you got gravitation water? About two years ago, for about a week.

Depth of watering.
3550. What amount of water do you put on the land at each irrigation? The plain land would take 4 inches to 6 inches each watering, whilst the swamp land would take, perhaps, double that amount.

Expenditure.
3551. How much has been advanced by the Government on your works? £13,580.

Written off.
3552. How much was written off? £12,000.

Revenue.
3553. What was the revenue last year? £660 4s. 6d.
3554. How was that made up? Irrigation, £322 10s. 6d.; general rate, £337 14s.

Rate.
3555. What is the rate? 5s. in the £.

Charges.
3556. What are the charges? For irrigation we charge 3s. per hour; that will irrigate 1½ to 2 acres, according to the kind of land irrigated.
3557. Is that the only water charge you have? For gardens and orchards the charge is 10s. per acre, with a minimum of £1; all the rest are at per hour.

Extensions.
3558. Is it the intention of the Trust to extend their works? Yes. About 1 mile from here they propose to take a channel across from the Gunbower Creek, as shown on plan [*Exhibit* 74], between A and B. This will be a gravitation channel, and will divert the water from the Gunbower Creek into the existing channels.

3559.

G. Vains. 21 July, 1902.

3559. What will be the level of the off-take referred to Summer level at the Echuca gauge? I think about 12 feet, but am not certain.
3560. What will be the size of the channel? It may be 25 feet in the bottom, 2 to 1 batter, with fall of 3 inches to the mile.
3561. Do you propose any storage? Not at the present time; although on the Gunbower Island it is possible that there will be a storage.
3562. In the meantime, you propose to divert water by gravitation from the Gunbower Creek when the water rises in flood 12 feet above Summer level, referred to Echuca gauge? Yes.
3563. Is there any other extension proposed? No.
3564. Do you get sufficient water by means of the pumps to serve your Trust? No; and that is why we propose the extension I have referred to.
3565. Does the Gunbower Creek empty into the Murray in the vicinity of the town of Koondrook? Yes.
3566. What water diverted from the Murray into Deep Creek by the Cohuna Trust finds its way through Gunbower Creek into the Murray? None; except that which escapes round the by-washes of the various dams.

James Henry Winkley, Chairman of the Koondrook and Myall Irrigation and Water Supply Trusts, Koondrook, sworn and examined:—

J. H. Winkley. 21 July, 1902.

3567. *President.*] What is your name? James Henry Winkley.
3568. You are Chairman of the *Koondrook and Myall Irrigation Trust*? Yes.
3569. Also a landowner? Yes.
3570. Do you regard the Trust that you represent as a success from the point of view of an irrigationist? Yes; but there is not sufficient water. We have only had 3 inches of rain in the last nine months, and unless we get more water, it will be impossible to carry on.
3571. What area do you cultivate? About 100 out of 600 acres.
3572. Would you irrigate and cultivate more than that if you could get the water? I think I would.
3573. Supposing you had ample water, what proportion do you think it would be fair to take of the whole of your land for irrigation? I think I could take 150 acres, or 25 per cent.

Irrigation.

3574. Has the portion you have irrigated turned out satisfactorily? Yes; so far the irrigation has been very satisfactory, and has paid us, *considering the small amount of water we have had.*

Depth of watering.

3575. How much water do you think is put on the first irrigation? 3 inches to 4 inches on my land.

Pumping and gravitation.

3576. Do you wish to add anything further to your evidence? Yes. The pumping is too costly. If we could get water by gravitation, *we could do very well here*; but the pumping-plant is a great drag on us, and it will become more expensive as the fuel gets used up.
3577. So that unless you can get gravitation, it means that irrigation will be killed by the expenses incurred? Yes.
3578. Can the settlers in your Trust afford to irrigate at the rates they have to pay you for pumping the water? No; not to make a profit out of it.
3579. What do you think the land in the Trust could pay as an ultimate price per acre for irrigation;—do you think it could stand more than 3s. 6d. to 5s. per acre? No; it could not.

Population.

3580. What is the number of settlers in your Trust? 45 to 48. The population is 130.

Locking.

3581. What is your opinion as to locking the river for the purpose of navigation, in view of the lack of water you have spoken of in your Trust? I think it would be a very good thing; but if the water is diverted higher up the river, the money the Government has spent down here will be thrown away.
3582. You think, therefore, that if the Murray is locked it would serve the purposes of navigation, and in that way give you *cheap carriage, and at the same time raise the level of the water, so* that you could draw off by gravitation? Yes.

Bungowannah.

3583. I gather that you object to the diversion at Bungowannah on the ground that you will be injured by it? Yes.
3584. Supposing a storage in the mountains is provided above Albury, what would you say then? I do not think it would supply us down here.
3585. Would there be the same objection? I think so.
3586. Has the diversion of the water at Kow Swamp, Deep Creek, and other places between your pumping station and Echuca had any material effect upon the level at which you can draw off from the river by gravitation? Yes; ten years ago we drew off at 17 feet at Echuca; now it takes 20 feet.

MONDAY, 21 *JULY*, 1902.

[*The Commission met at the Shire Hall, Kerang, Victoria, at 7·30 p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Roland Richardson, Chairman of the Macorna North Irrigation Trust, sworn and examined:—

R. Richardson. 21 July, 1902.

3587. *President.*] What is your name? Roland Richardson.
3588. You are chairman of the Macorna North Irrigation Trust? Yes.
3589. As well as being a landowner in that Trust? Yes.
3590. How much land have you? 640 acres.
3591. What portion of that do you irrigate? About half of it.
3592. Did you irrigate half of it last year? Yes, approximately.
3593. Was it wholly cultivated? *Partly cultivated and partly grassed.* I had about 100 acres under cultivation.
3594. What did you grow on it? Oats and hay.
3595. Were you quite satisfied with the result? Yes; I got somewhere about 5 bags to the acre.

3596.

R. Richardson. 21 July, 1902

3596. So far as you are personally concerned, what has been your experience of irrigation? Before the water was brought along the Macorna channel I was obliged to mortgage my property. As soon as water was available, I applied it to the land, and gradually removed the mortgage, and have made a comfortable living since. Failing the water, I could not have remained in the district. I might state that I am a director of the Pyramid Butter Factory, and about two months ago the united cheque of twenty suppliers of cream from the south side of the Macorna channel, where they have a very indifferent supply, only amounted to £18; whereas four suppliers from the north side, where they have an ample supply, drew from that factory £32. Owing to the want of water, my own revenue has gone down from £9 or £10 per week to about £2 10s.
3597. *Mr. Burchell.*] When did you first get the water from the Macorna channel? Originally we belonged to the Tragowel Trust, and that was a gigantic failure, as far as water was concerned. It is about seven or eight years since the Macorna North Trust was constituted.
3598. You were in the district twenty-one years before you got the water? Yes.
3599. How many times did you water your crop last year? Twice.
3600. Have you any idea what depth you put on? It all depends on the land; some will take three times as much as others. The least we can do with is 4 inches of water, and some land will take twice that quantity.

David John McClelland, Engineer to the Shire of Kerang, Cohuna Irrigation Trust, &c., sworn and examined:—

D. J. McClelland. 21 July, 1902.

3601. *President.*] What is your name? David John McClelland.
3602. You are M.C.E. of the Melbourne University, Engineer to the Shire of Kerang, and the Cohuna and other Irrigation Trusts? Yes.
3603. You have prepared particulars in regard to the Cohuna Irrigation Trust? Yes.
3604. Will you kindly give them to us? Area of Trust, approximately, 98,000 acres; total length of channels, 200 miles (main and distributaries); total length of creeks, 50 miles; total money borrowed, £154,000; written off, £94,000. The Trust will be paying interest on, approximately, £60,000 in about six months time, when the balance of the works will be completed. The total amount of interest written off by the Relief Bill of 1899 was £47,000, all the interest owing to that date. Population of Trust, 1,300; ratepayers, 253. Areas irrigated by pumping from 1st January to 30th June, 1899:—Wheat, 3,749½ acres; grass, 1,154 acres; oats, 146 acres; lucerne, 1,327½ acres; ambercane, 751 acres; barley, 35 acres; fallow, 169 acres; gardens, 214 acres; total, 7,546 acres. Areas irrigated by gravitation from 1st July to 31st December, 1899:—Wheat, 9,644 acres; grass, 4,654 acres; oats, 527 acres; lucerne, 887 acres; ambercane, 235 acres; barley, 331 acres; fallow, 20 acres; gardens, 33 acres; total, 16,331 acres. Areas irrigated by pumping from 1st January to 30th June, 1900:—Wheat, 1,417 acres; grass, 1,373 acres; oats, 98 acres; lucerne, 1,165 acres; ambercane, 653 acres; barley, 32 acres; fallow, 10 acres; gardens, 262 acres; total, 5,010 acres. Areas irrigated by gravitation from 1st July to 30th October, 1900:—Wheat, 2,669 acres; grass, 5,575 acres; oats, 343 acres; lucerne, 574 acres; ambercane, 152 acres; barley, 93 acres; self-sown, 58 acres; gardens, 6 acres; total, 9,470 acres. Areas irrigated by pumping from 1st December, 1900, to 31st May, 1901:—Wheat, 4,137 acres; grass, 5,159 acres; oats, 573 acres; lucerne, 1,993 acres; ambercane, 1,204 acres; barley, 79 acres; fallow, 21 acres; gardens, 289 acres; total, 13,455 acres. Areas irrigated by gravitation from 1st June to 30th November, 1901:—Wheat, 5,418 acres; grass, 20,838 acres; lucerne, 1,092 acres; oats, 1,004 acres; ambercane, 411 acres; barley, 48 acres; fallow, 80 acres; gardens, 34 acres; total, 28,925 acres. Areas irrigated by pumping from November, 1901, to 31st May, 1902:—Wheat, 1,250 acres; grass, 6,357 acres; oats, 486 acres; lucerne, 2,983 acres; ambercane, 2,59[illegible] acres; barley, 258 acres; fallow, 35 acres; gardens, 306 acres; total, 14,266 acres. Water diverted, calculated on the areas watered, allowing 10 inches per acre, and 33 per cent. loss—that is, a total of 15 inches per acre each watering:—From 1st January to 30th June, 1899, 180 days, the total diversion by pumping was 400,000,000 cubic feet, giving an average of 1,600 cubic feet per minute. From 1st July to 31st December, 1899, 180 days, the total diversion by gravitation was 900,000,000 cubic feet, giving an average of 3,400 cubic feet per minute; the average per acre for the whole Trust would be 13,000 cubic feet. From 1st January to 30th June, 1900, 180 days, the diversion by pumping was 272,000,000 cubic feet, giving an average of 1,000 cubic feet per minute. By pumping from the 1st November to 31st December, 1900, the total diversion was 200,000,000 cubic feet, giving an average of 2,400 cubic feet per minute. From 1st July to 31st October, 1900, 120 days, the total diversion by gravitation was 500,000,000 cubic feet, giving an average of 3,000 cubic feet per minute; the average per acre for the whole area was 9,720 cubic feet. From 1st January to 31st May, 1901, the diversion by pumping, for 150 days, was 530,000,000 cubic feet, or an average of 2,400 cubic feet per minute. From 1st June to 31st October, 1901, 150 days, the diversion by gravitation was 1,600,000,000 cubic feet, or an average of 7,300 cubic feet per minute, giving an average of 21,300 cubic feet per acre for the whole area. From 1st November, 1901, to 31st May, 1902, 210 days, the diversion by pumping was 780,000,000 cubic feet, or an average of 2,600 cubic feet per minute. The Cohuna Trust have two off-takes from the Murray, the Main Pump channel having a bottom width of 21 feet, side slopes 1½ to 1, and reduced level of bed 267·50 referred to L.W.M., Hobson's Bay. The summer-level at that point is 258. The approximate level of the bed of the river would be, approximately, 243. The fall of this channel is 4 inches per mile. Water is let into the channel from two 30-inch pipes. This channel is capable of diverting water as follows:—*At reduced level of the river*, 268·75, 500 cubic feet per minute; at 270, 1,770 cubic feet; at 272·75, 3,700 cubic feet; at 275, 5,000 cubic feet; at 277·50, 6,000 cubic feet. 277·50 is *flood-level at* that point. By pumping, 2,800 cubic feet per minute can be diverted into this channel. The Trust have *two 30-inch centrifugal pumps driven by compound condensing engines.* The other off-take is the Deep Creek channel, having a bottom width of 10 feet, side slopes 1½ to 1, fall 3 inches per mile; the reduced level of the bed is 258 feet. I suppose the river would be about the same depth there as it is higher up at the Main Pump channel, somewhere about 243 feet; and summer-level at Deep Creek, 258 feet. The water is regulated by a door on a circular tunnel 6 ft. 9 in. internal diameter. The channel will divert water as follows:—At reduced level 259 feet of the river, 200 cubic feet per minute; at 260 feet, 750 cubic feet; at 261 feet, 1,630 cubic feet; at 262 feet, 2,900 cubic feet; at 263·25 feet, 4,550 cubic feet; at 264·50 feet, 6,600 cubic feet; at 266 feet, 9,200 cubic feet; at 268·25 feet, 12,200 cubic feet; at 270·50 feet,

Area.
Capital cost.
Written off.
Population.
Areas irrigated by pumping and by gravitation.
Water diverted.
Pumping station.
Deep Creek.

D. J. McClelland. 21 July, 1902.

feet, 15,800 cubic feet; at 273·75 feet, 20,000 cubic feet; at 277·50 feet (flood-level), 24,700 cubic feet. The general rate of the Trust is 4s. in the £ on the municipal valuation. 2s. per acre is charged for pumped water; 1s. 6d. for gravitation.

3605. *President.*] Does it happen that the Deep Creek gravitation channel is working at the same time as the gravitation channel at the pumping-station? Yes; when the water rises to that level.

3606. You open the doors to allow whatever water will gravitate through the pumping-station and through Deep Creek at the same time? Yes.

Pumping periods.

3607. You only work the pumps when you cannot get gravitation water either *via* Deep Creek or the pumping-station? Yes.

3608. Are there occasions when you work the pumps at the same time as you are getting water *via* Deep Creek? Yes.

3609. The quantities you have given are on the assumption that certain quantities are used for each irrigation? Yes.

Depth of water.

3610. You assume that 15 inches would be used *on each occasion*? Yes.

3611. Have you any other means of finding out what water is diverted? No.

Method of computation.

3612. How have you arrived at the conclusion that 15 inches are put on each irrigation? From the results of experience in the district, by measuring actual areas watered, and by discharges.

3613. You take that to be a fair estimate of the quantity used in the district? Yes; a fair average quantity.

3614. Does any of the water that is diverted either at the pumping-station or Deep Creek pass through the Trust into the Barr and Gunbower Creeks? Yes.

3615. To what extent? I could not say exactly.

3616. On all occasions do you get from the Murray all the water you can through the channels? Yes.

3617. And if there is any to spare, then it goes into the two creeks named? Yes.

3618. *Mr. Burchell.*] Where do you think the 33 per cent. goes to? Leakage from channels, evaporation, soakage, &c.

3619. Have you any gauge on the Deep Creek gravitation channel? No.

3620. Is there any gauge on the Main Pump channel? Yes; but no record is kept of the gaugings.

3621. Do you know if it is intended to have any gauges fixed? Yes.

3622. Have you the reduced levels of the bed of the Murray at Deep Creek? No; only approximations.

Benjeroop and Murrabit Irrigation Trust.

3623. *President.*] You have also prepared particulars in regard to the Benjeroop and Murrabit Irrigation Trust;—will you kindly give them? Approximate area, 20,000 acres, the whole of which is irrigable; total mileage of creeks (Reedy Creek), 18 miles; channels, 42 miles. There is also a storage at the Benwell, on the Gutturam Swamps, holding, approximately, 370,000,000 cubic feet; total amount borrowed, £12,800; £7,200 written off by the Relief Bill; balance to pay interest on, £5,600. Working expenses of the Trust, £300; interest and redemption, £252; population, 250. Land irrigated during 1900, by gravitation:—Wheat, 1,699 acres; oats, 402 acres; barley, 299 acres; grass and other lands, 1,925 acres; orchard, 68 acres; total, 4,393 acres. During 1901:—Wheat 1,154 acres; oats, 229 acres; barley, 119 acres; grass, 4,263 acres; orchards, 60 acres; lucerne, 24 acres; total, 5,849 acres. There are two off-takes from the Murray, one (the Murray Huts channel) having a bottom width of 20 feet; side slopes, 1½ to 1; reduced level of bed, 230; summer-level of river, 228; flood-level, 243; fall, 3 inches per mile. The channel is capable of diverting, at 240 R.L., 400 cubic feet per minute; at 241, 1,450 cubic feet; at 242, 3,100 cubic feet; at 243, 5,200 cubic feet. The other take-off is at the Benwell, having a bottom width of 30 feet; side slopes, 1½ to 1; reduced level of bed, 242; fall, 3 inches per mile. This channel is capable of diverting at R.L. 243, 600 cubic feet per minute; at 244, 2,150 cubic feet; at 245, 4,550 feet; at 246, 7,700 cubic feet. The rate of the Trust is 1s. 6d. in the £ on the Shire valuation. Average revenue derived from sale of water for the last three or four years, £331. The total water diverted during 1900, calculated at 18 inches per acre, was 290,000,000 cubic feet; area watered, 4,400 acres, giving an average of 14,500 cubic feet per acre over the whole area of the Trust. In 1901, the diversion was 380,000,000 cubic feet, and the area watered 5,850 acres, giving an average of 19,000 cubic feet per acre.

Depth of watering.

3624. How do you arrive at the 18 inches per acre? I have allowed, as I did before, 33 per cent. for loss through soakage, percolation, breakages, &c., and the balance for actual water on the land, viz., 12 inches.

3625. Why do you make the difference in this case? The country in this Trust is much heavier than that in the Cohuna Trust, and consequently requires more water.

3626. You have no record of the actual quantities diverted? No.

3627. You have made the calculation on the same basis as before? Yes.

3628. Do you keep any record of the number of months your channels flow? Yes; but I have not that information available. The Secretary can supply those particulars from his books.

3629. From your experience, do you think the most accurate way that can be adopted for arriving at the quantity of water used is by assuming a certain quantity used per acre, and basing your calculation on that? No.

3630. But that is what you have done? That was the only method I could adopt.

3631. What method would you suggest? Either gauging the streams, or taking it by calculation through an orifice or tunnel.

3632. You do not regard the present method as satisfactory? No.

3633. You have made a series of experiments as to what quantity will irrigate the land? It varies from 6 inches to 24 inches; 24 inches would be for very heavy country.

3634. Does any of the water diverted from the Murray for this Trust find its way back again into the river? Practically none.

3635. *Mr. Burchell.*] Are any gauges kept on either of these channels? There is a gauge, but no system of taking readings.

3636. What is the number of ratepayers in the Trust? Sixty-six.

Private irrigation plants.

3637. *President.*] At my request you have obtained certain particulars as to the number of plants in use for private irrigation purposes, also the approximate area irrigated by those plants? Yes. The total number is about thirty; average capacity, 600 cubic feet per minute; total land irrigated, about 8,000 acres. These plants pump from the Loddon River, Gunbower Creek, and the Murray. They run from 8 up to 15 inch; the majority of them are 12 inch.

3638.

D. J. McClelland. 21 July, 1902.

3638. Will you prepare a list of them, and send it to the Secretary? Yes.

No. pumps.	*Sizes.*	*Approximate capacity.*
14	12 inch	4,100 gallons per minute.
2	8 "	1,500 "
9	10 "	2,000 "
2	11 "	3,500 "
3	15 "	7,000 "

This gives an average of about 570 c.f.m.

3639. The plants you have referred to are not those that are irrigating on the lakes? Only one of them.

3640. Which Lake is that? Reedy Lake.

3641. What length of the Murray does your return relate to? Starting at Deep Creek and finishing at the junction of the Murray and Loddon.

3642. What portion of the Loddon? The plants would start about 10 miles south of Kerang, and extend down to the Murray.

3643. What portion of the Gunbower? Starting at the junction of the Deep and Gunbower Creeks, and finishing approximately at Koondrook.

Private plants unauthorised.

3644. *Mr. Burchell.*] Have all the private plants you speak of authority? Not that I know of. I do not think there are any licenses issued at all.

3645. *President.*] I understand that a proposal is now being made to divert certain waters from the Murray River above the Cohuna pumping-station, and also above the Gunbower Creek? Yes.

3646. Will you give us particulars? The following is a report which I addressed to the Chairman of the Kerang Water League, on the 19th June last, regarding the proposal:—

Turrumberry headworks.

REPORT TO THE KERANG WATER LEAGUE *re* THE DIVERSIONS OF WATER DURING THE SUMMER MONTHS AT THE NATIONAL HEADWORKS, TURRUMBERRY.

1. In my opinion it is possible to raise the level of water in the Murray River during the summer months 7 ft. 3 in. above summer-level, by placing a temporary obstruction across the river at a point about 25 chains below the National headworks on what appears to be a hard sandstone bar.

2. When the water is raised to this level, there will be a flow of water 2 ft. 3 in. deep over the sill of the regulator in the National channel at the headworks.

3. Also, that with the river at this height, the volume of water passing down the National channel will be about 4,000 cubic feet per minute.

4. My estimate for putting in the obstruction is £2,200.

5. It would be practicable to arrange the obstruction (mentioned in clause 1), so that the greater portion of it might be removed every year before the winter floods come down the river, and to replace it in the summer-time when necessary.

6. I estimate the cost of removing and replacing the movable portion every year at a total of £160.

7. Before commencing the work it would be necessary to carry out a little preliminary work to ascertain the nature of sandstone bar at the site proposed for the obstruction. This preliminary work would embrace trial bores, and would cost about £30.

8. The success of the proposal depends on the assumption that the sandstone bar at the proposed site is sound, which it appears to be.

Proposed diversions.

3647. Can you tell us what quantity of water it is proposed to divert? In the summer 4,000 cubic feet per minute will be the minimum flowing down the National channel.

3648. The object is to give a water supply to the National channel for the period during which there is no water flowing down the channel? That is so.

3649. *Mr. Burchell.*] Is it proposed to make this diversion in the Summer? Yes.

Flow.

3650. Do you know the quantity flowing down the river at a very low Summer season? About 50,000 cubic feet.

3651. Where is that? Past the Turrumberry headworks; those are the figures given by the Victorian Water Supply Department.

3652. Do you think it has been less this year than that? I do not think so.

3653. Do you know that most of the Trusts are suffering by reason of not having sufficient water? I do.

3654. Notwithstanding the dimensions of the Gunbower—40,000 cubic feet per minute—Deep Creek, and other diversions, you propose to put a weir across the river Murray;—you could then take the whole of the Summer flow and leave the river dry? I think so, but it is not proposed to do this.

3655. How do you think that would affect settlement lower down? I am dealing with the engineering questions only.

Alfred Daniel Randall, Chairman of the Cohuna Irrigation Trust, sworn and examined:—

A. D. Randall. 21 July, 1902.

3656. *President.*] What is your name? Alfred Daniel Randall.

3657. You are Chairman of the Cohuna Irrigation Trust? Yes.

3658. And also a land-owner in that Trust? Yes.

3659. You have heard the evidence your engineer has given us in respect to the Trust? Yes.

3660. Do you generally agree with what he said? With most of it.

Depth of watering.

3661. In any particular do you disagree with it? With the amount used per acre. I am of the opinion that, on an average, 6 inches are quite as much as we use on an acre.

3662. Do you mean the actual quantity that goes on? Yes. I am taking 4 inches off his allowance for the land.

3663. Would you allow 3 inches for loss? Yes.

3664. How do you arrive at the conclusion that only 6 inches of water are actually put on the land? The only means I have is comparing it with the rainfall. I have been in the district twenty-six years, and have noticed the effect of a 2-inch and a 3-inch rain on the land. One season, in the early eighties, we had a 4-inch rain in April, and the land was very boggy.

3665. You heard what he said about measuring? I think it was a very crude way. Moreover, he did not make any allowance for stock and domestic supply.

3666. What do you think a fair allowance for stock and domestic purposes? Fully 50 per cent. of the water diverted in the Summer-time goes for stock.

3667. That is to say, supposing for the moment that Mr. McClelland is right in saying that 15 inches of water is required for each irrigation, on the top of that you would have to put 50 per cent. for stock and domestic supply? Yes.

3668. Have you got enough water for your purposes? No.

A. D. Randall, 21 July, 1902.

3669. It is your opinion, if more water were available, that more land would be irrigated? Certainly.
3670. You heard what Mr. McClelland said in regard to certain quantities of water passing out of your Trust into the Barr and Gunbower Creeks, and in that way back into the Murray;—do you agree with that? Very little has gone back of late years.
3671. Do I understand it is only in flood-time that the water of the Murray finds its way back after having been diverted? Yes.
3672. Supposing you had water, what area of land do you think could be irrigated in your Trust per annum? Fully 60,000 acres. The Deep Creek scheme has never been any benefit to us yet.
3673. What is necessary to complete it? The channels have to be made along the Barr Creek, and also the connections to the main channels.
3674. Will that enable you to irrigate more than you do now? It will enable us to irrigate for a longer period in the year.
3675. What *acreage have you in* the Trust? 550; in conjunction with my father I work 1,100 acres.
3676. What portion do you irrigate? In the gravitation season I have irrigated up to 500 acres.
3677. And in the pumping season? We are limited to 30 acres per block, or 120 acres. We get one watering every *four months*.
3678. I gather that you are fully alive to the advantages of irrigation? Yes.

Advantages of irrigation.

3679. How would you put them? If seasons like the present continue, we cannot remain in the district *without irrigation. In the early history* of the Trust the people were *not* alive to the benefits of irrigation as they are now; but those who took *advantage* of it at that time made money. At the present time there is hardly a ratepayer who would not use the water if it were available. We got one watering for the Summer, and it was four and a half months before we got the second.
3680. Could you give us approximately the number of stock in the Trust? We run at the rate of two sheep to the acre in No. 1 Riding.
3681. *Mr. Burchell.*] How many years have you been receiving the benefits of irrigation in the Cohuna Trust? Twelve years.
3682. Were you here during the construction of the works? Yes.
3683. Do you think the money was well expended? The channels were worth the money they cost.
3684. Can *you tell me how it is* that so much money was written off? The only way I can account for it is that the people did not take advantage of the water, and they were, therefore, *not* in a position to pay the interest on the £154,000.
3685. *Do you think they are* able to pay it now? No. When we get the Murray locked, and an adequate supply of water, we will be in a position to pay the interest. With a plentiful supply of water I think the district could pay all its indebtedness.

Matthew Bennett, Chairman of the Benjeroop and Murrabit Irrigation Trust, sworn and examined:—

M. Bennett. 21 July, 1902.

3686. *President.*] What is your name? Matthew Bennett.
3687. You are Chairman of the Benjeroop and Murrabit Irrigation Trust? Yes.
3688. *You heard the evidence* given by your engineer in respect to the Trust;—do you agree with what he said? Yes.

Depth of watering.

3689. You heard that he said it would take 18 inches for an irrigation in your Trust, assuming that 6 *inches would go for loss in respect* to evaporation, percolation, and *seepage*? Yes, I believe it would. The land in our area is constituted of rich alluvial flats, which were subject to inundation annually. The soil is very rich and of a porous nature, and it absorbs a great quantity of water. When sufficient water is applied it is very productive, but it is just as unproductive without water.

Carrying capacity.

3690. As regards stock, what is the carrying capacity of the land in your Trust? Under the present system of irrigation, about one sheep to two acres.

Proposed extension.

3691. Is it the intention of your Trust to extend their works at all? Yes. We find that our supply is so inadequate for requirements that there is a proposal now to borrow another £3,800 to supplement our present gravitation system with a pumping plant, because the water never runs in our channels until the river reaches a height of 14 feet above Summer level at Echuca. For the last six years our supply has only averaged fourteen to sixteen weeks per annum. I have been asked by the Commissioners of the Trust to bring under your notice the fact that, although this Trust is an old-established one, it has never received any allotment by Order in Council.

Locking.

3692. *I understand that you are in* favour of locking the river? Yes.
3693. Will you give us your reasons? We view with alarm the proposal to divert large quantities of water on the Upper Murray, as we feel that, unless some other provision is made, it will not be long before the very *small supply* we have will be taken from us, and we will not be able to live on the land, let alone pay our liabilities to the Government.
3694. *Mr. Burchell.*] What do you think will become of the Mildura and Renmark settlements in the event of there being a shortage of water? They will be in a similar position to ourselves.
3695. Do you think they should receive a constant supply? Certainly, if practicable.
3696. Do you think, if you had a sufficient supply, you could pay interest on the whole of the amount borrowed? I am positive we could.
3697. What land do you own? 700 acres in the Benjeroop and Murrabit Trust, and 500 acres just outside it.
3698. What portion do you irrigate? The 700 acres in the Trust.
3699. Any outside? Just a little.

Irrigation.

3700. What *has been your experience* of irrigation? I own 700 acres in Benjeroop Trust, also 3,000 acres of leasehold land just across in New South Wales, which is not irrigable; at the present time I can only carry 240 sheep on the 3,000 acres. Included in the 700 acres in the Trust are 200 acres that I irrigated by pumping from the river Murray. In the middle of March, and since then, this area has been carrying 700 sheep, which have done well, whilst the sheep on the unirrigated country in New South Wales are just existing, and that is all. Our supply is so inadequate we cannot go in for dairying, and we, therefore, have to depend on agriculture and grazing the very few sheep we can carry.
3701. You say you have 700 acres in the Trust;—*is* that irrigable land? Yes.
3702. Taking the Cohuna Trust, the average is nearly 400 acres to each settler? Yes.
3703. Do you ever send wheat up the river? Yes; to Echuca.

Navigation.

3704. Would it be an advantage to you to have the river permanently navigable? Yes. I can send my wheat to Echuca for less money than I can get it carted from my farm to Kerang, and when it arrives at Echuca I can almost always get 2d. per bushel more for it.

3705.

M. Bennett. 21 July, 1902.

3705. *How far is your place from Kerang?* 18 *miles.*
3706. How far is it to Echuca by the river? 140 miles.
3707. Does what you say apply to most people in the district here? Yes; all those along the river.

Martin Peacock, President of the Kow Swamp League, and Chairman of the Kerang East Irrigation Trust, further examined:—

M. Peacock. 21 July, 1902.

Particulars of Trust.

3708. *President.*] As Chairman of *the Kerang* East Irrigation Trust, you have prepared certain particulars of that Trust? Yes. The area of the Trust is 18,000 acres. Original loan, £17,825; expended, £13,984 18s. 10d; written off, £6,984; interest written off, £4,910; total, £11,894. Present liabilities, £6,983 8s. 9d.; annual interest, £314 6s. 6d.; arrears of interest, £328 13s. Area watered, 1901, 10,638 acres; area capable of being irrigated, 16,000 acres. Allotment of water in *Winter*, 1,480 *cubic feet* per minute; in *Summer*, 900 *cubic feet per minute*. In 1901, the revenue derived from the rate of 2s. 6d. amounted to £235 18s. 9d.; the revenue derived from sales of water was £382 13s.; total revenue, £618 11s. 9d. Number of landholders, 52; length of channels, 40 miles. Charges for water:—For cereal crops: first watering, 4d. per *inch per acre*, 3 *inches per acre* to constitute a watering, or 1s. per acre; second watering, 4d. per inch per acre, 2¼ inches per acre to constitute a watering, or 9d. per acre; for the third and subsequent waterings, 4d. per inch per acre, 1½ inches per acre to constitute a watering. For fodder crops: first watering, 4d. *per inch per acre*, 3 inches per acre to constitute a watering; and for second and subsequent waterings, 4d. per inch per acre, 1½ inches to constitute a watering. For grass land: in Winter months, 4d. per inch per acre for the first watering, 1½ inches to constitute a watering; second and subsequent waterings, 4d. per inch per acre, ¾-inch to constitute a watering; and for conserved water in the Summer months 4d. per inch per acre, 2¼ inches to constitute a watering.

Depth of watering.

3709. What quantity do you consider is *put on each irrigation*? About 12 inches the first watering.
3710. Would you allow on the top of that 6 inches for loss by evaporation, seepage, &c.? Yes.
3711. *Mr. Burchell.*] Do you think if you had an adequate supply of water you could pay interest on the total cost of the works? I believe we could.
3712. How many acres have you? 320.
3713. How *many do you irrigate*? We had 80 acres of sorghum in last year, and irrigated it four times.
3714. Was that enough? No; it was not enough last year.
3715. What do you think the yield of sorghum should be from 50 acres? If we got plenty of water, we ought to get three feedings off it.
3716. Have you ever grown lucerne? No; our land is not adapted for lucerne.

Arthur Mann, Secretary to the Twelve-miles Irrigation Trust, sworn and examined:—

A. Mann. 21 July, 1902.

3717. *President.*] What is your name? Arthur Mann.
3718. You are Secretary to the Twelve-miles Irrigation Trust? Yes.
3719. What is the area of the Trust? 9,030 acres.

Irrigated area.

3720. What area of land was *irrigated* last year? 2,305 acres.

Capital cost.

3721. What was the amount spent on your Trust on capital account? £5,050.
3722. What was it reduced to? £1,800.

Written off.

3723. In addition to that, how much *interest* was written off? £2,343.

Revenue.

3724. What was the revenue last year? £183 12s.—£89 19s. derived from the *uniform* rate of 1s. 9d. in the £, and the balance, £93 13s., from sales of water.

Water charge

3725. What are the water charges? 6d. per inch per acre; 2 inches to constitute a watering for crop, and 1 inch for grass.

Ratepayers.

3726. How many ratepayers are *there in the Trust*? Twenty-eight, only thirteen of whom reside in the area.
3727. What is the population? Eighty.

Source of supply.

3728. How is the water *supplied to your Trust*? By gravitation from the Loddon.
3729. *Mr. Burchell.*] Why is it that your Trust charge 6d. per inch per acre, *while* the East Kerang Trust only charge 4d.? I think it amounts to the same. They consider 3 inches a watering, and we consider 2 inches.
3730. Do you consider 2 inches enough for irrigation? There is no way of computing the amount of water actually used in our Trust.
3731. Do you think you use more than 2 inches? I should certainly say yes.
3732. You pay for 2 inches, and, as as matter of fact, *you might get* 6 inches? I dare say we do.
3733. Supposing you have sufficient water the whole year, what do you think it is worth per acre? About 5s. per acre.

Cost of distribution.

3734. *President.*] What *has been the cost of distributing* the water within the Trust? We estimate that there are 35 miles of channels, costing £1,700; 80 miles of check-banks, at £4 *per mile*; in addition to a number of stop-boards, sluices, &c.

Length of channels.

3735. How many miles of main channels have you *in the Trust*? Twelve miles.

George Peel, Chairman of the Gunbower West Irrigation Trust, sworn and examined:—

G. Peel. 21 July, 1902.

3736. *President.*] What is your name? George Peel.
3737. You are Chairman of the Gunbower West Irrigation Trust? Yes.

Particulars of Trust.

3738. Will you give us the particulars of the Trust? Area, 9,601 acres, (say) 9,000 of which are irrigable. The Trust has only been in working order for about eighteen months. In 1901-2, 3,349 acres were irrigated, and about 31,500,000 *cubic feet* of water used for the twelve months. £6,000 was voted; but we have only spent about £5,600, and that is our indebtedness to the Water Supply Department. Rate, 2s. in the £. Water *charges*:—*For cereals*, 1s. 6d. per acre for first watering, 1s. per acre for second and subsequent waterings; for fodder crops, 1s. per acre for first watering, 6d. *per acre* for second and subsequent waterings; for grass lands, 7d. per acre. In 1901, revenue derived from sale of water, £298 2s. 8d.; expenditure, *including indebtedness* to the Water Supply Department for interest on loan, £416. Gross areas watered:—Grass, 1,358 acres; wheat, 1,079 acres; oats, 108 acres; barley, 17 acres; lucerne, 312 acres; amber cane, 460 acres; maize, 9 acres; gardens, 5 acres. Population, 116; landowners, 34.

3739.

G. Peel. 21 July, 1902.

3739. Do you get an ample water supply? No.
3740. What more do you require? We need twice as much as we had last year.
3741. Do you know how much you had last year? 31,500,000 cubic feet.
3742. How do you arrive at that quantity? The Water Supply Department gives us an account of the number of inches per acre, and the secretary has made it up from that.

Depth of watering.

3743. How much water per acre is required for irrigation? About 6 inches per acre would be sufficient, but I am only judging by the rainfall and the effect on the land.
3744. Where do you get your supply from? Part from the Murray direct, and part from the Kow Swamp.
3745. *Mr. Burchell.*] You said that 312 acres of lucerne were irrigated last year;—how does it do? Very well on the timber land; but not very well on the plain land.
3746. Do you cut it off? In nearly every case it is fed off.
3747. What, in your opinion, is the quantity of water used per irrigation? It varies according to the land; I should say about 6 inches.
3748. Supposing you had sufficient water, what do you think irrigation would be worth to you? I could not say.
3749. Do you know the amount written off in connection with your Trust? The Trust I represent had nothing written off.

William John Davey, Proprietor of the *Kerang Observer*, and Commissioner of the Marquis Hill Irrigation Trust, sworn and examined:—

W. J. Davey. 21 July, 1902.

3750. *President.*] What is your name? William John Davey.
3751. You are proprietor of the *Kerang Observer*, a Commissioner of the Marquis Hill Irrigation Trust, and also a landowner in the district? Yes.

Reason for Relief Act.

3752. I understand that you have formed an opinion as to the reason why the Government of the State of Victoria took certain action some years ago in regard to the indebtedness of the different Trusts? I consider it was on account of the insufficiency of water.
3753. What you say is that the anticipations have not been realised? Just so. As illustrating the necessity for water in the early part of the year, I might state that in March, 1900, we had a rainfall of 2 inches 19 points, and as a consequence, the amount of dairy produce sent away from the Kerang station alone was 200 tons greater the first six months of that year than that sent away the corresponding period of the following year, when there was no rain in March. If the people had received the water as they were led to believe they would, I believe they would have been able to pay their interest from the first.
3754. Are we to understand that this writing down has been a necessity, and has been wholly due to the fact that there has not been sufficient water for the people to use in order to get a result, so as to enable them to pay interest? Yes.
3755. You hand in two statements, the first being particulars of the Trusts and their liabilities, and the second being a statement giving the charges for water in the several Trusts in the district before and after the passing of the Relief Bill? Yes. [*Exhibits 75 and 76*].

Michael Harvey, Overseer-in-charge of the Kerang Lake Works, sworn and examined:—

M. Harvey. 21 July, 1902.

3756. *President.*] What is your name? Michael Harvey.
3757. You are overseer in the employ of the Victorian Water Supply Department, in charge of the Kerang Lake works? Yes.
3758. Where do you get the water for the lakes from? From the Murray.
3759. *Via* what creek? Pyramid Creek.
3760. Do you get very much from the Loddon? Not a great deal.
3761. How long have you been in your present position? I can speak from twelve months' experience, and during that time there has been very little water down the Loddon at all. We have had to depend entirely on the Murray supply.
3762. That comes *via* Gunbower Creek into the Pyramid Creek? Yes.

Kerang Lakes.

3763. Can you tell us the condition of the Kerang Lakes before and after the season closed? Three feet of water was put into Reedy Lake; Second Lake the same, Third Lake the same, about 4 feet into Lake Charm, about 4 ft. 3 in. into Racecourse Lake, and about the same into Bertram's Lake.

Private pumps.

3764. How many pumps are working privately round the lakes? Six.
3765. What are their sizes? Ten inches and 12 inches.
3766. *Mr. Burchell.* Are those pumps authorised? Not to my knowledge.

WEDNESDAY, 23 JULY, 1902.

[*The Commission met at Modern Chambers, Collins-street, Melbourne.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

John Stewart Dethridge, Assistant Engineer in the Department of Mines and Water Supply, Melbourne, sworn and examined:—

J. S. Dethridge. 23 July, 1902.

3767. *President.*] What is your name? John Stewart Dethridge.
3768. You are Assistant Engineer in the Department of Mines and Water Supply? Yes.
3769. You are in charge of the Kow Swamp and Goulburn works? Yes.
3770. Last week we had evidence to the effect that it is proposed by the Melbourne Metropolitan Board of Works to divert a maximum of 10,000,000 gallons per day with a minimum of 8,000,000 gallons between the months of April and October; and between the months of November and May the quantity, if any, to be diverted is to be left to the discretion of the Engineer-in-Chief for the Victorian Water Supply;—will you tell us what the view of your department is in regard to that proposal? I do not think the proposal has come before the Department in that form, therefore it cannot be said that the Department has any settled

settled view in regard to that proposal. I could give the views of the department in regard to former proposals dealing generally with the question.

J. S. Dethridge. 23 July, 1902.

3771. We understood by the evidence given by Mr. Thwaites that the proposal to divert 20,000,000 gallons per day, which the Department have been considering, has never been made by the Metropolitan Board;—that being so, unless you are prepared to consider the proposal as put before this Commission by the Board, it would be better to leave the matter in abeyance until you are prepared to do so? I am not prepared to advance any opinion on the proposal as stated by you.
3772. Will you submit a Departmental statement dealing with the proposal as laid before the Commission, and lay it before us in a few days? Yes. [*This information was not supplied.*]

Alfred Stephen Kenyon, Assistant Engineer, Water Supply Department, Victoria, further examined:—

A. S. Kenyon. 23 July, 1902.

3773. *President.*] You have been asked to prepare, for the use of the Commission, a statement showing the total area of the land along the Valley of the Murray, and contributing streams in Victoria, which is suitable for irrigation? Before answering that question, I would like to rectify an omission in my previous evidence with regard to the Murray and its contributing streams. In the watershed of the Goulburn, the Metropolitan Board of Works diverts up to 12,000,000 gallons per day from the Silver Creek, and 21,000,000 gallons per day from the Wallaby Creek.

Classes of land.

For the purpose of estimating the total area of land suitable for irrigation within the Murray Basin within the State of Victoria, it is advisable to form three classes:—(1st) Irrigable river flats in the mountainous districts; (2nd) river flats which are liable to submergence, and are to a certain extent naturally irrigated; (3rd) the most important class, lands suitable for irrigation, forming the "plains" of the various river valleys.

In all the areas given, deduction is made for roads, &c.

Method of computing requirements for watering.

The annual volumes of water to be reserved are calculated upon the following basis:—One-half of the area is assumed to be irrigated each year, the depth of watering is estimated at 12 inches for the year's watering, and an allowance of 50 per cent. of the total volume reserved is made for losses in conveyance and distribution. In the case of the flooded river flats, however, provision is made for watering the whole area each year, as practically the whole already enjoys an annual watering, but as no provision is needed for losses, the volumes to be reserved per unit of area remain the same.

The following table gives the areas of the various classes, and the annual volumes of water to be reserved for each locality:—

Name.	Mountainous river flats.	Flooded river flats.	River plains.	Total area.	Annual volumes to be reserved.
	acres.	acres.	acres.	acres.	millions of cubic feet.
Upper Murray	2,000	.....	.....	2,000	87
Mitta	2,000	.....	.....	2,000	87
Kiewa	1,000	1,000	.....	2,000	87
Ovens	1,500	2,000	300,000	303,500	13,220
Goulburn and Broken	4,000	90,000	1,800,000	1,894,000	82,503
Campaspe	2,000	1,000	300,000	303,000	13,199
Loddon	12,000	70,000	1,000,000	1,082,000	47,132
Lower Murray (river frontage below Swan Hill)	.....	60,000	300,000	360,000	15,682
	24,500	224,000	3,700,000	3,948,500	171,997

Total irrigable area and water supply.

The total area is, approximately, 4,000,000 of acres, whose irrigation requirements amount to 172,000 millions of cubic feet of water per annum. The annual contributions to the flow of the Murray River from the streams in the State of Victoria total 264,000 millions of cubic feet in an average year, and 157,000 millions for a minimum. As the flow at the measuring points for these contributions would be considerably less, owing to natural losses, than at the required points of off-take for irrigation, it is reasonable to assume that the ultimate requirements of this State, for irrigation within the Murray valley, can be supplied by Victorian streams, even in minimum years. The requirements for domestic and stock supply are relatively so small as not to need separate consideration; they would not aggregate more than 5,000 millions of cubic feet per annum.

The demands for irrigation in the various watersheds, as given in the preceding table, cannot, however, in every case, be met from their own resources, as the following table, giving the percentages of irrigable land and reservations of water, and of volumes of flow in a minimum year, for each watershed shows:—

Name.	Percentage of irrigable land and of water reservations.	Percentage of flow in a minimum year.
Upper Murray	·05	14
Mitta	·05	21
Kiewa	·05	
Ovens	7·69	
Goulburn	47·97	
Campaspe	7·67	
Loddon	27·40	
Lower Murray	9·12	
	100·00	100

Storages required.

Evidently, the utilisation of the surplus waters of the Upper Murray, Mitta, Kiewa, and Ovens watersheds to meet the demands of the Goulburn, Campaspe, Loddon, and Lower Murray districts is inevitable. This would necessitate the construction of storages on all streams, of capacity equal to, say, one-half of the minimum annual volume, together with a diversion, such as has been proposed from Bungowannah to the Loddon River, but of much greater dimensions.

I also hand in the final report of the Parliamentary Standing Committee on Railways on the Mallee water supply, which was not printed when I gave evidence previously. [*Exhibit* 78.]
3774. You have prepared a statement showing the gaugings of the Murray River at Tooleybuc and the contributing streams? Yes.

NOTES

A. S. Kenyon. 23 July, 1902.

NOTES ON TOOLEYBUC GAUGINGS.

All figures in millions of cubic feet.

Typical maximum year, 1894.

CONTRIBUTIONS BY STREAMS ABOVE ECHUCA.

		Echuca.	
New South Wales...	Upper Murray	87,000	
	Albury, &c. (say)	15,000	
			102,000
Victoria	Upper Murray	66,000	
	Mitta	88,000	
	Kiewa	29,500	
	Ovens	82,950	
	Goulburn	180,500	
			446,950
	Total		548,950
Year 1894, gauged at Echuca			400,031
	Losses		148,919

CONTRIBUTIONS BY STREAMS ABOVE TOOLEYBUC.

New South Wales, as before			102,000
Victoria	As before	446,950	
	Campaspe	17,250	
	Loddon	26,000	
			490,200
	Total		592,200
Year 1894, gauged at Tooleybuc			295,000
	Losses		297,200

Typical minimum year, 1896.

CONTRIBUTIONS BY STREAMS ABOVE ECHUCA.

New South Wales...	Upper Murray	30,000	
	Albury, &c. (say)	2,000	
			32,000
Victoria	Upper Murray	22,200	
	Mitta	32,500	
	Kiewa	12,700	
	Ovens	25,450	
	Goulburn	59,000	
			151,850
	Total		183,850
Year 1896, gauged at Echuca			152,480
	Losses		31,370

CONTRIBUTIONS BY STREAMS ABOVE TOOLEYBUC.

New South Wales, as before			32,000
Victoria	As before	151,850	
	Campaspe	2,400	
	Loddon	3,000	
			157,250
	Total		189,250
Year 1896, gauged at Tooleybuc			140,000
	Losses		49,250

Typical mean year, 1900.

CONTRIBUTIONS BY STREAMS ABOVE ECHUCA.

New South Wales...	Upper Murray	45,000	
	Albury, &c.	8,400	
			53,400
Victoria	Upper Murray	34,600	
	Mitta	54,400	
	Kiewa	19,700	
	Ovens	46,500	
	Goulburn	111,600	
			266,800
	Total		320,200
Year 1900, gauged at Echuca			249,944
	Losses		70,256

CONTRIBUTIONS BY STREAMS ABOVE TOOLEYBUC.

New South Wales, as before			53,400
Victoria	As before	266,800	
	Campaspe	7,750	
	Loddon	9,650	
			284,200
	Total		337,600
Year 1900, gauged at Tooleybuc			208,000
	Losses		129,600

3775. Have you seen the map showing the basin of the river Murray, prepared by Mr. McKinney some years ago, and marked *Exhibit No.* 1 by this Commission? Yes.

3776.

A. S. Kenyon. 23 July, 1902.

3776. Do you agree with the portions shown as contributing and non-contributing respectively, so far as Victoria is concerned? This map, so far as relates to the State of Victoria, is sufficiently accurate in the definition of the lines of watershed, and the total area given of the Murray basin in the State, 50,979 square miles, may be concurred in. But, even allowing for varying interpretation of the somewhat vague definition of non-contributing areas, those areas as given must be taken exception to. The following table shows the figures given on the map, and those suggested by me in their stead:—

CONTRIBUTING AREAS.

	H. G. McKinney.	A. S. Kenyon.
	square miles.	square miles.
Murray (Upper)	1,500	1,500
Mitta	2,400	2,400
Kiewa	700	700
Ovens	2,800	2,700
Goulburn	5,700	5,240
Campaspe	1,250	970
Loddon	2,350	1,800
Total effective catchment area	16,700	15,310
Delta land and non-contributing areas	34,279	35,669
Total area in Victoria	50,979	50,979

3777. Have you prepared a statement of the quantities of water supplied to each of the Irrigation Trusts on the Loddon River, for the years 1899, 1900, and 1902? Yes. Water supplied to Irrigation Trusts on the Loddon.

All quantities in millions of cubic feet.

	1899.	1900.	1901.
Irrigation Trusts—			
Tragowel Plains	3,186	3,378	1,478
East Boort	490	520	227
North Boort	163	173	76
Leaghur and Meering	168	178	78
Wandella	381	404	177
Twelve-mile	150	159	69
Domestic and stock supplies	400	400	300
Diverted to Kerang Lakes	600	1,000	500
Passing Kerang weir for Lower Loddon and to the Murray River.	1,500	1,000	none.
Losses	350	324	288
Annual totals	7,388	7,536	3,193

3778. *Mr. Murray.*] What was the volume supplied to the Tragowel Plains Trust for the year 1901? 1,478,000,000 cubic feet.

3779. I will read from my notes of the evidence we obtained from the Engineer of the Trust, on the 11th of this month:—"The maximum supply to the Trust was 5,724 cubic feet per minute—that is, after making allowance for riparian rights of lessees from the river channel. In the year 1901 the supply was about 512,000,000 cubic feet. The extent of irrigation was 12,953 acres wheat, 5,935 acres oats, 419 acres fodder, 7,532 acres grass, or a total of 26,486 acres; 39 garden waterings, 539 tank fillings. The depth of water used in irrigation varies from 3 inches to 20 inches, the average is about 8 inches for the first and 6 inches for the second watering. The quantity used is excessive, and might be reduced by the proper laying out and grading of the land."—The depths and areas stated by the witness give 742,000,000 cubic feet; he explained the discrepancy between the figures of water supplied and water used, by the fact that the latter is an estimate based on a few experiments only; what do you think of that;—where is the mistake?—The statement as to the amount received is wrong. They receive up to 20,000 or 25,000 cubic feet per minute.

3780. His statement as to the amount received for 1901, *i.e.*, 512,000,000 cubic feet, is wrong? Yes; it should be 1,478,000,000, about three times the amount stated. The acreage given would, I estimate, take 1,200,000,000 cubic feet of water to irrigate it.

3781. How do you arrive at that conclusion? By taking an average depth of 10 inches per watering, which my experience leads me to think would be nearer the mark than 8 inches, and making due allowance for losses.

3782. *President.*] Have you prepared a statement of the quantity of water diverted from the Murray River at the various points of off-take, from the year 1890 to date? Yes.

QUANTITIES OF WATER DIVERTED FROM THE MURRAY RIVER AT THE VARIOUS POINTS OF OFF-TAKE, FROM THE YEAR 1890 TO DATE. Water diverted from Murray.

All quantities in millions of cubic feet.

	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	Total.	Mean.
Kow Swamp Head-works..	...	...	...	6,345	6,167	2,976	3,715	4,359	5,498	3,844	8,543	5,887	47,334	5,259
Less returned to river by Gunbower Creek.	...	...	..	4,800	3,500	100	600	500	1,100	400	4,200	900	16,100	1,789
Net diversion	...	...	...	1,545	2,667	2,876	3,115	3,859	4,398	3,444	4,343	4,987	31,234	3,470
Cohuna Head-works	12	20	212	294	234	947	1,173	1,177	1,087	955	596	1,695	8,402	700
Koondrook and Myall	7	17	28	57	7	61	98	13	101	96	69	114	668	56
Benjeroop and Murrabit	50	22	57	75	34	156	109	140	180	138	176	234	1,371	114
Swan Hill	36	115	49	127	44	107	148	292	236	167	237	189	1,797	150
Mildura	135	354	696	759	606	712	933	1,153	954	815	751	1,933	9,801	817
Totals	240	528	1,042	2,857	3,592	4,859	5,576	6,634	6,956	5,615	6,222	9,152	53,273	5,307

A. S. Kenyon. 23 July, 1902.

3783. Have you also a statement of the water discharged from the Kow Swamp since its construction? Yes.

Year.	Volumes in millions of cubic feet.		Year.	Volumes in millions of cubic feet.
1893	500	Estimated.	1899	2,397
1894	1,500		1900	3,179
1895	1,850		1901	3,930
1896	2,114			21,576
1897	2,764			
1898	3,342			

NOTE.—The differences between these figures and those given for the diversions of the Murray at the Kow Swamp Head-works represent the volumes returned to the Gunbower Creek, an ana-branch of the Murray, and the losses by evaporation, &c., in the Kow Swamp storage, which may be estimated at 1,000 millions of cubic feet per annum.

3784. *Mr. Murray.*] How do you explain the difference between the figures giving the discharge from the Kow Swamp works and those giving the volumes diverted from the river? The whole volume diverted is not taken into Kow Swamp.

Kow Swamp headworks.

3785. The Kow Swamp head-works is partly a natural effluent of the Murray? Yes; it is at the head of the Gunbower Creek.

Natural diversion.

3786. So that a volume probably as large as the difference referred to by you would, in the ordinary course of nature, have flowed down the creek? In some years a diversion as great as has taken place through the present works would have occurred naturally, and sometimes, in wet years, the diversions would have been even greater.

3787. The water diverted under natural conditions would spread over the country and be retained by the lakes and ana-branches, and ultimately be lost by evaporation, whereas it is now under control? Yes; to a large extent.

3788. *President.*] Do I understand you to say that greater diversions into the Kow Swamp would take place naturally at the head of the Gunbower Creek than under present conditions? Greater diversions would have taken place; but not into the Kow Swamp.

3789. In your opinion, taking all the creeks in the vicinity of Gunbower Creek into consideration, as much water would have been diverted naturally before the works were carried out as since? Not necessarily every year; but in years of high river.

Bed of Gunbower Creek.

3790. What was the level of the bed of Gunbower Creek as compared with that of the present channel? Speaking from memory, diversion takes place at about 4 feet lower level than it would have done naturally.

Level of present channel.

3791. Do I understand that diversion takes place now at 4 feet above Summer level of the river? Between that and 5 feet.

3792. While previously it took place at 8 feet 6 inches above Summer level? Between 8 feet and 9 feet.

Dimensions of channel.

3793. What was the size of the channel at the river? The diversions through the artificial works are limited to 40,000 cubic feet per minute. The natural diversion when the river was in high flood would probably be five to ten times as great.

3794. Would the diversions which originally took place find their way into the Murray again? Yes; to a certain extent.

3795. Do they do so now? I have shown in the statement of diversions the amount I estimate would return to the Murray.

3796. Originally the water would find its way back to the river, whereas now it is, to a large extent, used on the land? To the extent I have called the "net diversion" on my statement.

Water returned to river.

3797. *Mr. Murray.*] You say, in the natural course of events, the water would have been returned to the river, whereas portion of it is now used; but the whole of the water diverted naturally was not returned was it? In years of low river there would be comparatively little waste of the water diverted, nearly the whole of it being returned to the river; but in years of high river the diversions would be more largely absorbed than now.

3798. The loss by evaporation and soakage is now more under control than previously? Yes; in years of high river a large extent of country was flooded previously which is not now.

3799. *Mr. Burchell.*] Diversions take place through the channels now in years of low river which did not do so before? We have no record of any year during which diversions would not have taken place naturally.

3800. *President.*] Have you any means of knowing the amount of the diversions which took place prior to the construction of the head-works? Not with any degree of accuracy.

3801. Does the statement of diversions which you have put in, so far as the Murray is concerned, include the whole of the water diverted therefrom? It does not include the small diversions for town supplies along the river, nor the unauthorised diversions; but all authorised diversions of importance are shown.

Unauthorised diversions.

3802. Have you any information as to the unauthorised diversions from the Murray? Nothing beyond what I gave in my previous evidence. The total volume thus diverted is not great.

3803. We had evidence in the country that a large number of pumping plants, consisting of 10-inch to 12-inch centrifugal pumps were engaged privately pumping from the Murray;—have you any information in regard to such? I know there are a considerable number of pumping plants—twenty to thirty perhaps; but they do not work constantly.

3804. Do they work six months in the year? No; the average length of time pumping is carried on, taking the country between Echuca and Swan Hill, which covers pretty well the whole of the unauthorised diversions, would not be more than, say, twenty days of twenty-four hours.

3805. *Mr. Murray.*] What quantity would they divert? 250 cubic feet per minute each.

3806. For the whole time? Yes.

3807. *President.*] The effect of your evidence is that there are twenty-five plants working twenty days per annum, which would give an annual diversion, so far as unauthorised private pumping is concerned, of 180,000,000 cubic feet? That is as near as I can estimate it; but it seems to me rather more than the actual quantity diverted.

3808. *Mr. Murray.*] Could you give us any idea of the total amount of land irrigated in that way from the Murray? I should think, say, 4,000 to 5,000 acres.

3809. How many cubic feet of water per acre? From 40,000 to 50,000.

A. S. Kenyon. 23 July, 1902.

3810. *President.*] Have you prepared a statement of the quantities of water supplied to the different Trusts from the Kow Swamp system? No. I put in a return showing the total volumes diverted for the Trusts, but not separately to each. The quantity diverted from Kow Swamp is included.

3811. Will you prepare a statement showing how the water is disposed of from the Kow Swamp head-works? Yes. [*See reply to Question* 3834.]

3812. You have given us the quantity diverted from the Loddon into the Kerang Lakes, but not the quantity diverted from the Murray;—will you supply the latter? Yes.

Method of computing amount of water returned to rivers.

3813. How have you arrived at the quantity returned to the Murray, *via* Gunbower Creek? From observations made by the Departmental officers of the overflows of the Kow Swamp Channel into the Gunbower Creek.

3814. I presume the quantities you have given as used by the various Trusts have been arrived at in a similar way? In the case of the Loddon Trusts, the figures are supplied by our own officers. The diversions from the Murray, except Kow Swamp, are arrived at by returns furnished by the Trusts in addition to our own observations.

3815. How do you arrive at the Cohuna diversions? Partly by observations made by officers of the Department, but principally from returns made by the Trust, and by the river heights, which are known to the Department.

3816. From the evidence given by Mr. McClelland, the engineer of that Trust, we gathered that, so far as that Trust is concerned, it was not possible to give the quantities, except on the basis of an assumed quantity put on the land; in other words, so far as the quantities diverted from the river are concerned, it was not possible to ascertain it in the way you have described? I do not know why not. The pump discharge is well known, also the capacity of the gravitation channels.

3817. You are aware that there is no gauge at the Deep Creek diversion? We have measured it by the river gauge. The level of the river gives the actual discharge if the gates are full open. The heading-up is computed. The gauge staff is read by our officers at the pumping-station. It is situated about half a mile up stream from Deep Creek.

3818. *Mr. Burchell.*] When were the first diversions from the Murray made? In connection with the off-takes I have mentioned, I should think about 1887, for Benjeroop and Murrabit; Cohuna, about 1888 or 1889; Koondrook and Myall, about 1890; Swan Hill, 1889; and Mildura, 1889.

3819. *President.*] Mr. McClelland, engineer for the Cohuna Trust, gave it in evidence that in 1901, there was diverted, by means of pumping, from the 1st July to 31st May, 530,000,000 cubic feet, and by gravitation, from 1st June to 31st October, 1,600,000,000 cubic feet; a total for that year of 2,130,000,000 cubic feet; you have given 1,695,000,000 cubic feet as the total diversion for that year;—can you explain the discrepancy? We must have worked on different data. The estimated discharge from the pumping-plant is based upon measurements made four years ago; the diversions given by Mr. McClelland are undoubtedly too large; they could not have occurred, so far as I have computed them.

3820. You know him to be a thoroughly competent man? Yes.

3821. Do you not think, seeing he is on the ground, and capable of computing the quantities, it would be fair to take what he says? Before answering that, I should like to know his method of arriving at his figures.

3822. Will you communicate with him with a view of learning that, and be prepared to answer later on? Yes. [*Vide* Question 5167.]

3823. When we were visiting Koondrook we took evidence from the chairman and secretary to the effect that, except in flood times, no water came down the Gunbower Creek? I would not like to contradict them, as I have only been there twice, but the explanation of the apparent discrepancy between their statement and my own may lie in the use of the term "flood times."

3824. Have you prepared a statement of the dimensions of the channels of diversion from the Murray River, and particulars of pumping plants? Yes.

Diversion channels and pumping plants.

DIMENSIONS OF CHANNELS OF DIVERSION FROM THE MURRAY RIVER, AND PARTICULARS OF PUMPING PLANTS.

Channels.	Bed Width.	Side Slopes	Grade of Channel. Fall in inches per mile.	Height of Sill above summer level.	Approximate River Bed below summer level.	Full Supply, depth in channel.	Notes.
		h. v.					
Kow Swamp	44′	1½ 1	3	5	12′	8	
Cohuna (Deep Creek)	10′	1½ 1	3	0′	23′	12′	
Cohuna (at pumping station)	21′	1½ 1	4	9′	27′	6′	Used both for pumping and gravitation
Koondrook and Myall	18′	1½ 1	6	12′ 6″	13	1′ 6″	" " "
Benjeroop and Murrabit	30′	1½ 1	9	9′	20′	3	
	20′	2 1	12	9′	20′	3′	
Swan Hill	12′	2 1	9	11 4″	11′	3′ 6″	" " "

Pumping Plants—Gross Capacity (in cubic feet per minute).

Cohuna	5,000	
Koondrook and Myall	1,600	
Swan Hill	1,800	
Mildura, Psyche Bend	13,500	NOTE.—The actual possible diversion from the river is limited to 5,405 cubic feet per minute, as the Psyche Bend pumps merely deliver into a billabong when the river is too low to flow into it.
" Billabong	5,000	
" Town	115	
" Ranfurly	290	

A. S. Kenyon. 23 July, 1902.

3825. You have also a statement showing the quantities of water those channels are capable of diverting at various heights of the river above summer level? Yes.

THEORETICAL quantities of water that Murray River diversion channels are capable of diverting at various heights of the river above summer level, both as to local gauge readings and as referred to the Echuca gauge.

Local heights above summer level	0′	1′	2′	3′	4′	5′	6′	7′	8′	9′	10′	11′	12′	13′	14′	15′	16′	17′	18′
KOW SWAMP.																			
Above summer level—Echuca	..	..	..	..	..	£ 5′	6′	7′	8′	9′	10′	11′	12′	13′	..	..	..	..	..
Depth in channel	..	..	..	..	..	0′	1′	2′	3′	4′	5′	6′	7′	8′	..	..	..	..	..
Cubic feet per minute	..	..	..	..	..	0	820	3,160	6,600	11,100	16,700	23,200	30,900	39,400	..	..	..	..	..
COHUNA (DEEP CREEK).																			
Above summer level—Echuca	0′ 0″	0′ 8″	1′ 6″	2′ 6″	3′ 6″	4′ 6″	5′ 6″	6′ 8″	7′ 11″	9′ 1″	10′ 2″	11′ 3″	12′ 4″	13′ 7″	14′ 9″	16′ 0″	17′ 1″	18′ 6″	20 0″
Cubic feet per minute	0	200	740	1,520	2,700	4,300	6,100	8,100	10,300	12,500	14,800	17,200	19,600	21,900	24,100	26,100	28,100	30,200	32,200
COHUNA (AT PUMPING STATION).																			
Above summer level—Echuca	..	..	..	..	..	..	..	..	..	9′ 1″	10′ 2″	11′ 3″	12′ 4″	13′ 7″	14′ 9″	16′ 0″	..	..	..
Depth in channel	..	..	..	..	..	..	..	..	..	0″	1′	2′	3′	4′	5′	6′	..	..	..
Cubic feet per minute	..	..	..	..	..	..	..	..	..	0	520	1,820	3,770	6,320	9,570	13,400	..	..	..
KOONDROOK AND MYALL.																			
Above summer level—Echuca	..	..	..	..	..	..	..	..	..	..	..	..	21′	+24′	..	..	..	..	..
Depth in channel	..	..	..	..	..	..	..	..	..	..	..	..	0′	1′	..	..	..	..	..
Cubic feet per minute	..	..	..	..	..	..	..	..	..	..	..	..	0	560	..	..	..	..	..
BENJEROOP AND MURRABIT.																			
Above summer level—Echuca	..	..	..	..	..	..	..	..	..	12′ 6″	14′	20′	+24′	..	..	..	..	..	..
Depth in channel	..	..	..	..	..	..	..	..	..	0′	1′	2′	3′	..	..	..	..	..	..
Cubic feet per minute	..	..	..	..	..	..	..	..	..	0	2,300	7,070	14,670	..	..	..	..	..	..
SWAN HILL.																			
Above summer level—Echuca	..	..	..	..	..	..	..	..	..	..	..	+24′	+24′	+24′	38′	..	..	..	..
Depth in channel	..	..	..	..	..	..	..	..	..	..	..	0′	1′	2′	3′	..	..	..	..
Cubic feet per minute	..	..	..	..	..	..	..	..	..	..	..	0	460	1,660	4,670	..	..	..	..

3826. What is the maximum diversion of the Kow Swamp head-works? 39,400 cubic feet per minute.
3827. What happens when more than that quantity passes out of the river? No more is allowed to pass into the channel.
3828. What would happen supposing a larger quantity did by accident pass into the channel? It would eventually find its way into the Gunbower Creek.
3829. *Mr. Murray.*] Would not a good deal of it lie on Gunbower Island? I take that to be part of Gunbower Creek.
3830. *President.*] How would the water you refer to get into the Gunbower Creek? From the Kow Swamp channel, through flood escapes, which form part of the Kow Swamp works.
3831. Do I understand that would be the result of more than 39,400 cubic feet per minute being put into the channel? No; the diversions never exceed the maximum stated.
3832. How do you explain it then? The Kow Swamp head-works are *not* always used to regulate the diversion from the river. They are left open, and the whole possible diversion up to the maximum capacity of the channel takes place; but the excess above the Kow Swamp requirements is returned to the Gunbower from points lower down, where there are flood escapes.
3833. Have you prepared a supplementary statement of the authorised diversions from non-contributing streams within the watershed of the Murray in the State of Victoria. Yes. [*Appendix* 17A.]

TUESDAY, 29 JULY, 1902.

[*The Commission met at Modern Chamber Collins-street, Melbourne.*]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).

FREDERICK N. BURCHELL, ESQ.

Alfred Stephen Kenyon, Assistant Engineer, Water Supply Department, Victoria, further examined:—

A. S. Kenyon. 29 July, 1902.

3834. *President.*] You have prepared a statement showing the water supply to the various Trusts connected with the Kow Swamp National Works? Yes.

KOW SWAMP WORKS—WATER SUPPLIED TO TRUSTS, KERANG LAKES, LODDON RIVER, AND BOX CREEK.

All quantities in millions of cubic feet.

Years.	Macorna North Trust.	Kerang East Trust.	Marquis Hill Trust.	Wandella Trust.	Gunbower West Trust.	South Kerang Trust.	Dry Lake Trust.	Kerang Lakes.	Loddon River and Box Creek.	Total Volumes.
1893	No gaugings of Trust supplies available for these years									500
1894										1,500
1895	398	388	355	... ..	.....	.....	.....	.....	709	1,850
1896	609	452	470	.....	.....	.....	.....	.....	583	2,114
1897	557	324	459	109	.....	2	.....	.....	1,313	2,764
1898	632	345	420	296	.....	Nil.	.....	.....	1,649	3,342
1899	647	366	44.	332	.....	9	10	.....	584	2,397
1900	411	265	235	287	49	23	6	182	1,661	3,179
1901	737	555	544	545	160	48	25	150	1,166	3,930
	3,991	2,695	2,992	1,569	209	82	41	332	7,665	21,576

A. S. Kenyon. 29 July, 1902.

3835. Are these figures prepared from returns supplied by local officers of the Department, in the same way as those you put in when previously giving evidence before the Commission? Yes.
3836. The quantities you have given in the return as being supplied to the Kerang Lakes, taken in conjunction with that which is supplied from the Loddon River as given when you were previously before the Commission, is the total quantity supplied to those lakes? Yes.
3837. When giving evidence before the Commission on 23rd instant you supplied information as to the area of the land suitable for, and which it was possible to irrigate in the State of Victoria;—have you now prepared a statement giving the locality and the quantities that could be stored for the purpose of irrigating those lands? No. I have prepared a statement of the existing and proposed storages on the tributary streams of the Murray River in this State, but the proposed storages would not be sufficient to irrigate the total area set down.

Storages available.

3838. Would there be any difficulty in providing storages for the whole quantity of water required to irrigate the land to which I have referred? It is simply a question of cost; from my acquaintance with the rivers, I am of opinion that storages could be obtained, but the cost would be prohibitive.
3839. Then, as a matter of fact, unless you could afford to construct storage reservoirs, it would be of little use saying that the land could be irrigated—is not that so? Yes. The total area given, viz, 4 million acres, is, in my opinion, beyond the practical limit of irrigation works.

Irrigable area.

3840. What quantity of land do you consider could be irrigated profitably in view of the quantity of water available in the river, and the practicability of storing water for the purpose of irrigating those lands? In schemes already considered by the Department and schemes carried out, an area of about 2,000,000 acres is involved, or half the area in the Murray Basin which is suitable for irrigation, but, so far, sufficient sites have not been investigated to store water to supply the whole of that area. From my knowledge of the rivers, I should say there is no difficulty in providing, at reasonable cost, storage sufficient for the 2,000,000 acres concerned.
3841. Do you regard that as the approximate limit of the irrigable land available in Victoria, in view of all conditions I have named? Yes, the extreme limit.

Future requirements.

3842. How much per annum do you think would be a fair allowance of water to make for the distant future, for the purpose of irrigating that 2,000,000 acres? About 15,000 cubic feet per acre per annum in the off-takes should be sufficient for good irrigation.

Method of computation.

3843. How do you arrive at that amount? By taking 12 inches deep for watering, and about half the irrigable area to be watered each year, and making an allowance of 100 per cent. for losses.
3844. You make your calculations on the supposition that 1,000,000 acres per annum would be watered, and that, while 12 inches of water would actually be applied to the land, there would be 100 per cent. over and above, which must be allowed for evaporation, seepage, and soakage? Yes.
3845. So far as your Department has investigated the matter, will you give the storages and particulars in respect thereto which you know of? Yes, they are as follows:—

Existing and proposed storages.

EXISTING AND PROPOSED STORAGES ON THE TRIBUTARY STREAMS OF THE MURRAY RIVER IN THE STATE OF VICTORIA.

River.	Locality.	Capacity in millions of cubic feet.	Approximate Cost.	Remarks.
		Existing Storages.	£	
Wimmera	Lake Lonsdale	2,000	50,000	Not yet completed.
	Wartook	1,040	31,000	
Loddon	Laanecoorie*	610	135,000	
Campaspe	Malmsbury*	546	150,000	
	Upper Coliban	648	77,000	
Goulburn	Weir	550	225,000	Principally for diversion.
Murray	Kow Swamp	1,780	100,000	Cost of supply channel included.
		Proposed Storages.		
Wimmera	Eversley	700	95,000	Will not be constructed if Glynwylln Res. [be constructed.
	Glynwylln*	2,224	125,000	
	Taylor's Lake	1,174	60,000	Superseded by Lake Lonsdale and Glynwylln.
	Kewell	5,000	291,000	
	Black Swamp	732	10,000	Superseded by Lake Lonsdale.
	Hall's Gap	1,600	80,000	Superseded by Lake Lonsdale.
Avoca	Amphitheatre	347	40,000	
Loddon	Newstead	1,200	200,000	
Campaspe	Langwornor*	640	50,000	
Goulburn	Reedy Lake	Not estimated.		
	Waranga Swamp	7,500	235,000	Exclusive of cost of supply channel.
Broken	Mokoan	6,000	143,000	Alternative schemes.
	Nillahcootie	2,300	149,000	
Upper Murray	Cumberoona	13,000	Not estimated.	Joint works with N.S.W. alternative.
	Talmalmo	11,000	300,000	

* These storages act also as regulating basins.

3846. Have you made any calculations as to the area it would be possible to supply with water for irrigation from existing and proposed storages on the basis you have already laid down in your evidence to-day? No.
3847. Will you do so, and forward the statement? Yes. [*Witness subsequently supplied the following information*]:—

Area irrigable from existing and proposed works.

In a year of low river flow, the existing works of storage and of diversion are capable of supplying water for irrigation of, approximately, 700,000 acres; proposed works under consideration would similarly be capable of an irrigation supply for about 1,000,000 acres. The river flats irrigated naturally by flooding total some 200,000 acres. The area, therefore, of the total lands suitable for irrigation in the State of Victoria, which can be supplied under existing conditions and by proposed works, is 1,900,000 acres, of which one-half would be irrigated annually to a depth of 12 inches, provision being made for an equal volume to cover losses in conveyance and distribution.

3848.

A S. Kenyon. 29 July, 1902.

3848. Have you prepared statements showing quantity of water diverted from the Goulburn, Broken, Campaspe, Wimmera, Richardson, and Avoca Rivers? Yes.

DIVERSIONS FROM THE GOULBURN RIVER.
All quantities in millions of cubic feet.

	Rodney Trust.	Echuca and Waranga Trust.	Metropolitan Board of Works, Silver and Wallaby Creeks. Approximate.	Total.
1891	202	133	500	835
1892	302	152	500	954
1893	400	196	500	1,096
1894	560	272	500	1,332
1895	993	950	500	2,443
1896	2,223	1,210	500	4,033
1897	3,566	1,291	500	5,357
1898	1,996	1,250	500	3,746
1899	2,231	1,128	500	3,859
1900	2,184	1,250	500	3,934
1901	2,523	1,670	500	4,993
	17,585	9,502	5,500	32,587

DIVERSIONS FROM THE BROKEN RIVER.
All quantities in millions of cubic feet.

	Tungamah Trust.	Numurkah Trust.	Shepparton Trust.	Losses.	Reaching Goulburn River.	Total.
1891	2 3	2 0	.....	220	6 008	6,631
1892	200	171	.....	230	8,241	8,842
1893	206	230	.....	250	16,613	17 299
1894	360	502	.....	250	21,992	23,104
1895	202	300	.....	200	5,474	6,176
1896	204	150	.....	150	3,050	3,554
1897	200	200	.....	180	4,328	4,908
1898	260	400	120	200	4,931	5,941
1899	300	623	270	180	3 246	4,619
1900	200	183	125	220	6,158	6,886
1901	350	655	305	180	3 233	4,723
Totals	2,715	3,614	820	2,230	83,274	92,683

DIVERSIONS FROM THE CAMPASPE RIVER.
All quantities in millions of cubic feet.

	Coliban Scheme.	Campaspe Trust.	Passing Rochester.	Total.
1891	831	.....	7,173	8,004
1892	1,063	.....	8,015	9,078
1893	1,049	125	14,305	15,479
1894	979	159	14,450	15,588
1895	938	341	3,034	4,313
1896	908	274	2,721	3,903
1897	973	150	4,004	5,127
1898	893	160	3,974	5,027
1899	803	100	5,844	6,752
1900	8 9	120	6,351	7,370
1901	916	250	1,522	2,678
Totals	10,247	1,679	71,393	83,319

DIVERSIONS FROM THE WIMMERA RIVER.
All quantities in millions of cubic feet.

	Wimmera United Trust.	Western Wimmera Trust.	Reaching Lake Hindmarsh.	Losses.	Totals.
1895	264	166	2,095	543	3,068
1896	572	316	Nil.	205	1,093
1897	377	176	430	450	1,433
1898	362	337	3,100	701	4,500
1899	553	319	1,105	520	2,997
1900	690	514	3,320	610	5,134
1901	652	422	1,400	770	3,244
	3,470	2,250	11,950	3,799	21,469

DIVERSIONS FROM THE RICHARDSON (AVON) RIVER.

No diversions of any importance take place. Practically the whole flow is discharged naturally into Lake Buloke.

DIVERSIONS FROM THE AVOCA RIVER.

No artificial diversions of any importance occur, but diversions into flood effluents take place naturally. In wet years the river empties into Lake Boel Boel, and, exceptionally, reaches the Little Murray River.

Very little irrigation takes place in the non-contributing area, the whole not amounting to 1,000 acres per annum.

3849.

A. S. Kenyon. 29 July, 1902.

3849. May we take it that the storages you have indicated in the statement can be materially supplemented? Yes.

3850. On which rivers? On all, except the Avoca and the Wimmera; but principally on the Mitta and the Goulburn.

3851. *Mr. Burchell.*] Could you supply a plan of the total area of land irrigable in the Valley of the Murray and contributing streams? Yes. [*Exhibit No.* 86.]

3852. Could you also supply a return showing how the land was occupied previously to the formation of the Irrigation Trusts? Yes.

The lands within Irrigation Trust Districts were, at the time of constitution, almost wholly alienated from the Crown. In some cases lands were included which were reserved for timber or other purposes, but have since been thrown open and alienated; these, however, form but a trifling proportion of the whole.

Ettore Checchi, Chief Assistant Engineer, Water Supply Department, Victoria, further examined:—

E. Checchi. 29 July, 1902.

3853. *President.*] Have you prepared a statement of the discharges of the Murray at Jingellic, Albury, Echuca, and Mildura? Yes.

TABLE showing Annual Rainfall, Diversion, and Discharge of the MURRAY RIVER at JINGELLIC.
Drainage Area, 2,520 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge, as gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual volume discharged from the catchment, in cubic feet.	Proportion of total rainfall discharged.
1891	39	91,772,000,000	Diversions not appreciable.	91,772,000,000	40 per cent.
1892	34	71,709,000,000		71,709,000 000	36 „
1893	40	103,339,000,000		103,339,000,000	44 „
1894	48	152,991,000,000		152 991,000,000	55 „
1895	28	72 932 000,000		72,932,000,000	44 „
1896	20	52,199,000,000		52,199,000,000	31 „
1897	27	55,141,000,000		55,141,000,000	35 „
1898	30	66,241,000,000		66,241,000,000	37 „
1899	27	55,624,000,000		55,624 000,000	35 „
1900	36	89,997,000,000		89,997,000,000	43 „
1901	20	63,659,000,000		63,659,000,000	38 „

TABLE showing Annual Rainfall, Diversion, and Discharge of MURRAY RIVER at ALBURY.
Drainage Area, 6,470 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge, as gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual volume discharged from the catchment, in cubic feet.	Proportion of total rainfall discharged.
1887	51	230,205,000 000	Diversions not appreciable.	230,205,000,000	30 per cent.
1888	30	111,093,000,000		111,093,000,000	25 „
1889	47	239,715,000,000		239,715,000,000	34 „
1890	40	174,550,000,000		174,550,000,000	29 „
1891	35	158,956,000,000		158,956,000,000	30 „
1892	33	133,722,000,000		133,722,000,000	27 „
1893	30	175,325,000,000		175,325,000,000	30 „
1894	46	264,383,000,000		264,383,000 000	38 „
1895	30	126,846,000,000		126,846,000,000	28 „
1896	31	90,586,000,000		90,586,000,000	20 „
1897	29	99,421,000,000		99,421,000,000	23 „
1898	33	107,103,000,000		107,103,000,000	22 „
1899	29	93,769,000,000		93,769 000,000	22 „
1900	37	143,654,000,000		143,654,000,000	26 „
1901	30	95,480,000,000			23 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the MURRAY RIVER at ECHUCA.
Drainage Area, 19,400 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge, as gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual volume discharged from the catchment in cubic feet.	Proportion of total rainfall discharged.
1887	45	330,565,000,000	1,500,000,000	391,915,000,000	19 per cent.
1888	25	216,724,000,000	1,500,000,000	218,074,000,000	19 „
1889	44	398,825,000,000	1,500,000,000	400,175,000,000	20 „
1890	36	352,803,000,000	1,500,000,000	354,158,000,000	22 „
1891	32	269,767,000,000	2,389,000,000	271,917,000,000	19 „
1892	30	259,843,000,000	2,002,000,000	261,645,000,000	19 „
1893	35	336,244,000,000	2,225,000,000	338,247,000,000	22 „
1894	41	400,031,000,000	2,913,000,000	402,725,000,000	22 „
1895	26	223,757,000,000	3,654,000,000	232,046,000,000	19 „
1896	27	152,480,000,000	5,050,000,000	157,034,000,000	13 „
1897	23	161,975,000,000	6,441,000,000	167,772,000,000	15 „
1898	23	182,811,000,000	5,192,000,000	187,484,000,000	15 „
1899	26	176,485,000,000	5,597,000,000	181,522,000,000	15 „
1900	32	249,944,000,000	4,497,000,000	254,441,000,000	18 „
1901	26	189,594,000,000	6,838,000,000	195,748,000,000	17 „

E. Checchi.
29 July, 1902.

TABLE showing Annual Rainfall, Diversion, and Discharge of the MURRAY RIVER at MILDURA.

Drainage Area, 92,000 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge, as gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual volume discharged from catchment, in cubic feet.	Proportion of total rainfall discharged.
1887	34	557,320,000,000	3,830,000,000	562,038,000,000	7·8 per cent.
1888	15	354,262,000,000	3,332,000,000	356,674,000,000	11·3 „
1889	30	642,489,000,000	2,465,000,000	644,999,000,000	10·0 „
1890	28	516,450,000,000	3,096,000,000	518,764,000,000	8·8 „
1891	27	534,115,000,000	4,069,000,000	537,239,000,000	9·2 „
1892	22	359,475,000,000	5,507,000,000	363,665,000,000	7·6 „
1893	24	511,228,000,000	19,025,000,000	525,582,000,000	10·1 „
1894	31	750,125,000,000	16,222,000,000	762,557,000,000	11·4 „
1895	18	346,582,000,000	13,391,000,000	356,793,000,000	9·5 „
1896	19	203,456,000,000	15,776,000,000	217,060,000,000	5·2 „
1897	17	197,288,000,000	11,320,000,000	211,623,000,000	5·8 „
1898	18	204,257,000,000	17,247,000,000	217,764,000,000	5·7 „
1899	18	209,686,000,000	17,512,000,000	223,031,000,000	5·9 „
1900	21	354,302,000,000	22,077,000,000	371,399,000,000	7·5 „
1901	17	210,368,000,000	21,117,000,000	227,151,000,000	6·1 „

3854. In preparing the tables and giving the proportion of the total rainfall discharge from each catchment, have you taken into consideration not only the quantity gauged, but the diversions? Yes.

3855. Have you prepared a statement showing the annual rainfall, diversion, and discharge of the Mitta River at Tallangatta, the Kiewa River at Kiewa, the Ovens River at Wangaratta, the King River at Wangaratta, the Broken River at Casey's weir, the Goulburn River at Murchison, the Coliban at Malmsbury, the Campaspe River at Rochester, the Loddon River at Bridgewater, the Loddon River at Laanecoorie, the Avoca River at Coonooer weir, the Mackenzie River at Wartook reservoir, the Glenelg River at Moora Moora, the Wimmera River at Glenorchy, and the Wimmera River at Horsham? Yes.

TABLE showing Annual Rainfall, Diversion, and Discharge of the MITTA RIVER at TALLANGATTA.

Drainage Area, 1,990 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	55	81,261,000,000	Diversions not appreciable.	81,261,000,000	32 per cent.
1888	32	36,277,000,000		36,277,000,000	25 „
1889	49	80,366,000,000		80,366,000,000	36 „
1890	39	65,230,000,000		65,230,000,000	36 „
1891	33	63,384,000,000		63,384,000,000	44 „
1892	32	52,855,000,000		52,855,000,000	36 „
1893	36	63,370,000,000		63,370,000,000	38 „
1894	44	87,987,000,000		87,987,000,000	43 „
1895	30	43,491,000,000		43,491,000,000	31 „
1896	31	32,517,000,000		32,517,000,000	23 „
1897	31	38,834,000,000		38,834,000,000	27 „
1898	35	41,377,000,000		41,377,000,000	26 „
1899	29	38,710,000,000		38,710,000,000	29 „
1900	36	51,309,000,000		51,309,000,000	31 „
1901	28	31,300,000,000		31,300,000,000	24 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the KIEWA RIVER at KIEWA.

Drainage Area, 434 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	65	27,438,000,000	Diversions not appreciable.	27,438,000,000	42 per cent.
1888	38	15,489,000,000		15,489,000,000	40 „
1889	65	27,121,000,000		27,121,000,000	41 „
1890	60	22,835,000,000		22,835,000,000	38 „
1891	47	17,889,000,000		17,889,000,000	38 „
1892	51	18,787,000,000		18,787,000,000	36 „
1893	62	23,093,000,000		23,093,000,000	37 „
1894	68	29,506,000,000		29,506,000,000	43 „
1895	54	19,245,000,000		19,245,000,000	35 „
1896	54	12,703,000,000		12,703,000,000	23 „
1897	49	14,801,000,000		14,801,000,000	30 „
1898	56	17,788,000,000		17,788,000,000	31 „
1899	54	13,243,000,000		13,243,000,000	24 „
1900	65	20,534,000,000		20,534,000,000	32 „
1901	62	13,516,000,000		13,516,000,000	22 „

E. Checchi.
29 July, 1902.

TABLE showing Annual Rainfall, Diversion, and Discharge of the OVENS RIVER at WANGARATTA.

Drainage Area, 2,090 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	56	56,741,000,000	Diversions not appreciable.	56,741,000,000	21 per cent.
1888	36	25,464,000,000		25,464,000,000	15 „
1889	60	62,006,000,000		62,006,000,000	21 „
1890	51	50,003,000,000		50,003,000,000	20 „
1891	44	35,723,000,000		35,723,000,000	17 „
1892	45	48,873,000,000		48,873,000,000	22 „
1893	53	71,263,000,000		71,263,000,000	28 „
1894	59	82,948,000,000		82,948,000,000	29 „
1895	42	43,526,000,000		43,526,000,000	22 „
1896	42	23,608,000,000		23,608,000,000	14 „
1897	37	29,863,000,000		21,863,000,000	17 „
1898	43	38,281,000,000		38,231,000,000	18 „
1899	41	30,140,000,000		30,140,000,000	15 „
1900	47	47,605,000,000		47,605,000,000	21 „
1901	43	32,307,000,000		32,307,000,000	15 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the KING RIVER at WANGARATTA.

Drainage Area, 620 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	55	12,786,000,000	Diversions not appreciable.	12,786,000,000	15 per cent.
1888	30	5,090,000,000		5,090,000,000	12 „
1889	60	14,008,000,000		14,008,000,000	16 „
1890	43	11,501,000,000		11,501,000,000	19 „
1891	37	5,837,000,000		5,837,000,000	11 „
1892	36	8,535,000,000		8,535,000,000	16 „
1893	41	9,770,000,000		9,770,000,000	17 „
1894	56	12,495,000,000		12,495,000,000	16 „
1895	35	6,504,000,000		6,504,000,000	13 „
1896	36	4,672,000,000		4,672,000,000	9 „
1897	34	4,453,000,000		4,453,000,000	9 „
1898	37	5,572,000,000		5,572,000,000	10 „
1899	37	5,985,000,000		5,985,000,000	11 „
1900	40	7,124,000,000		7,124,000,000	12 „
1901	35	7,206,000,000		7,206,000,000	14 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the BROKEN RIVER at CASEY'S WEIR.

Drainage Area, 730 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	41	12,465,000,000	400,000,000	12,865,000,000	18 per cent.
1888	22	3,508,000,000	400,000,000	3,908,000,000	11 „
1889	42	19,436,000,000	400,000,000	19,836,000,000	23 „
1890	33	15,131,000,000	400,000,000	15,531,000,000	28 „
1891	32	6,223,000,000	403,000,000	6,631,000,000	12 „
1892	31	8,471,000,000	371,000,000	8,842,000,000	17 „
1893	39	16,863,000,000	436,000,000	17,299,000,000	26 „
1894	47	22,242,000,000	862,000,000	23,104,000,000	29 „
1895	29	5,674,000,000	502,000,000	6,176,000,000	13 „
1896	29	3,200,000,000	354,000,000	3,554,000,000	7 „
1897	30	4,508,000,000	400,000,000	4,908,000,000	10 „
1898	29	5,251,000,000	690,000,000	5,941,000,000	12 „
1899	29	3,696,000,000	923,000,000	4,619,000,000	9 „
1900	33	6,503,000,000	383,000,000	6,886,000,000	12 „
1901	26	3,718,000,000	1,005,000,000	4,723,000,000	11 „

E. Checchi.
29 July, 1902.

TABLE showing Annual Rainfall, Diversion, and Discharge of the GOULBURN RIVER at MURCHISON.
Drainage Area, 3,966 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	52	167,625,000,000	1,000,000,000	168,625,000,000	35 per cent.
1888	32	80,061,000 000	1,000,000,000	81,061,000,000	23 „
1889	48	158,536,000,000	1,000,000,000	159,536,000 000	36 „
1890	42	128,563,000,000	1,000,000,000 Including evaporation from storage at Goulburn Weir.	129,563,000,000	34 „
1891	32	82,037,000 000	*1,885,000,000	83,922,000,000	28 „
1892	32	99,785,000,000	1,538,000,000	101,323,000,000	34 „
1893	37	124,379,000,000	1,680,000,000	126 059,000,000	37 „
1894	42	153,822,000,000	1,916,000,000	155,738,000,000	40 „
1895	28	76,01 ,000,000	3,(27,000,000	79,037,000 000	31 „
1896	27	51,317,000,000	4,617,000,000	55,934,000 000	22 „
1897	28	54,927,000,000	5,941,000,000	60,868,000,000	23 „
1898	2.)	63,(2),000,000	4,3: 0,000,000	67,350,000 000	25 „
1899	2.)	64,554,000 000	4,143,000 000	68,997,000,000	2: „
1900	32	84,784,000,000	4,518,000,000	93,302,000,000	31 „
1901	31	87,408,000 000	5,5 2,000,000	92 990,000,000	32 „

* Including water impounded at Goulburn Weir.

TABLE showing Annual Rainfall, Diversion, and Discharge of the COLIBAN RIVER at MALMSBURY.
Drainage Area, 112 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	...	....	600,000,000	5 680,000,000	....
1888	...	.....	800,000,000	2,299 000,000	.....
1889	42	....	953,000,000	2,6 9,000,000	24 per cent.
1890	31	....	867,000,000	2,235,000,000	28 „
1891	30	....	831,000,000	2,301,000,000	29 „
1892	33	.....	1,063,000,000	3,229,000,000	38 „
1893	39	.....	1,049,000,000	2,(40,000,000	29 „
1894	37	....	979,000,000	3,531,000,000	37 „
1895	28	.....	938,000,000	1,833,000,000	25 „
1896	26	....	908,000,000	1,688,000,000	25 „
1897	30	.....	972,000,000	2,048,000,000	27 „
1898	27	.. ..	894,000,000	1,748,000,000	25 „
1899	31	.....	809,000,000	2,336,000,000	29 „
1900	33	.....	900,000,000	2,334,000,000	27 „
1901	30	.....	905,000,000	1,247,000,000	16 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the CAMPASPE RIVER at ROCHESTER.
Drainage Area, 1,362 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	36	13,326,000,000	800,000,000	14,046,000,000	12 per cent.
1888	19	2,943,000,000	800,000,000	3,663,000,000	6 „
1889	36	17,252,000,000	953,000,000	18,110,000,000	16 „
1890	29	10,273,000,000	867,000,000	11,053,000,000	13 „
1891	24	7,173,000,000	831,000,000	7,921,000,000	11 „
1892	26	8,015,000,000	1,063,000,000	8,972,000,000	11 „
1893	29	14,305,000,000	1,174,000,000	15,362,000,000	17 „
1894	31	14,450,000,000	1,138,000,000	15,474,000,000	16 „
1895	22	3,034,000,000	1,038,000,000	3,968,000,000	6 „
1896	19	2,721,000,000	1,008 000,000	3,628,000,000	6 „
1897	22	4,004,000,000	1,073,000,000	4,970,000,000	7 „
1898	20	3,974,000,000	993,000,000	4,868,000,000	8 „
1899	23	5,844,000,000	808,000,000	6,661,000,000	9 „
1900	24	6,351,000,000	999,000,000	7,250,000,000	10 „
1901	20	1,522,000,000	1,006,000,000	2,427,000,000	4 „

E. Checchi.
29 July, 1902.

TABLE showing Annual Rainfall, Diversion and Discharge of the LODDON RIVER at BRIDGEWATER.
Drainage Area, 1,856 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	29	9,892,000,000	The volumes given include all appreciable diversions.	9,892,000,000	7·9 per cent.
1888	15¾	4,641,000,000		4,641,000,000	6·8 „
1889	31¾	18,706,000,000		18,706,000,000	13·7 „
1890	25¼	7,414,000,000		7,414,000,000	6·8 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the LODDON RIVER at LAANECOORIE WEIR.
Drainage Area, 1,590 square miles.

Year.	Rainfall on drainage area, n inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged
1891	20	4,265,000,000	Volumes given include evaporation from storage; other diversions above the point of measurement not appreciable.	4,265,000,000	5·7 per cent.
1892	27	13,880,000,000		13,880,000,000	14 „
1893	31	25,926,000,000		25,926,000,000	22·9 „
1894	30	19,172,000,000		19,172,000,000	17·5 „
1895	21	6,633,000,000		6,633,000,000	8·7 „
1896	18	3,928,000,000		3,923,000,000	5·8 „
1897	22	6,194,000,000		6,194,000,000	7·7 „
1898	21	5,602,000,000		5,602,000,000	7·1 „
1899	22	7,568,000,000		7,568,000,000	9·1 „
1900	23	7,716,000,000		7,716,000,000	9·1 „
1901	21	3,548,000,000		3,548,000,000	4·0 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the AVOCA RIVER at COONOOER WEIR.
Drainage Area, 1,029 square miles.

Year.	Rainfall on drainage area, in inches, per year.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1890	25	5,361,000,000	Diversions not appreciable.	5,361,000,000	8·9 per cent.
1891	18	283,000,000		283,000,000	0·7 „
1892	22	3,495,000,000		3,495,000,000	6·7 „
1893	26	7,279,000,000		7,279,000,000	11·8 „
1894	26	4,989,000,000		4,989,000,000	8·1 „
1895	17	679,000,000		679,000,000	1·7 „
1896	15	106,000,000		106,000,000	0·3 „
1897	17	1,701,000,000		1,701,000,000	4·2 „
1898	18	1,915,000,000		1,915,000,000	4·5 „
1899	17	885,000,000		885,000,000	2·2 „
1900	17	671,000,000		671,000,000	1·7 „
1901	16	634,000,000		634,000,000	1·7 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the WIMMERA RIVER at GLENORCHY.
Drainage Area, 768 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	25¼	.....	.....	1,908,000,000	4·2 per cent.
1888	17½	.....	.....	488,000,000	1·6 „
1889	31	.....	.....	5,578,000,000	10·1 „
1890	27	.....	.....	2,519,000,000	5·2 „
1891	21	174,000,000	319,000,000	493,000,000	1·3 „
1892	26	1,929,000,000	312,000,000	2,241,000,000	4·8 „
1893	26	6,653,000,000	100,000,000	6,753,000,000	14·5 „
1894	31	5,828,000,000	341,000,000	6,169,000,000	11·2 „
1895	18	658,000,000	66,000,000	724,000,000	2·2 „
1896	18	224,000,000	184,000,000	408,000,000	1·3 „
1897	18	746,000,000	188,000,000	934,000,000	2·9 „
1898	20	844,000,000	79,000,000	923,000,000	2·6 „
1899	20	619,000,000	189,000,000	808,000,000	2·2 „
1900	20	1,313,000,000	208,000,000	1,521,000,000	4·2 „
1901	20	772,000,000	225,000,000	997,000,000	2·8 „

E. Checchi.
29 July, 1902.

TABLE showing Annual Rainfall, Diversion, and Discharge of the WIMMERA RIVER at HORSHAM.
Drainage Area, 1,530 square miles.

Year.	Rainfall on drainage area, in inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfa discharged.
1889	34	12,511,000,000	.....	.....	.....
1890	28	10,776,000,000	.....	.....	.....
1891	19	536,000,000	.....	.....	.....
1892	24	7,493,000,000	.....	.....	.....
1893	26	19,386,000,000	.....	.....	.....
1894	30	16,472,000,000	.....	.....	.....
1895	18	2,842,000,000	360,000,000	3,202,000,000	4·9 per cent.
1896	17	148,000,000	818,000,000	966,000,000	1·6 „
1897	17	961,000,000	444,000,000	1,405,000,000	2·3 „
1898	20	3,426,000,000	580,000,000	4,006,000,000	5·7 „
1899	20	2,071,000,000	566,000,000	2,637,000,000	3·8 „
1900	19	3,704,000,000	1,108,000,000	4,812,000,000	7·1 „
1901	19	2,022,000,000	973,000,000	2,995,000,000	4·5 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the MACKENZIE RIVER at WARTOOK RESERVOIR.
Drainage Area, 29 square miles.

Year.	Rainfall on drainage area in inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1887	41	1,137,035,000	The volumes given include evaporation from storage; other diversions not appreciable.	1,137,035,000	42 per cent.
1888	31	517,514,000		517,514,000	25 „
1889	50	1,736,726,000		1,736,726,000	51 „
1890	36	1,200,775,000		1,200,775,000	49 „
1891	27	297,000,000		297,000,000	16 „
1892	37	1,083,000,000		1,083,000,000	43 „
1893	38	1,083,000,000		1,083,000,000	43 „
1894	40	1,041,000,000		1,041,000,000	39 „
1895	30	639,000,000		639,000,000	32 „
1896	25	388,000,000		388,000,000	23 „
1897	29	588,000,000		588,000,000	31 „
1898	29	855,000,000		855,000,000	43 „
1899	32	844,000,000		844,000,000	39 „
1900	31	847,000,000		847,000,000	41 „
1901	33	624,000,000		624,000,000	28 „

TABLE showing Annual Rainfall, Diversion, and Discharge of the GLENELG RIVER at MOORA MOORA.
Drainage Area, 166 square miles.

Year.	Rainfall on drainage area in inches, per annum.	Total annual discharge gauged, in cubic feet.	Total annual diversions, in cubic feet.	Total annual discharge, in cubic feet.	Proportion of total rainfall discharged.
1889	44	3,989,000,000	Diversions not appreciable.	3,989,000,000	24 per cent.
1890	32	2,388,000,000		z 2,388,000,000	20 „

3856. Have you prepared statements showing the annual volumes, in cubic feet, from point to point above the junction of the Mitta River to Murray Bridge in South Australia, giving full details of the discharges of the river at the several points of junction of the contributing streams, and the effect upon the main river of the volumes from the contributing streams, also the effect of the diversions both on the main river and the contributing streams? Yes.

MURRAY RIVER DISCHARGES.

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF MITTA RIVER.

Year.	MAIN STREAM.				CONTRIBUTING.			Total annual discharge of Murray below point of affluence of Mitta River.
	Discharge, in cubic feet, per annum of the Murray River at Jingellic.	Total diversions, authorised and unauthorised, from main stream between Jingellic and the Mitta River.	Total estimated losses in main river channel, in cubic feet, per annum between Jingellic and the Mitta River.	Discharge of catchment above affluence of Mitta River, in cubic feet, per annum.	Discharge, in cubic feet, per annum of Mitta River, at its junction with Murray River.	Total diversions, in cubic feet, per annum, authorised or unauthorised, made from Mitta River.	Total annual discharge from catchment of Mitta River.	
1887 ...	.....	Not appreciable.	.....	.....	.....	Not appreciable.	.....	.....
1888 ...	.....		.....	.....	.....		.....	.....
1889 ...	.....		.....	.....	.....		.....	.....
1890 ...	.....		.....	.....	.....		.....	.....
1891 ...	91,772,000,000		11,469,000,000	80,303,000,000	66,247,000,000		66,247,000,000	146,550,000,000
1892 ...	71,709,000,000		5,765,000,000	65,944,000,000	51,793,000,000		51,793,000,000	117,737,000,000
1893 ...	103,339,000,000		9,035,000,000	94,304,000,000	61,991,000,000		61,991,000,000	156,295,000,000
1894 ...	152,991,000,000		3,868,000,000	149,123,000,000	87,432,000,000		87,432,000,000	236,555,000,000
1895 ...	72,932,000,000		5,505,000,000	67,427,000,000	42,671,000,000		42,671,000,000	110,098,000,000
1896 ...	52,199,000,000		4,242,000,000	47,957,000,000	31,858,000,000		31,858,000,000	79,815,000,000
1897 ...	55,144,000,000		5,652,000,000	49,492,000,000	37,842,000,000		37,842,000,000	87,334,000,000
1898 ...	66,241,000,000		11,326,000,000	54,915,000,000	39,610,000,000		39,610,000,000	94,525,000,000
1899 ...	55,624,000,000		8,383,000,000	47,241,000,000	37,252,000,000		37,252,000,000	84,493,000,000
1900 ...	89,997,000,000		11,502,000,000	78,495,000,000	49,674,000,000		49,674,000,000	128,169,000,000
1901 ...	63,659,000,000		8,447,000,000	55,212,000,000	30,231,000,000		30,261,000,000	85,473,000,000

E. Checchi.
29 July, 1902.

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF THE KIEWA RIVER.

Year.	MAIN STREAM.				CONTRIBUTING.			Total annual discharge of Murray River below point of affluence of Kiewa River.
	Discharge, in cubic feet, per annum below affluence of the Mitta River and main stream.	Total diversions, authorised and unauthorised, from main stream between Mitta River and Kiewa River.	Total estimated losses in main river channel, in cubic feet, per annum between Mitta River and Kiewa River.	Discharge of catchment above affluence of Kiewa River, in cubic feet, per annum.	Discharge, in cubic feet, per annum of the Kiewa River, at its junction with the Murray River.	Total diversions, in cubic feet, per annum, authorised and unauthorised, made from the Kiewa River.	Total annual discharge from catchment of Kiewa River.	
1887 ...	.....	Not appreciable.	.....	.....	.....	Not appreciable.	.....	.....
1888 ...	.....		.....	.....	.....		.....	.....
1889 ...	.....		.....	.....	.....		.....	.....
1890 ...	.....		.....	.....	.....		.....	.....
1891 ...	146,550,000,000		3,114,000,000	143,436,000,000	17,621,000,000		17,621,000,000	161,057,000,000
1892 ...	117,737,000,000		1,613,000,000	116,124,000,000	18,607,000,000		18,607,000,000	134,731,000,000
1893 ...	156,295,000,000		2,329,000,000	153,966,000,000	22,852,000,000		22,852,000,000	176,818,000,000
1894 ...	236,555,000,000		1,016,000,000	235,539,000,000	29,418,000,000		29,418,000,000	264,957,000,000
1895 ...	110,098,000,000		1,409,000,000	108,689,000,000	19,072,000,000		19,072,000,000	127,761,000,000
1896 ...	79,815,000,000		1,100,000,000	78,715,000,000	12,581,000,000		12,581,000,000	91,296,000,000
1897 ...	87,334,000,000		1,519,000,000	85,827,000,000	14,619,000,000		14,619,000,000	100,446,000,000
1898 ...	94,525,000,000		2,751,000,000	91,774,000,000	17,427,000,000		17,427,000,000	109,201,000,000
1899 ...	84,493,000,000		2,163,000,000	82,330,000,000	13,004,000,000		13,004,000,000	95,334,000,000
1900 ...	128,169,000,000		2,781,000,000	125,388,000,000	20,221,000,000		20,221,000,000	145,619,000,000
1901 ...	85,473,000,000		1,929,000,000	83,544,000,000	13,301,000,000		13,301,000,000	96,845,000,000

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF OVENS RIVER.

Year.	MAIN STREAM.				CONTRIBUTING.			Total annual discharge of Murray River below point of affluence of Ovens River.
	Discharge, in cubic feet, per annum below affluence of the Kiewa River and main stream.	Total diversions, authorised and unauthorised, from main stream between Kiewa River and Ovens River.	Total estimated losses in main river channel, in cubic feet, per annum between Kiewa River and Ovens River.	Discharge of catchment above affluence of Ovens River, in cubic feet, per annum.	Discharge, in cubic feet, per annum of the Ovens River, at its junction with the Murray River.	Total diversions, in cubic feet, per annum, authorised and unauthorised, made from the Ovens River.	Total annual discharge from catchment of Ovens River.	
1887 ...	.....	Not appreciable.	.....	216,739,000,000	55,416,000,000	Not appreciable.	55,416,000,000	272,155,000,000
1888 ...	.....		.....	110,576,000,000	25,410,000,000		25,410,000,000	135,986,000,000
1889 ...	.....		.....	225,310,000,000	60,515,000,000		60,515,000,000	285,825,000,000
1890 ...	.....		.....	171,932,000,000	49,703,000,000		49,703,000,000	221,635,000,000
1891 ...	161,057,000,000		4,691,000,000	156,366,000,000	35,491,000,000		35,491,000,000	191,857,000,000
1892 ...	134,731,000,000		6,129,000,000	128,602,000,000	48,140,000,000		48,140,000,000	176,742,000,000
1893 ...	176,818,000,000		9,907,000,000	166,911,000,000	69,910,000,000		69,910,000,000	236,821,000,000
1894 ...	264,957,000,000		22,754,000,000	242,203,000,000	80,170,000,000		80,170,000,000	322,373,000,000
1895 ...	127,761,000,000		5,073,000,000	122,688,000,000	42,957,000,000		42,957,000,000	165,645,000,000
1896 ...	91,296,000,000		4,631,000,000	86,665,000,000	28,114,000,000		28,114,000,000	114,779,000,000
1897 ...	100,446,000,000		6,004,000,000	94,442,000,000	29,266,000,000		29,266,000,000	123,708,000,000
1898 ...	109,201,000,000		7,478,000,000	101,723,000,000	37,516,000,000		37,516,000,000	132,239,000,000
1899 ...	95,334,000,000		4,264,000,000	91,070,000,000	29,808,000,000		29,808,000,000	120,878,000,000
1900 ...	145,609,000,000		8,491,000,000	137,118,000,000	46,741,000,000		46,741,000,000	183,859,000,000
1901 ...	96,845,000,000		5,958,000,000	90,887,000,000	31,686,000,000		31,686,000,000	122,573,000,000

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF GOULBURN RIVER.

Year.	MAIN STREAM.				CONTRIBUTING.			Total annual discharge of Murray River below point of affluence of Goulburn River.
	Discharge, in cubic feet, per annum below affluence of Ovens River and main stream.	Total diversions, authorised and unauthorised, from main stream between Ovens River and Goulburn River.	Total estimated losses in main river channel, in cubic feet, per annum between Ovens River and Goulburn River.	Discharge of catchment above affluence of Goulburn River, in cubic feet, per annum.	Discharge, in cubic feet, per annum of the Goulburn River, at its junction with the Murray River.	Total diversions, in cubic feet, per annum, authorised and unauthorised, made from the Goulburn River.	Total annual discharge from catchment of Goulburn River.	
1887...	272,155,000,000	Not appreciable.	31,840,000,000	240,315,000,000	152,532,000,000	1,500,000,000	153,882,000,000	394,197,000,000
1888...	135,986,000,000		1,469,000,000	134,517,000,000	82,315,000,000	1,500,000,000	83,665,000,000	218,182,000,000
1889...	285,825,000,000		34,356,000,000	251,469,000,000	149,748,000,000	1,500,000,000	151,098,000,000	402,567,000,000
1890...	221,635,000,000		6,648,000,000	214,987,000,000	138,349,000,000	1,500,000,000	139,699,000,000	354,686,000,000
1891...	191,857,000,000		6,252,000,000	185,605,000,000	84,602,000,000	2,389,000,000	86,752,000,000	272,357,000,000
1892...	176,742,000,000		13,537,000,000	163,205,000,000	97,633,000,000	2,002,000,000	99,435,000,000	262,640,000,000
1893...	236,821,000,000		22,732,000,000	214,089,000,000	123,767,000,000	2,225,000,000	125,770,000,000	339,859,000,000
1894...	322,373,000,000		54,157,000,000	268,216,000,000	135,195,000,000	2,993,000,000	137,889,000,000	406,105,000,000
1895...	165,645,000,000		10,932,000,000	154,713,000,000	74,799,000,000	3,654,000,000	78,088,000,000	232,801,000,000
1896...	114,779,000,000		9,870,000,000	104,909,000,000	48,225,000,000	5,060,000,000	52 779,000,000	157,688,000,000
1897...	123,708,000,000		12,395,000,000	111,313,000,000	51,471,000,000	6,441,000,000	57,268,000,000	168,581,000,000
1898...	132,239,000,000		13,276,000,000	118,963,000,000	64,762,000,000	5,192,000,000	69,435,000,000	188,398,000,000
1899...	120,878,000,000		6,961,000,000	113,917,000,000	63,076,000,000	5,597,000,000	68,113,000,000	182,030,000,000
1900...	183,859,000,000		16,730,000,000	167,129,000,000	83,952,000,000	4,937,000,000	88,449,000,000	255,578,000,000
1901...	122,573,000,000		11,792,000,000	110,781,000,000	79,725,000,000	6,838,000,000	85,879,000,000	196,760,000,000

E. Checchi.
29 July, 1902.

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF CAMPASPE RIVER.

Year.	MAIN STREAM. Discharge, n cubic feet per annum below affluence of Goulburn River and main stream.	MAIN STREAM. Total diversions, authorised and unauthorised, from main stream between Goulburn River and Campaspe River.	MAIN STREAM. Total estimated losses in main river channel, in cubic feet, per annum between Goulburn River and Campaspe River.	MAIN STREAM. Discharge of catchment above affluence of Campaspe River, in cubic feet, per annum.	CONTRIBUTING. Discharge, *in cubic feet*, per annum of the Campaspe, at its junction with the Murray River.	CONTRIBUTING. Total diversions, in cubic feet, per annum, authorised and unauthorised, made from the Campaspe River.	CONTRIBUTING. Total annual discharge *from* catchment of Campaspe River.	Total annual discharge of Murray River below point of *affluence* of Campaspe River.
1887...	394,197,000,000	Not appreciable.	3,226,000,000	396,971,000,000	13,162,000,000	800,000 000	13,871,000,000	404,842,000,000
1888...	218,182,000,000		165,000,000	218,017,000,000	2,907,000,000	800,000,000	3,619,000,000	221,636,000,000
1889...	*402,567,000,000*		3,381,000,000	399,186,000,000	17,038,000,000	953,000,000	17,884,000,000	*417,070,000,000*
1890...	354,686,000,000		743,000,000	353,943,000,000	10,144,000,000	867,000 000	10,916,000,000	364,859,000,000
1891...	272,357,000,000		619,000 000	271,738,000,000	7,083,000 000	831,000,000	7,822,000,000	279,560,000,000
1892...	262,640,000,000		1,408,000,000	261,232,000,000	7,915,000,000	1,063,000,000	8,860,000,000	270,092,000,000
1893...	339,859,000,000		2,281,000,000	337,578,000,000	14,132,000,000	1,174,000,000	15,172,000,000	352,750,000,000
1894...	406,105,000,000		4,775,000,000	401,330,000,000	14,269,000,000	1,138,000 000	15,282 000,000	416,612,000,000
1895...	232,801,000,000		1,075,000,000	231,726,000,000	2,996,000,000	1,038,000,000	3,918,000,000	235,644,000,000
1896...	157,688,000,000		948,000,000	156,740,000,000	2,688,000,000	1,008,000,000	3,585,000,000	160,325,000,000
1897...	169,581,000,000		1,181,000 000	167,400,000,000	3,954,000,000	1,053,000,000	4,908,000,000	172,308,000,000
1898...	188,398,000,000		1,321,000,000	187,077,000,000	3,925,000,000	993,000,000	4,803,000,000	191,885,000,000
1899...	182,030,000,000		733,000,000	181,297,000,000	5,772,000,000	908,000,000	6,578,000,000	187,875,000,000
1900...	255,578,000,000		1,626,000,000	253,952,000,000	6,271,000,000	999,000,000	7,159,000,000	261,111,000,000
1901...	196,760,000,000		1,324,000,000	195,436,000,000	1,503,000,000	1,006,000,000	2,397,000,000	197,833,000,000

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF LODDON RIVER.

Year.	MAIN STREAM. Discharge, *in cubic feet*, per annum below affluence of Campaspe River and main stream.	MAIN STREAM. Total *diversions*, authorised and unauthorised, from main stream between Campaspe River and Loddon River.	MAIN STREAM. Total estimated losses in main river channel, *in cubic feet*, per annum between Campaspe River and Loddon River.	MAIN STREAM. Discharge of catchment *above affluence* of Loddon River, in cubic feet, *per annum.*	CONTRIBUTING. Discharge, in cubic feet *per annum* of the Loddon River, at its junction with the Murray River.	CONTRIBUTING. Total diversions, *in cubic feet* per annum, authorised and unauthorised, made from the *Loddon* River.	CONTRIBUTING. Total *annual discharge* from *catchment* of Loddon River.	Total *annual discharge* of Murray River, below point of affluence of Loddon River.
1887...	104,842,000,000	not appreciable	32,071,000,000	372,771,000,000	7,000,000,000	1,500,000,000	8,200,000,000	380,971,000,000
1888...	221,635,000,000	32,000,000	17,563,000,000	204,104,000,000	3,000,000,000	1,000,000,000	3,800,000,000	207,904,000,000
1889...	417,070,000,000	not appreciable	33,042,000,000	384,028,000,000	15,000,000,000	1,000,000,000	15,800,000,000	399,828,000,000
1890...	364,859,000,000	58 000,000	28,908,000,000	336 009,000,000	6,000,000,000	500,000,000	6,400,000,000	342,409,000,000
1891...	279,560,000,000	57,000,000	22,154 000,000	257,463,000,000	3 000,000,000	300,000 000	3,240,000,000	260,703 000,000
1892..	270,092,000,000	218,000,000	21,417,000,000	248,893,000,000	10,000 000,000	1,500,000,000	11,200,000 000	260,093,000,000
1893...	352,750,000,000	6,715,000,000	28,480,000,000	330,985,000,000	14,000,000,000	8,000,000,000	20,400,000,000	351,385,000,000
1894...	416,612,000,000	6,432,000,000	33,514,000,000	389,530,000 000	11,000 000,000	5,000,000,000	15,000,000,000	404,530,000,000
1895...	235,644,000,000	3,859,000,000	18,973,000,000	220,530,000,000	2,000,000,000	4,000,000,000	5,200,000,000	225,730,000,000
1896...	160,325,000,000	5,097,000,000	13,103,000,000	152,316,000,000	.....	3,500,000,000	2,800,000 000	155,116,000,000
1897...	172,308,000,000	5,745,000,000	14,103,000,000	163,950,000,000	1,500,000,000	3 500,000,000	4,300,000,000	168,250,000,000
1898...	191,885,000,000	6,824,000,000	15,740,000,000	182,969,000,000	2,000,000,000	3,000,000,000	4,400,000,000	187,369,000,000
1899...	187,875,000,000	4,992,000,000	15,281,000,000	177,586 000,000	1,500,000,000	5,000,000,000	5,500,000,000	183,086 000,000
1900...	261,111,000 000	9,486,000,000	21,440,000,000	249,157,000,000	1,000,000,000	5,500 000,000	5,400,000,000	254,557,000 000
1901...	197,833,000,000	8,020,000,000	16,309,000,000	189,544,000,000	.....	3,000,000,000	2,400,000,000	191,944,000,000

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF MURRUMBIDGEE RIVER.

Year.	MAIN STREAM. Discharge, *in cubic feet*, per annum, below affluence of Loddon River and main stream.	MAIN STREAM. Total diversions, *authorised* and unauthorised, from main stream between Loddon River and Murrumbidgee River.	MAIN STREAM. Total estimated losses in main river channel, in cubic feet, per annum between Loddon River *and* Murrumbidgee River.	MAIN STREAM. Discharge of catchment *above affluence* of Murrumbidgee River, in cubic feet, *per annum.*	CONTRIBUTING. Discharge, in cubic feet, per annum of Wakool and Murrumbidgee Rivers, at the junction of the latter with the Murray River.	CONTRIBUTING. Total diversions, in cubic feet, per annum, authorised or unauthorised, *made from* Wakool and Murrumbidgee Rivers.	CONTRIBUTING. Total annual discharge from catchment of Wakool and Murrumbidgee Rivers.	Total annual discharge *of* Murray River below the point of affluence of Murrumbidgee River.
1887...	380,971,000,000	not appreciable	13,980,000,000	366,991,000,000	255,948,000,000	Not known.	255,948,000,000	622,939,000,000
1888...	207,904,000,000	,,	7,630,000,000	200,274,000,000	194,990,000,000		194,990,000,000	395,264,000,000
1889...	399,828,000,000	,,	14,672,000,000	385,156,000,000	329,230,000,000		329,230,000,000	714,386,000,000
1890...	342,409,000,000	36,000,000	12,566,000,000	329,878,000,000	245,500,000,000		245,500,000,000	575,379,000,000
1891...	260,703,000,000	138 000,000	9,573,000,000	251,268,000,000	343,237,000,000		343,237,000,000	594,505,000,000
1892...	260,093,000,000	23,000,000	9,546,000,000	250,575,000,000	152,791,000,000		152,791,000,000	403,366,000,000
1893...	351,385,000,000	152,000,000	12,901,000,000	338,636,000,000	243,819,000,000		243,819,000,000	582,455,000 000
1894...	404,530,000,000	53,000,000	14,848,000,000	389,735,000,000	453,452,000,000		453,452,000,000	843,187,000,000
1895...	225,730,000,000	123,000,000	8,281,000,000	217,569,000,000	177,686,000,000		177,686,000,000	395,255,000 000
1896...	155,116,000,000	178,000,000	5,699,000,000	149,595,000,000	91,490,000,000		91,490,000,000	241,085,000,000
1897...	168,250,000,000	408,000,000	6,190,000,000	162,468 000,000	71,920,000,000		71,920,000,000	234,388,000,000
1898...	187,369,000,000	284,000,000	6,887,000,000	180,766,000,000	60,717,000,000		60,717,000,000	241,483,000,000
1899..	183,086,000,000	200,000,000	6,726,000,000	176,560,000,000	70,926,000,000		70,926,000,000	247,486,000,000
1900...	254,557,000,000	344,000,000	9,355,000,000	245,546,000,000	165,806,000,000		165,806,000,000	411,352,000,000
1901...	191,944,000,000	320,000,000	7,056,000,000	185,208,000,000	66,644,000,000		66,644,000,000	251,528,000,000

STATEMENT OF VOLUMES OF WATER BELOW POINT OF AFFLUENCE OF THE DARLING RIVER.

Year.	MAIN STREAM. Discharge, in cubic feet, per annum below affluence of Murrumbidgee River and main stream.	MAIN STREAM. Total diversions, authorised and unauthorised, from main stream between Murrumbidgee River and Darling River.	MAIN STREAM. Total estimated losses in *main river channel*, in cubic feet, per annum between Murrumbidgee River and Darling River.	MAIN STREAM. Discharge of catchment above affluence of Darling River, in cubic feet, per annum.	CONTRIBUTING. Discharge, in cubic feet, per annum of Darling River at its junction with Murray River.	CONTRIBUTING. Total diversions, in cubic feet, per annum, authorised or unauthorised, made from Darling River.	CONTRIBUTING. Total annual discharge from catchment of Darling River.	Total annual discharge of Murray River below point of affluence of Darling River.
1887...	622,939,000,000	.....	69,147,000,000	553,792 000,000	289,295,000,000	Not known.	289,295,000,000	843,087,000,000
1888...	395,264,000,000	.....	43,874,000,000	351,390,000,000	229,231,000,000		229,231,000,000	580,621,000,000
1889...	714,386,000,000	12,000,000	80,012,000,000	634,386 000,000	168,420,000,000		168,420,000,000	802,806,000,000
1890...	575,379,000,000	135 000,000	64,444,000,000	511,070,000,000	717,342,000,000		717,342,000,000	1,228,412,000,000
1891...	594,505,000,000	354,000,000	66,588,000,000	528,271,000,000	488,904,000,000		488,904,000,000	1,017,175,000,000
1892...	403,366,000,000	696,000,000	45,186,000,000	358,876 000,000	234,594,000,000		234,594,000,000	593,470,000,000
1893...	582,455,000,000	759,000,000	65,244,000,000	517,970 000,000	383,812,000,000		383,812,000,000	901,782,000,000
1894...	843,187,000,000	606,000,000	94,446,000,000	749,347,000,000	357,604,000,000		357,604,000,000	1,106,951,000,000
1895...	395,255,000,000	712 000,000	44,277,000,000	351,690,000,000	226 468,000,000		226,468,000,000	578,158,000,000
1896...	241,085,000,000	933,000,000	27,014,000,000	215,004,000,000	144,068,000,000		144,068,000,000	359,072,000,000
1897...	234,388,000,000	1,153,000,000	26 267,000,000	209,274,000,000	129,414,000,000		129,414,000,000	338,688,000,000
1898...	241,483,000,000	954 000,000	27,659 000,000	215,378,000,000	121,355,000,000		121,355,000,000	336,733,000,000
1899...	247,486,000,000	815,000,000	27,730,000,000	220,571 000,000	120,500,000,000		120,500,000,000	341,071,000,000
1900...	411,352,000,000	751 000,000	46 081,000,000	366,022,000,000	147,733,000,000		147,733,000,000	513,755,000,000
1901...	251,852,000,000	1,933,000,000	28,233,000,000	225,552,000,000	77,784,000,000		77,870,000,000	303,336,000,000

3857. On what basis have you prepared the statement, first, as to the losses which occur in the main river between the points of affluence of the contributing streams? I have used principally the Victorian and South Australian gaugings. I was unable to use the New South Wales gaugings, as they did not work in with ours. To make Table B I divided the Murray basin into four systems. In the first—the Jingellic–Albury system—I used the gaugings at Jingellic and Albury, also the gaugings of the two contributing streams—the Mitta and the Kiewa. The second system—Albury–Echuca—I computed from the gaugings at Albury, Echuca, and the contributing streams—the Ovens, the Goulburn, and the Broken River. In the third system—Echuca–Mildura—I used the Echuca and Mildura gaugings, also the gaugings of the contributings streams between those two points—the Campaspe and the Loddon. In the fourth system—Mildura–Morgan—I used the Mildura and Morgan gaugings. I could not use the gaugings of the contributing streams in New South Wales. E. Checchi. 29 July, 1902. Method of computation.

3858. You had to ignore the Murrumbidgee, the Wakool, and the Darling? Yes; I computed the flow. As an instance, I may say that the quantity recorded as passing the Murrumbidgee at Hay, and the Murray at Echuca, is in some cases less than the quantity given as passing Mildura, which is impossible. The same applies to the fourth system. If you add the Mildura and Darling gaugings together, you get less than at Morgan, though in some instances you get more. In the former case it is impossible that the gaugings should be correct. Gaugings unreliable.

3859. How do you explain the discrepancy? Either the Mildura, Morgan, or Darling gaugings are incorrect. I took the Mildura gaugings personally, and consider them reliable. The gaugings at Morgan appear to be correct. Morgan is a good place to take gaugings at, whereas I do not think Wilcannia is. Again, in time of flood, an officer cannot reach Wilcannia from Sydney within a week, and by that time the flood may have subsided.

3860. Would that not be attributable, to some extent, to the fact that in flood-time the flow is not confined to the river, but spills out over the country, and may, therefore, take a long time to reach the main river? Yes; but the discrepancy extends over seven years, and could not be entirely accounted for in that way. For this reason I was compelled to abandon the Hay and the Wilcannia gaugings. Floods.

3861. From what you know of the conditions at Morgan, you are disposed to think that the gaugings at that place would be correct? Yes.

3862. On what basis do you estimate the losses which take place in the main river between any two contributing streams? I have the actual gaugings between the several points, and from those I compute what has been the actual loss each year in the volume of the river per mile. I find, taking one year with another, that the average rate of loss of volume of discharge is ·001,047 in the Jingellic–Albury system. In the second system, Albury to Echuca, on the same basis, the rate is ·000,417. In the next system, Echuca to Mildura, I had no data such as were used in the two other systems; but having the gaugings at Echuca and Mildura, I used the percentage arrived at in the second instance, viz., ·000,417, and in that way found what the Murrumbidgee and Wakool would bring, to make the two sides balance. The fourth system was calculated from the gaugings at Mildura and Morgan, and this gave the contribution of the Darling. Estimate of losses.

3863. How did you arrive at the diversions? From the returns available in our office.

3864. Have you any further information to put before the Commission? I have prepared a statement of annual volumes of water, in cubic feet, at Murray Bridge, South Australia, from 1887 to 1901. This shows the volumes affected by diversions in one column, the Victorian diversions in the second column, and the volumes unaffected by Victorian diversions in the third column.

MURRAY RIVER DISCHARGES.—STATEMENT OF VOLUMES AT MURRAY BRIDGE, SOUTH AUSTRALIA.

Year.	Discharge in cubic feet per annum at Murray Bridge affected by diversions.	Total Victorian diversions.	Discharge in cubic feet per annum at Murray Bridge unaffected by Victorian diversions.	Year.	Discharge in cubic feet per annum at Murray Bridge affected by diversions.	Total Victorian diversions.	Discharge in cubic feet per annum at Murray Bridge unaffected by Victorian diversions.
1887	670,461,000,000	3,800,000,000	672,361,000,000	1895	453,632,000,000	13,391,000,000	460,328,000,000
1888	461,322,000,000	3,332,000,000	462,988,000,000	1896	277,150,000,000	15,776,000,000	285,038,000,000
1889	639,531,000,000	3,465,000,000	641,264,000,000	1897	259,219,000,000	18,320,000,000	238,379,000 000
1890	978,021,000,000	3,096,000,000	279,569,000,000	1898	258,121,000,000	17,247,000,000	266,745,000,000
1891	810,008,000,000	4,069,000,000	812,043,000 000	1899	261,603,000,000	17,512,000,000	270,359,000,000
1892	470,240,000,000	5,507,000,000	472,994,000,000	1900	396,986,000,000	22,077,000,000	408,025,000,000
1893	708,568 000,000	19,023,000,000	718,091,000,000	1901	229,067,000,000	21,117,000,000	239,626,000,000
1894	875,440,000,000	16,222,000,000	883,551,000,000				

NOTE 1.—The South Australian diversions amount to 532,000,000 cubic feet per annum. The discharge of the Murray River at Murray Bridge would be increased 500,000 000 cubic feet per annum thereby.

NOTE 2.—The returns of the diversions in New South Wales are too incomplete to use.

WEDNESDAY,

WEDNESDAY, 30 *JULY*, 1902.

[*The Commission met at the Shire Hall, Numurkah, Victoria, at* 10 *a.m*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

James Meldrum, Engineer of the Shire of Numurkah and Numurkah Waterworks Trust, sworn and examined:—

J. Meldrum, 30 July, 1902.

3865. *President.*] What is your name? James Meldrum.
3866. You are Engineer of the Shire of Numurkah and the Numurkah Waterworks Trust? Yes.
3867. Have you prepared a plan showing the area of the Trust and the works therein? The complete works are not shown, but those which will be referred to are (*Exhibit* 81).

Trust area.

3868. What is the area of the Trust? About 329,600 acres.

Irrigable area.

3869. What portion of that area is irrigable? After deducting Crown lands, roads, creek frontages, reserves, &c., comprising approximately 50,600 acres, there is a total irrigable area within the Trust of, say, 279,000 acres.
3870. Is any of that area irrigated at present? No, because we have not the water.

Source of supply.

3871. Where do you get your water from? Casey's Weir on the Broken River. After leaving Casey's Weir the water flows for 40 or 50 miles through the Tungamah Trust before reaching our territory. There are two diversions near the head which are regulated by that Trust, and have caused much trouble owing to the diversions not having been made in conformity with an Order-in-Council, which states that no diversion is to be made at these points when the quantity diverted at Casey's Weir is less than 400 cubic feet per minute.
3872. I understand that after the water reaches the Numurkah Shire boundary it remains in natural channels? Yes.
3873. Have you any means of knowing the quantity of water which reaches you from Tungamah? No measurements are taken, the creek only runs for about seven months in the year, this year it stopped about the 7th of January and did not reach here until the 24th of June.

Diversion.

3874. Is there any arrangement by which the water diverted at Casey's Weir is divided between Tungamah and Numurkah? We have an Order-in-Council which provides that no diversion shall be made until there is a flow of over 400 cubic feet per minute from Casey's Weir.

Supply insufficient.

3875. Does your Trust get as much water as it requires for stock and domestic purposes? We do not consider the supply sufficient for that purpose; those living a long distance from the creek are not supplied.
3876. The present available supply can only be regarded as sufficient within a certain range of the creek? That is so.

Wells, &c.

3877. What have you to depend upon for stock and domestic purposes besides the supply you have in the creek? We have wells and tanks throughout the Shire.
3878. Do they fairly meet all requirements? The three wells marked on *Exhibit* 81 give a fair supply, and the people in the Shire have gone in for a system of self-help. One firm alone has supplied 108 wind-mills and storage tanks at a cost of from £35 to £125.

Proposed weirs.

3879. In what way does your Trust propose to supplement the present water supply? Our Trust proposes making two weirs across the creek and another tank in the bottom of the creek. When this is done we think we shall have a satisfactory supply in that part of the district for stock and domestic purposes.

Existing weirs.

3880. *Mr. Burchell.*] How many weirs are there across the Broken Creek within the Trust area shown on *Exhibit* 81? There are five on the Broken Creek and one on the Baalia Creek.

Irrigation.

3881. What is the depth of the wells you referred to? Over 100 feet.
3882. What depth of water do you estimate you require for irrigation? A duty of one quarter of a cubic foot per minute per acre; in this country there are a lot of losses on the way.
3883. What depth would that give? About 36 inches per annum, and would allow for waste and losses.
3884. What area do you think likely to be irrigated? I do not think more than about half the total area given—say, 140,000 acres.
3885. Is that country already settled? Yes.
3886. Have you had any experience in the supply of water for irigation? Yes.
3887. How do you think the land here will answer for irrigation. I do not think you could get better.
3888. Have you any means of conserving water, or how do you expect to get it? I understand that a scheme has already been proposed to give us a water supply for that purpose—the Murray-Goulburn scheme.

Benjamin Lancaster, Secretary to the Shire of Numurkah and Shire of Numurkah Waterworks Trust, of Numurkah, sworn and examined:—

B. Lancaster. 30 July, 1902.

3889. *President.*] What is your name? Benjamin Lancaster.
3890. You are Secretary to the Shire of Numurkah and Shire of Numurkah Waterworks Trust? Yes.
3891. You have prepared a statement giving the revenue of the Trust for the last five years, the average revenue for the same period, and the estimated revenue for 1902; also the total indebtedness and the amounts written off? Yes.

SHIRE OF NUMURKAH WATERWORKS TRUST.

STATEMENT OF REVENUE, &c.

Rural District.

Revenue.

Revenue.

	£	s.	d.		
Year 1897 ...	1,391	11	1	...	Rate: 6d. and 4d. in the £ on Nos. 1 and 2 Divisions respectively.
„ 1898 ...	1,528	16	5	...	„ 5d. and 4d. „
„ 1899 ...	1,218	0	8	...	„ 5d. and 3d. „
„ 1900 ...	861	3	8	...	„ 4d. and 3d. „
„ 1901 ...	1,061	2	1	...	„ 4d. and 3d. „
	5) 6,060	13	11		
	£1,212	2	9	Average for five years.	

Estimated Revenue for 1902, £881 16s. 6d.; Rate, 4d. and 3d. in the £. Loan indebtedness, £6,140 6s. 10d.

Numurkah

B. Lancaster. 30 July, 1902

Numurkah Urban District.

Revenue.

	£	s.	d.		
Year 1897 ...	767	2	11	...	Rate: 1s. 3d. in the £.
„ 1898 ...	916	13	4	...	„ 1s. 3d. „
„ 1899 ...	722	14	6	...	„ 1s. 3d. „
„ 1900 ...	701	16	5	...	„ 1s. 2d. „
„ 1901 ...	657	6	7	...	„ 1s. „
	5) 3,765	13	9		
	£753	2	9	Average for five years.	

Estimated Revenue for 1902, £609 3s. 2d.*; Rate, 1s. 2d. in the £. Loan indebtedness, £5,953 9s. 4d.

* Payment by Railway £50 less.

Nathalia Urban District.

	£	s.	d.		
Estimated Revenue for 1902	502	0	0	...	Rate: 2s. in the £.
Loan indebtedness	6,000	0	0	} £6,481 11s. 5d.	
Expended in expectation of further loan ...	481	11	5	}	

Average Revenue for Rural and Numurkah Urban Districts for five years, 1897 to 1901, inclusive, £1,965 5s. 6d.
Estimated Revenue for these districts for year 1902, £1,490 19s. 8d.
Estimated Revenue for these districts including Nathalia, for year 1902, £1,932 19s. 8d.

Total Indebtedness.

	£	s.	d.
Rural District	6,140	6	10
Numurkah Urban District ...	5,953	9	4
Nathalia District	6,481	11	5
	£18,575	7	7

Amount written off 1899 Act, No. 1625.

	£	s.	d.
Due prior to writing off	19,757	0	0
Written off	6,076	0	0
	£13,681	0	0

Interest written off, £358.

3892. What is the total number of ratepayers? Rural District, No. 1 Division, 506; Rural District, No. 2 Division, 362; Numurkah Urban District, 255; Nathalia Urban District, 180; Total, 1,303. Ratepayers.
3893. *Mr. Burchell.*] What is the rainfall of the district? A complete table has recently been published in the Numurkah *Leader*, of the 25th instant, showing the rainfall for the last 35 years, which I put in. [*Exhibit* 83.] Rainfall.
3894. Have you any knowledge of the feeling of settlers within the area in regard to irrigation? A strong desire has been expressed for an irrigation supply. Irrigation.
3895. Have you any knowledge of their opinion as to what they could afford to pay for the water if supplied in sufficient quantities? No, but in the Petition presented some years ago we had powers of rating up to 5s. in the £.
3896. What population would be supplied? I estimate there are 6,500 persons within the Trust area, which is smaller than the area of the Shire.

John Meiklejohn, grazier, of Numurkah, sworn and examined:—

J. Meiklejohn. 30 July, 1902.

3897. *President.*] What is your name? John Meiklejohn.
3898. You are Chairman of the Shire of Numurkah Waterworks Trust? Yes.
3899. Is the present water supply regarded by the Trust as sufficient for all purposes? No.
3900. Will you give us the ideas of the Trust with regard to supplementing it? It is to supplement the supply by means of the Murray-Goulburn scheme, as referred to at the Corowa Conference. We have never had sufficient water, even for stock and domestic purposes. In 1890 we presented a petition to Parliament, praying to have the Koonomoo Irrigation and Water Supply Trust constituted, but nothing came of it.
3901. What quantity of water was it proposed to divert by that scheme? 11,300 cubic feet per minute from 1st July to 31st October, and from 1st November to 1st April, 6,000 cubic feet per minute.
3902. That scheme having been abandoned, your Trust relies on the Murray-Goulburn scheme? Yes.
3903. What quantity of water would you require from that scheme? I could not say.
3904. How would you put the case for the Trust in favour of the Murray-Goulburn scheme? Stock have been dying for want of sufficient water during the past five or six years, and there has been a partial failure of the crops every year during that period. Unless we get the water supply, it will be a serious matter, as we cannot get it elsewhere for irrigation purposes. Our present supply is inadequate for stock and domestic purposes. This year our town reservoir was quite dry, and in a place like this, where from 1,200 to 1,600 people are dependent on the water, that was a very serious matter. Supply inadequate.
3905. *Mr. Burchell.*] If you could get an adequate supply for stock and domestic purposes, could you carry on? Not in the northern portion of the district.
3906. How have you managed to exist previously? We had a better rainfall previously than during the last seven years.
3907. How long has farming been carried on in this district? About twenty-five years.
3908. How much land do you think one man could irrigate profitably without assistance 50 to 100 acres.
3909. What produce would you grow? I would grow lucerne, as I am a grazier.

John

John Scott Christie, Commissioner of the Shire of Numurkah Waterworks Trust, sworn and examined:—

J. S. Christie. 30 July, 1902.

3910. *President.*] What is your name? John Scott Christie.
3911. You are a Commissioner of the Shire of Numurkah Waterworks Trust? Yes.
3912. Are you acquainted with the Goulburn-Murray scheme for diverting water at Bungowannah through this district; also with the Koonoomoo scheme for pumping from the Murray at that place? Yes.

Koonoomoo scheme.

3913. Will you tell us your views in regard to those schemes? I think it would be better to construct a weir at Koonoomoo, and gravitate the water.
3914. For what reason? We should then have direct contact with the Murray. I put in a printed statement of the proposal as submitted to the Government of Victoria (*Exhibit* 84).
3915. Do I understand that you advocate that the Koonoomoo proposal be converted into a gravitation scheme, as you consider you would not then be dependent on the action of any Trusts above you, whereas if the Goulburn-Murray scheme were carried out you would be? Yes.
3916. Do you consider that, as far as the stock and domestic supply is concerned, it is fairly adequate at present? Yes; that is to say, settlers have made provision for themselves by sinking.

John Frederick Bedwell, President of the Numurkah Agricultural Society and Katunga Irrigation League, sworn and examined:—

J. F. Bedwell. 30 July, 1902.

3917. *President.*] What is your name? John Frederick Bedwell.
3918. You are President of the Numurkah Agricultural Society and the Katunga Irrigation League? Yes.

Koonoomoo and Goulburn-Murray schemes.

3919. Do you agree with what the last witness said with regard to the Murray-Goulburn and the modified Koonoomoo schemes? Yes, in so far as that I believe it would supply the Northern part of the shire; but I think the Murray-Goulburn scheme would supply the whole district.
3920. Do you know the proposal made to the Victorian Government, and that the channels, as shown on Exhibit 84, indicate that the whole area of the Trust would be adequately supplied with water by that scheme? Yes; but it is not intended to supply the area to the South of Broken Creek Eastward from the shire.
3921. The land you have in view is outside the Trust? Yes.
3922. Would the Koonoomoo scheme, if modified as suggested by the last witness, supply the whole area of the shire Trust? It would supply the portion North of the creek.
3923. Do you think that would meet the case? Yes; so far as this Trust is concerned.
3924. What have you in your mind beyond that? A scheme to supply the Murray Valley as far as the Goulburn.
3925. For that reason you advocate the Murray-Goulburn scheme in preference to the Koonomoo? Yes.
3926. The East Goulburn channel would supply that part of the district? I do not approve of that scheme at all.
3927. Why? I think there is quite enough country on the West side to take all the water they can get. I believe it would provide a very small quantity to Numurkah.
3928. Is the country within the Trust suitable for irrigation? None more so.
3929. The whole of the area given by your Engineer? I think even more than that.
3930. *Mr. Burchell.*] How many acres are there on an average to each settler? 640 acres.
3931. Do you think each settler should be supplied with sufficient water to irrigate the whole of his land? I should say that half the land might be irrigated.
3932. Do you think the irrigable area should be reduced, instead of carrying the water out to each settler, and thus increasing the length of the channels? I think the holdings would become smaller with irrigation.
3933. Then you suggest providing for a larger area than would be irrigated? What I mean is that there would be more settlers, probably one to every 400 acres.

George Stickels, Commissioner of the Shire of Numurkah Waterworks Trust, of Kaarimba, further examined:—

G. Stickels. 30 July, 1902.

3934. *President.*] As a Commissioner of the Shire of Numurkah Waterworks Trust, are you well acquainted with the works of the Shire, and with the quantity of water diverted into the Shire channels? We are supposed to get 400 cubic feet per minute from Casey's weir, but, as a matter of fact, we are at the mercy of Tungamah, and only get what is left after their wants are supplied.
3935. Do you regard the present supply to Numurkah as being adequate? In no sense, not even for stock and domestic purposes.
3936. Does any of the water turned into your territory after Tungamah is supplied find its way to the Murray? At some periods of the year it does, but at the present time the water does not reach beyond Kaarimba, and, therefore, the whole district is not supplied.
3937. Have you anything to add to the evidence you gave to the Commission at Shepparton? Only that it is absolutely necessary we should have a better supply than at present. We had to shut off the town supply for several hours per day this year.
3938. Does that not point to the necessity of conserving the water in your own territory? Yes; and we have tried to do so, but our storage is only a small depression, and we cannot store water in this district without a very large expenditure.

James

James MacGregor, Commissioner of the Shire of Numurkah Waterworks Trust, of Kaarimba, further examined:—

J. MacGregor. 30 July, 1902.

3939. *President.*] Do you know anything as to the record of rainfall published in the *Numurkah Leader*, of Friday, 25th July, 1902? I kept the record, with the exception of the first ten years. I know the remainder to be correct, and have no reason for doubting the accuracy of the first part.
3940. Have you any idea of the quantity of water you received into the channels of the Trust? I believe we are entitled to 400 cubic feet per minute, delivered at our boundary before any diversions take place.
3941. Do you get it? Only at flood times.

Order-in Council.

3942. Do you wish to supplement your evidence on the general question given at Shepparton? I would like to say that there is an Order-in-Council giving this Trust its proper share of the water going down the Broken and Baalia Creeks, but that it is entirely ignored by the Tungamah Trust, and we are practically at their mercy. The Department took upon itself the right to divert the water into the different channels, and while they did so we got a reasonable share of the water; but immediately Tungamah found they were not able to send the water through all their channels they took forcible possession of the headworks and now divert it as they think fit. The creek is dry for several months, and thus there is no supply at the very time it is required.

George Russell, agent, of Numurkah, sworn and examined:—

G. Russell. 30 July, 1902.

3943. *President.*] What is your name? George Russell.
3944. You are a member of the Katunga Irrigation League? Yes.
3945. Do you regard the present supply to Numurkah and district as satisfactory? Only about 10 per cent. of the people avail themselves of it; the remainder have provided their own supply.
3946. Is that because there is no water available from the Trust, or because it is cheaper to get it for themselves? Principally because there is no water available from the Trust during the Summer months.

Failure of supply.

3947. Do you know of any occasion when the present supply has wholly failed? On one occasion we were absolutely without water in this township for a month, and the supply is limited every year.
3948. Would not that difficulty be met by additional storages on the creek? Yes.
3949. Would you not advocate that course? No; because the residents are anxious to obtain a purer water supply, and, therefore, desire a continuously running stream.

Wells and dams.

3950. *Mr. Burchell.*] I understand you to say that nine-tenths of the people in this district provide themselves with water;—where do they get it from? Wells and dams.
3951. Have they sufficient? Yes; for domestic purposes; but we have lost large numbers of stock owing to the want of water, and have had to send a third of our cattle away in addition.
3952. Do you consider the Koonoomoo scheme a good one for the Numurkah Shire Trust? If we had a gravitation scheme from that place, it would be the best for the district.
3953. Providing that scheme would give a sufficient supply for stock and domestic purposes, and a little for irrigation, you would prefer it to the Bungowannah scheme? Yes; principally because we should be more directly supplied.

WEDNESDAY, 30 *JULY*, 1902.

[*The Commission met at the Shire Hall, Tungamah, Victoria, at* 7 30 *p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).
FREDERICK N. BURCHELL, Esq.

Tobias Kelly, Engineer to the Shire of Tungamah, and Shire of Tungamah Waterworks Trust, sworn and examined:—

T. Kelly. 30 July, 1902.

3954. *President.*] What is your name? Tobias Kelly.
3955. You are engineer to the Shire of Tungamah and the Shire of Tungamah Waterworks Trust? Yes.
3956. Have you a plan of the district? I have a plan showing the area supplied by the Trust at the present time. [*Exhibit* 85.]

Area.

3957. What is the total area of the Trust? 249,600 acres.
3958. What portion of that area is irrigable? The whole of it, practically.

Capital cost.

3959. What was the total cost of the works? Portion of the works was constructed jointly by the Numurkah and Tungamah Shires. Our share of the total cost was £16,568.

Written off.

3960. How much of that sum has been written off? £4,759, leaving a liability of £11,818, and interest to the amount of £1,650, was also written off.

Revenue.

3961. How is the revenue derived? By a uniform rate of 6d. in the £ on the valuation.
3962. How much per annum does that produce? £1,544 18s. 6d.

Water diverted.

3963. How much water per annum is diverted into your channels from Casey's weir? In 1891, 403,000,000 cubic feet; 1892, 371,000,000 cubic feet; 1893, 436,000,000 cubic feet; 1894, 862,000,000 cubic feet; 1895, 502,000,000 cubic feet; 1896, 354,000,000 cubic feet; 1897, 400,000,000 cubic feet; 1898, 690,000,000 cubic feet; 1899, 923,000,000 cubic feet; 1900, 383,000,000 cubic feet.
3964. How is it that it fluctuates so much? In some seasons we have a regular rainfall during June, July, August, and September; when that is the case, we do not require water from Casey's weir during those months. We had most water diverted in 1899, when the rainfall was small.
3965. Do the quantities given represent the quantities used by both the Numurkah and Tungamah Trusts? Yes.

Supply not sufficient.

3966. Do you regard it as sufficient for stock and domestic purposes? No.

Goulburn-Murray scheme.

3967. How do you propose it should be improved? The Goulburn-Murray scheme would suit us best, I think.
3968. Would you give us your reasons for thinking so? We have been without sufficient water from the Broken River scheme, during April to June, for the last seven years, and I think we could get sufficient from the Goulburn-Murray scheme.

T. Kelly. 30 July, 1902.

3969. Is it possible to supplement the supply from any other scheme? There is a proposal to store water at the head of the Broken River, known as the Nillacootie scheme, also the Mokoan scheme, about 8 miles from Casey's Weir.

3970. Why would they not answer? I do not think we could get sufficient water from either. The volume of water passing Casey's weir since 1895 is as follows :—1895, 6,176,000,000 cubic feet; 1896, 3,554,000,000 cubic feet; 1897, 4,908,000,000 cubic feet; 1898, 5,941,000,000 cubic feet; 1899, 4,119,000,000 cubic feet; 1900, 6,886,000,000 cubic feet.

Makoan Swamp storage.

3971. What proportion do you divert? One-tenth of the total. To fill Makoan Swamp it would be necessary to construct a channel sufficiently large to divert the whole of the flood-waters during June, July, and August. To make provision for the Shepparton Trust, which is below us, and for our share of the water, would necessitate a storage of 2,500,000,000 cubic feet per annum. The bulk of that must be provided for during June, July, and August, and a channel sufficiently large to do so would be impracticable.

3972. Would the Mokoan Swamp storage be of sufficient capacity to provide for the flood-waters you mention? We should have to make sufficient for our requirements.

3973. Suppose it were practicable to construct the channel referred to, would the 2,500,000,000 million cubic feet meet your requirements? I have not gone into the question very closely.

3974. You prefer that the waters of the Broken River should be supplemented by the waters of the Murray from Bungowannah? Yes; I think that would provide a permanent supply, whereas the other would not.

3975. Has any proposal been made for converting your Trust into an Irrigation Trust? There was such a proposal some years ago; but not within the last nine years.

3976. Would the conversion of the Trust be contingent upon the construction of the Goulburn-Murray channel? I could not say; it would probably depend upon the expense, and the advantage to be gained thereby.

3977. Do you regard the land in this Trust as suitable for irrigation? Yes; also the land north of the Tungamah Trust area in the Tungamah Shire.

Broken River insufficient for requirements.

3978. *Mr. Burchell.*] Supposing the Tungamah Trust could take the whole of the water coming down the Broken River, would that be sufficient for your requirements? We are at the present time depending upon the flow of the Broken River; and there are periods when there is only sufficient water for riparian rights.

3979. Supposing Numurkah had an independent supply; would not the Broken River provide sufficient water for stock and domestic purposes for Tungamah? With a storage at Mokoan, I think it might.

3980. Do you think it necessary that irrigation should be carried out in this Trust? It depends on the people themselves. There is no move in that direction at the present time.

3981. You know there has been more than one scheme suggested for supplying Numurkah with water? Yes.

3982. How would that affect you? The Numurkah area might be taken off ours, so that we should get a less quantity from the Broken River.

Irrigable area.

3983. *President.*] Is there any other land in this district besides that comprised in the Trust, which is suitable for irrigation, if water were available? Yes; I think a total area, including the Trust of, say, 307,200 acres.

Rainfall.

3984. *Mr Burchell.*] What is the rainfall on that area? The average rainfall per annum from 1889 to 1894 was 26·27 inches; from 1895 to 1901 it was 17·45 inches. The rainfall on the catchment of the Broken River from 1895 to 1901 was 30 inches.

Catchment.

3985. What is the area of that catchment? 730 square miles above Casey's weir.

3986. How many miles of channel have you in the Trust? 372; 40 miles of which are outside the Trust area.

Settlers.

3987. Do you know the number of settlers within the Trust area? About 1,600.

3988. What are they doing principally? Wheat farming and dairying.

Land values.

3989. What is the value of the land per acre? From £3 to £7.

TUESDAY, 19 *AUGUST*, 1902.

[*The Commission met at the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Stephen Mills, Barrister-at-law, and Engineer and Secretary to the City Improvement Advisory Board, sworn and examined :—

S. Mills. 19 Aug., 1902.

3990. *President.*] What is your name? Stephen Mills.

3991. You are a barrister-at-law? Yes; and Engineer and Secretary to the City Improvement Advisory Board.

3992. You have read the evidence given by Mr. Glynn, of South Australia, in regard to the question of water rights on the various rivers in the States, included in this reference? I have.

3993. Will you give us your opinion, more especially in regard to the position which he took up as to South Australia? Yes. His position, as set forth in his evidence, was to some extent amplified and more fully stated in a pamphlet which he published in 1891, called "A Review of the Murray River Question." That pamphlet was put in when he gave his evidence. [*Exhibit* 38.] I have prepared a written statement dealing particularly with what Mr. Glynn has advanced in that pamphlet in conjunction with the evidence he gave.

3994. Will you read the statement you have prepared? Yes.

Sir Henry Parkes' claim of Murray waters

Sir Henry Parkes, then Premier of New South Wales, in a letter dated 6th March, 1890, and addressed to the Premier of South Australia, claimed for New South Wales the ownership of the waters of the Murray from the source of the river to the eastern boundary of South Australia. This claim is based upon the words of section 5 of the Constitution Act

S. Mills. 19 Aug., 1902.

Act 18 and 19 Vic., c. 54, which says, "The whole watercourse of the said River Murray from its source therein described to the eastern boundary of the Colony of South Australia, is and shall be within the territory of New South Wales."

Mr. Glynn, in his pamphlet "A Review of the River Murray Question," published in 1891, and which he has put in as an exhibit in connection with the evidence before this Commission, says that this claim "is more suggestive of impudence than strength." The Imperial Act only declares "the whole of the watercourse" to be within the territory of New South Wales, while Sir Henry Parkes claims—as incident to the ownership of the bed—the whole of the water.

Mr. Glynn makes the following objections to this claim :— Right to water.

(*a*) "The right to the water is pertinent or incident to the ownership of, not the bed, but the banks, and Limitation.

(*b*) "Is limited to such a use as does not diminish the customary flow."

(*c*) "Not only does the grant of the watercourse not include the whole of the water, but the Imperial Parliament never intended that it should. The object of the section was evidently, too, for criminal jurisdiction, which otherwise might be of doubtful residence on some one colony." Object of Act

(*a*) Mr. Glynn says the right to water is incident to ownership, not of the bed, but the banks, and he speaks of the "watercourse or bed" as if these two words were synonymous. Let us ask what is the meaning of the word "watercourse" used in the section of the Constitution Act above quoted. "A watercourse consists of bed, banks, and water" (Angell on "Watercourses.") Angell is an American writer; but his book is, as was said by one of the Law Lords in a Privy Council case, continually referred to in the English Courts. Meaning of "watercourse." Angell.

Stephen ("Commentaries," Book 1, p. 606) says: "A watercourse may be defined generally as the right which a man has to the benefit of the flow of water . . . . but a watercourse is distinguishable from the right of merely using the water flowing over the soil, which is incident, as a matter of course, to the property in the soil itself; for the right to a watercourse involves the right to have the course of the water kept free from any interruption or disturbance to the prejudice of the claimant of the right by the acts of persons from without, and in parts not within his own territory." Stephen.

Wharton ("Law Lexicon") defines watercourse almost in the same words as Stephen. Wharton.

These authorities are obviously opposed to Mr. Glynn's use of the word "watercourse" as meaning merely the bed of a stream.

Hall ("International Law") says: "Upon whatever ground property in the entirety of a stream or lake is established, it would seem in all cases to carry with it the right to the opposite bank as accessory to the use of the stream." Hall.

What is a "bank"? Bouvier ("Law Dictionary") says: "Banks of rivers contain the water in its natural channel when there is the greatest flow of water." Meaning of "bank."

Mr. Glynn appears to admit that the bed, at least, of the Murray is the property of New South Wales. Now, the bed is land, and ownership of land carries with it certain necessary incidents. A well-known maxim applies—"*cujus est solum, ejus est usque ad cœlum*"—and this "inculcates that land in its legal significance has an indefinite extent upwards, and therefore it is that the grant of it conveys all grass, timber, and water standing thereon; and a stream of water is consequently as much the property of the owner of the soil over which it passes as the stones scattered over it." (Angell, "Watercourses.") Incidents of land ownership. A stream, the property of the owner of the soil.

It would be possible by the insertion of apt words in a deed to convey the bed of a stream excluding the water; but "in the absence of such words the bed, and consequently the stream itself, passes by the conveyance." (Angell, p. 9.)

No doubt the ownership of the bank of a stream carries with it the presumptive right to a certain limited use of the stream; but the basis of this right is, perhaps, not the mere possession of the land along the bank, but the presumption of law (which was confirmed by the Privy Council in the appeal case of Lord *v.* Commissioners for the City of Sydney, and is generally applicable, in England, to non-tidal waters) that a grant of land bounded by a stream passes the ownership of the soil of the stream *ad medium filum aquæ*, the right to use of the water then following as an incident to the ownership of the soil over which it passes in accordance with the maxim above quoted.

Lord Selborne, in delivering the judgment of the House of Lords in the case of Lyon *v.* Fishmonger's Co. (1 App. Cases, 683), said: "It is, of course, necessary for the existence of a riparian right that the land should be in contact with the flow of the stream, but lateral contact is as good *jure naturæ* as vertical." Mr. Glynn seems to argue that lateral contact, that is, contact of the bank, which Lord Selborne says is as good as vertical, is so much better that it ousts the right conferred by ownership of the land in which there is vertical contact with the water, that is, the ownership of the bed. I am not aware of any authority for such an opinion. The case just quoted decides that ownership of the bank is sufficient to give a right to a certain limited use of the water, but it is a very different thing to say that ownership of the bank ousts the right of the owner of the bed. Taking Angell's definition of watercourse, and Bouvier's definition of a bank, as authoritative—and I think they may be justly so regarded—and reading them in conjunction with the judgment in Lyon *v.* Fismongers' Co., above quoted, where it is laid down that contact with the flow of the stream is necessary for the existence of a riparian right, it seems clear that the waters of the Murray River, from the South Australian boundary to the right-line boundary run from Cape Howe, pass wholly over New South Wales territory, and consequently are the property of New South Wales. Contact with stream essential to riparian right. Waters of Murray the property of New South Wales.

(*b*) The "right is limited to such a use as does not diminish the customary flow." In this part of his argument, as in the first part (*a*), Mr. Glynn is dealing purely with the riparian law as between an upper and lower proprietor of a stream where both proprietors are under the same government. His contention would only be true as applied to two States if there were an inter-state riparian law exactly similar to the Common law affecting individuals; but I do not think there is any such riparian law. If there were such a law, and it were strictly enforceable, we should have the astounding result that South Australia could demand that all the waters collected from an area nearly twice as large as France, should pass into her territory unused except as to such limited domestic use as does not diminish the customary flow. Right to use of water. No inter-state riparian law.

(*c*) "Not only does the grant of the watercourse not include the whole of the water," &c. Lawrence (International Law) says: "There can be no doubt that a State possesses territorial rights over that portion of a river, which is entirely within its own boundary." The Constitution Act declares the whole of the River Murray to be within the territory of New South Wales. I think, therefore, that in this case the grant of the watercourse does include the whole of the water. Grant of watercourse includes water.

As to the intention of the Imperial Parliament. The Act, in plain, unambiguous words, fixes the boundary of New South Wales territory on the southern side of the Murray, and even though this was done primarily to avoid possible difficulties with regard to criminal jurisdiction, that fact cannot alter the territorial rights thus conveyed. "When the words admit of but one meaning, the Court is not at liberty to speculate on the intention of the Legislature, or to construe an Act according to its own notions of what ought to have been enacted." (Maxwell, Interpretation of Statutes.) Intention of Imperial Parliament.

"There is," says Mr. Glynn, "another point. The bed of a navigable river is, according to the best authorities, in the Crown, not in the proprietors of the banks. No riparian owner can become possessed of a right to divert the water of a navigable river to the injury of navigation. The watercourse of the Murray from its source to the eastern boundary of South Australia may be within the territory of New South Wales, but is not, therefore, necessarily the property of New South Wales. The Murray from our boundary to the mouth is within the territory of South Australia, but is not therefore the property of South Australia." Bed of navigable river vested in Crown.

There are two preliminary difficulties in commenting upon this statement.

(1.) Mr. Glynn, in the sentence which I quoted above, and which appears on the same page of his pamphlet as the sentences just given, distinctly uses the words "watercourse" and "bed" as if they were synonymous. Let us then substitute the one word for the other. The last sentence quoted will then read "the bed of the Murray from its source to the eastern boundary of South Australia may be within the territory of New South Wales, but is not therefore necessarily the property of New South Wales." Now, the bed is land, not water, and I do not think that Mr. Glynn intends to maintain that land which is within the territory of New South Wales is not the property of New South Wales. But if, by the word "watercourse" he does not mean the bed, he must, I think, mean the water. If this is Mr. Glynn's meaning, what becomes of his former argument, which was chiefly based upon the assumption that the word "watercourse" in the Constitution Act means the bed, and not the water.

(2.) The second preliminary difficulty is the assumption that the Murray is a navigable river in the sense in which the word "navigable" is used in English law. There is in England no river whose physical conditions are even remotely similar to those of the Murray, and I think the tribunals to be created under the Commonwealth Constitution Act will, to a large extent, have to create precedents of interpretation. Apart

S. Mills. 19 Aug., 1902.

Apart from these preliminary difficulties, I confess I do not quite see how Mr. Glynn's statement strengthens his position.

If the Murray bed, though within the territory of New South Wales, is vested in the Crown, and if "the Crown" in this connection does not mean the Government of New South Wales, it can only mean the Imperial Government. If that is so, then the territorial rights of a sovereign State operate, and the water in the Murray bed is also the property of the Imperial Government. If the Crown means the Government of New South Wales, which, as against the other States, is also the proprietor of the banks, the argument only amounts to saying that "A" as proprietor of the banks must not do anything to the prejudice of "A" (the same person) who is proprietor of the bed.

Throughout his whole argument, Mr. Glynn is endeavouring to show that independent States are in exactly the same position as individual dwellers in one State would be.

He has after all to admit that his arguments are only deductions from private law, and "have no sanctions outside the consciences of those to whom they relate. There exists neither a court to declare nor an executive to enforce them."

Definition of "bank."

3995. *Mr. Burchell.*] With regard to the "bank" of the river, do you know that the flow extends for some miles beyond the bank of the river? "The greatest flow in its natural channel" is the definition.

3996. The natural channel is not sufficient to carry the greatest flow? The definition does not extend the territory to the utmost bounds of the water that spills over the bank, otherwise it would embrace huge areas.

3997. The natural flow would sometimes cause a diversion into Victorian territory, for instance? Most rivers are subject to more or less alteration of channel.

3998. But then it would flow out of the Colony;—it might form an island? It might be a case for arbitration in a matter of that sort; but, subject to the possible decision of any tribunal by arbitration, the general rule would be the right of the bank would remain where the bank naturally placed itself. The whole matter is not without difficulty, and the chief difficulty arises in this way: If a State is in the position of an individual, then there is no doubt the decisions of the English courts on riparian law, as affecting individuals, would apply; but, in my opinion, this State—I am speaking now of the position before Federation—as against the neighbouring colonies, is an independent State, and I may read the definition of an independent State, given by a well-known writer on international law. He defines it as "a community permanently established for a political end, possessing a definite territory, and independent of external control." If you refer to Mr. Glynn's evidence, you will see he makes a statement with regard to international treaties giving equality of right. Well, the equality of right that has been determined by any of the international treaties has simply been the right of navigation. There are, as far as I know, no precedents in international law for cases similar to this, where one State may have a desire to restrain, or in any way to restrict, the diversions of water from a river by either an opposite State or one higher up or lower down the river. Every possible analogy from private riparian law which might be applied either in favour of or against any of the colonies is always subject to the "if" the law is applicable. My view is that it is not, and I do not know of any court where it has ever been enforced against a Colonial Government. Since Federation another power has arisen, and the rights of the States are to some extent modified.

"Independent State."

No international precedents.

Private riparian law not applicable.

Henry Chamberlaine Russell, Government Astronomer, Sydney, sworn and examined:—

H. C. Russell. 19 Aug., 1902.

3999. *President.*] You are the Government Astronomer? Yes.

4000. We have asked you to give us your records of the rainfall along the banks of the rivers Darling, Murray, Murrumbidgee, and Lachlan, say, for the last twenty years;—can you supply that information? I put in a chart [*Exhibit* 87] showing the information that has been asked for.

Rainfall.

4001. You also put in maps showing the driest year (1888) and the wettest year (1890), so far as your records go? Yes [*Exhibits* 88 and 89].

4002. You also put in a diagram showing the recurrence of rain for the last thirty years? Yes. [*Exhibit* 90.]

Evaporation, Method of measuring.

4003. Will you tell us your experience in regard to evaporation;—I understand you have been investigating the subject? Yes; for a number of years. At Bourke, Wilcannia, Hillston, and other places I have tubs 4 feet in diameter and 3 feet deep, and they have attached to the upper part of them an apparatus for measuring the quantity of water that is evaporated out of the reservoir day by day, and in that way I find that at Bourke the average is something like 5 feet in the year. With regard to Lake George, where—in consequence of there not being much stock there—it is purely a question of evaporation, the quantity taken by birds being quite insignificant; the western side of the Lake is protected from the western winds (which are the prevalent winds) by a very high range of hills, running along right at the water's edge nearly all the way. I have had this lake examined every day since February, 1885, because I felt it was not affected by ordinary difficulties—that is, by a number of sheep and cattle going into it, and, further, that it could not be used much because it is rather salient in its character, and very little is taken out of it. So I had a recording machine put up, showing the quantity of wind that passed, and the daily amount of water which evaporates from the lake itself. I also had one of the evaporators, similar to the one used at Bourke, placed at the side of the lake. My object was to see the effect of the waves, which are raised up by the wind at Lake George. The man who is doing this work is a very intelligent man, and he noticed that great quantities of rain were blown by the strong winds off the top of the water in the Lake, and sometimes it is carried a half of a mile into the bush. Of course, that appears in the measurement as evaporation. The same thing must affect all the large reservoirs that are used in the different parts of New South Wales.

Effect of wind.

4004. So that you have not only taken into consideration the quantity of water lost by evaporation, but also the quantity that the wind drives away from the reservoir on to the land? Yes.

4005. What quantity, then, was evaporated at Lake George, taking that into consideration? The greatest change in level in a month was 19⅛ inches, during January, 1900.

4006. *Mr. Burchell.*] You mentioned that you had an evaporating tank at Lake George whilst you were recording the evaporation of the lake itself;—how did they compare? I forget the exact quantity, but very much more—I should think about 30 or 40 per cent.—goes from the surface of the lake.

4007. Is the tank in the ground? The upper edge of it is within an inch of the level of the ground surface. It is a large galvanised iron tub.

4008. Do you not think that the evaporation being greater in the lake is accounted for by soakage? I do not think so; there is no sign of it at all.

H. C. Russell. 19 Aug., 1902. Soakage.

4009. Do you not think it is worth allowing a percentage for soakage? I have made inquiry about that, and I do not think so. It is quite evident that for many centuries the water has been coming in from the sides of the hills, and it is a close, tenacious mud that covers the whole of the floor of the lake.

4010. Have you the records of the rain that fell during the period in which the lake dried up? Yes. The quantities of rain and wind are shown on the diagram (*Exhibit* 90A), and the loss from year to year.

Leslie Augustus Burton Wade, Principal Engineer for Water Supply and Sewerage, Public Works Department, Sydney, further examined:—

L. A. B. Wade. 19 Aug., 1902.

4011. *President.*] You have been asked for certain information to assist the Commission in coming to a conclusion in regard to the question remitted to them;—what have you prepared? I put in a plan (*Exhibit* 91) showing the area of irrigable land in New South Wales.

Irrigable area, N.S.W.

4012. The approximate irrigable land in New South Wales, according to this plan, is 68,035 square miles? Yes.

4013. That is on the Lower Murray, Lower Murrumbidgee, Lachlan, and along the Darling from Wentworth to Boggabilla? Yes.

Water insufficient for total area.

4014. Have you any idea as to whether there would be water sufficient to supply that area? I am afraid there is only sufficient water for a very small proportion of it.

Area of flooded country.

4015. You have prepared a statement of the flooded country on the various streams? Yes. The area on the Lower Murrumbidgee is 1,250 square miles, Lower Lachlan 950 square miles, Macquarie (Marshes) 80 square miles, and Gwydir 1,030 square miles.

Estimated diversions from Murray for stock and domestic use.

4016. You have also prepared a statement in regard to the quantity of water that will be diverted down the various diversion works on the Murray? The diversions from the Murray into the Tuppal and Eagle Creek cuttings have only recently been completed, while the work in connection with Bullatale Creek has not yet been commenced, so that actually no water is diverted at present. These diversions are for the purpose of stock and domestic supply only, and it is anticipated that 100,000,000 cubic feet per annum will meet the requirements down the Tuppal and Eagle Creeks, and about 5 1,000,000 cubic feet down the Bullatale Creek.

Surplus would return to the Murray.

4017. Will any of that get back again into the Murray? If a supply greater than requirements for stock and domestic purposes were diverted down those creeks, I think most of it would eventually get back into the Murray, but we only purpose to divert sufficient for stock and domestic requirements.

4018. And of that quantity you have given an estimate? Yes.

Nature of the diversions.

4019. *Mr. Burchell.*] What is the nature of those diversions? An improvement at the head of the creek by cutting. Each cutting is provided with a regulator, so that we have it under perfect control.

Level of sills.

4020. What level is the sill in respect to summer level? They vary. In giving evidence previously, I gave the information with regard to the bed of the diversions referred to the nearest river gauge.

Tuppal and Eagle Creeks.

4021. Do you remember if they were near the summer level, or much above the summer level? To the best of my recollection, the Tuppal Creek does not run until 5 or 6 feet above summer level. The Eagle Creek is nearer to summer level.

4022. And the Bullatale? I could not say from memory; but I think it was stated in the previous evidence given by me.

Yanko Creek diversions.

4023. *President.*] You have also prepared information with regard to the diversions that have taken place down the Yanco Creek from the Murrumbidgee, near Narrandera? Yes.

YANCO CREEK CUTTING.

Water diverted from Murrumbidgee River at Yanco Creek.

TABLE showing, approximately, the quantity of water which was diverted from the Murrumbidgee River during the years 1892 to 1901 inclusive.

Year.	Quantity of Water in cubic feet.	No. of days in which depth of flow was over 15 feet 6 inches.	No. of days Creek ran.	Year.	Quantity of Water in cubic feet.	No. of days in which depth of flow was over 15 feet 6 inches.	No. of days Creek ran.
1892.....	11,558,903,040	27	366	1897.....	2,943,561,600	.....	278
1893.....	11,003,592,960	9	365	1898.....	2,948,088,960	.....	243
1894.....	25,379,395,200	75	365	1899.....	3,084,670,080	.....	229
1895.....	5,179,455,360	.....	365	1900.....	12,821,500,800	19	288
1896.....	2,560,377,600	.....	281	1901	5,356,592,640	.....	266

The whole of the water diverted down the Yanco Creek flows into the Billabong, thence into the Edwards, and thence into the Murray.

4024. So that the diversion from the Murrumbidgee is in favour of the Murray? Yes. It gets into the Murray higher up than it otherwise would.

4025. *Mr. Burchell.*] Is there any regulator at the Yanco Creek, near the Murrumbidgee? No; not at the present time.

Surplus water returns to Murray.

4026. *President.*] Supposing more water finds its way through the Yanco Cutting into the Billabong, Colombo, and Edwards Rivers than is required for stock and domestic purposes, what becomes of it? It returns into the Murray.

Irrigation at Coonong and Widgiewa.

4027. Have you made any estimate as to the quantity that is required for the purposes named? No. There is a little irrigation carried on at two places only—on Coonong and Widgiewa stations, on the Colombo.

4028. Are there any conditions as to the irrigation carried on at those two stations? Yes; no irrigation can take place until the flow through the Yanco and Billabong has reached the Edwards.

4029. *Mr. Burchell.*] Where does the Edwards enter the Murray again? A short distance above the Murrumbidgee.

L. A. B. Wade. 19 Aug., 1902.

4030. What would be the depth of water on the Echuca gauge when the water leaves the Murray and flows into the Edwards? I will supply that information. [*Witness subsequently furnished the following particulars*]:—

Owing to the inflow of the Goulburn River being between the Edwards River and Echuca gauge, a rise in the Goulburn River would affect the Echuca gauge without altering the level of water in the Murray River at the head of the Edwards River, and consequently the heights shown below will not be nearly so reliable on the Echuca gauge as those on the Tocumwal gauge.

The Edwards River commences to run:—

1st. Through Gulpa Creek Cutting, at 6 inches on Tocumwal gauge, = 6 inches on Echuca gauge (approx.).
2nd. Through head of Edwards River, at 3 feet on Tocumwal gauge, = 4 feet on Echuca gauge (approx.).
3rd. Through Tuppal Creek Cutting, at 6 ft. 6 in. on Tocumwal gauge, = 9 feet on Echuca gauge (approx.).

It should be pointed out that, although water would begin to flow through head of the Edwards River when Tocumwal gauge reads 3 feet, it would, owing to the large area of reed-beds along its course, take a rise of about 6 feet on the gauge for five or six days to cause the Edwards to run through to Deniliquin.

4031. *President.*] You have prepared a list of the natural lakes along the course of the River Darling, giving the situation, area, lake depth, and the approximate capacity? Yes, as far as our information allows us to.

LAKES ALONG COURSE OF RIVER DARLING.

Name of Lake.	County in which situated.	Area in acres.	Approximate maximum depth in feet.	Approximate capacity, cubic feet.
Narran	Finch	9,040	10	2,297,034,000
Terewah or Narran	Narran	20,880	10	5,505,608,000
Tonga	Fitzgerald	12,860	8	2,601,984,000
Yetabungie	,,	2,560	12	780,594,000
Coopooka	Killara	1,330	.....	.....
Olepololo	,,	1,970	9	475,675,000
Peery	,,	11,040	8	2,244,211,000
Mooratchia	Yungnulgra	230	.....	.....
Nine-mile	,,	3,300	15	1,257,795,000
Dick	Young	3,160	12	939,154,000
Copago	,,	770	30	586,971,000
Courntilly	,,	.....	.....	.....
Tillinbury	,,	.....	.....	.....
Purnawilla	,,	.....	.....	.....
Island	,,	.....	.....	.....
Outilla	Killara	450	.....	.....
Cullewie	,,	450	7	85,759,000
Naroolpilly	Rankin	610	.....	.....
Tilpilly*	,,	100	.....	.....
Waragoonderie	,,	2 300	.....	.....
Wangalara	,,	16,640	12	5,796,707,200
Poopelloe	,,	40,640	12	13,600,000,000
Gunyulka	,,	6,400	10	1,950,000,000
Woychugga	Young	1,536	10	457,380,000
Martha's Bath	Manara	100	.....	.....
Bobby's Hole	,,	100	.....	.....
Satan's Toe	,,	109	.....	.....
Pigeon's Hole	,,	60	.....	.....
Nellegoe	Menindie	7,040	10	1,839,974,000
Tandou	,,	43,392	7	7,560,622,000
Kangaroo	,,	1,587	12	1,483,908,000
Bintullia	,,	102	.....	.....
Yartla	Windeyer	2,660	.....	.....
Popio	,,	947	.....	.....
Popilta	,,	9,609	.....	.....
Nearie	,,	3,360	16	1,460,600,000
Nitchie	,,	.....	.....	.....
Milkengay	Tara	1,060	18	562,200,000
Traveller's Lake	Windeyer	.....	.....	.....
Yeltow	,,	.....	13	.....
Nialia	,,	.....	.....	.....
Brumney's Lake	Livingstone	3,328	18	1,642,400,000
Victoria	,,	3,580	15	1,540,000,000
Waterloo	,,	3,460	11	1,078,000,000
Eucalyptus	,,	2,220	9	580,000,000
Pelican	,,	260	9	67,000,000
White Water	,,	370	9	103,680,000
Dry Lake	,,	1,920	13	687,000,000
Teryaweynya (including Swan Lake)	,,	5,620	23	.....
Mosley Lake	,,	614	12	209,000,000
Long Lake	,,	760	16	335,000,000
Minden	,,	300	12	104,500,000
Brick-kiln	,,	470	9	.....
Haystack	,,	470	.....	.....
Sayer Lake	,,	3,140	10	878,000,000
Gum	,,	2,000	10	526,300,000
Bullabolka	,,	9,650	20	8,407,080,000
Ratcatchers'	,,	11,420	12	5,957,460,000
Denny's	,,	2,320	10	607,200,000
Brennan's	,,	1,070	10	290,400,000
North	,,	5,150	.....	.....
Wallace	,,	1,180	.....	.....
Malla	Tandora	940	.....	.....
Bijjiie	,,	2,500	.....	.....
Tandure	,,	4,671	.....	.....
Pamamaroo	,,	16,896	.....	.....
Speculation	,,	690	23	445,855,000*
Menindie	Menindie	38,707	15	16,720,000,000†
Cawndilla	,,	21,850	31	17,195,709,000
Bucobilli	,,	384	12	117,089,000
Emu	,,	2,897	10	749,319,000

* Inlet runs when Menindie gauge reads 27 feet. † Inlet runs when Menindie gauge reads 11 feet.

L. A. B. Wade. 19 Aug., 1902.

4032. You also put in a list of the lakes along the Murrumbidgee? Yes.

LAKES ALONG COURSE OF MURRUMBIDGEE RIVER.

Name of Lake.	County in which situated.	Approximate area in acres.	Name of Lake.	County in which situated.	Approximate area in acres.
Albert	Wynyard	250	Leriwah	Wakool	.....
Cullivel	Urana	3,500	Kerkeri	,,	.....
Urangong	,,	1,170	Dry	,,	.....
Urana	,,	16,200	Pitarpunga	Caira	15,700
Coolah-Gumparma and Mejum	Cooper	.....	Muckee	,,	400
Loorica	Caira	660	Macomommon	,,	4,240
Tala	,,	1,420*	Dundomallee	,,	1,920
Yanga	,,	3,450†	Paika	,,	650
Condoulpe	Wakool	1,230	Nowie	,,	800
Talbett's	,,	530	Maremley	,,	300
Harvey's	,,	.....	Gannaway	,,	2,300
Merwin	,,	210	Tori	,,	1,150
The Big Sandhill	,,	.....	Waldaira		1,180

* Inlet runs when Balranald gauge reads 8 feet. † Inlet runs when Balranald gauge reads 8 feet.

4033. And the Lachlan? Yes.

LAKES ALONG COURSE OF LACHLAN RIVER.

Name of Lake.	County in which situated.	Approximate area in acres.	Name of Lake.	County in which situated.	Approximate area in acres.
Cowal	Gipps	46,000	Dry	Waljeers	420
Cargelligo	Dowling	.....	Tarrawong	,,	850
Moon Moon	Nicholson	420	Comayjong	,,	300
Gunbar	,,	320	Boocathan	Caira	920
Waljeers	Waljeers	1,400	Bunumburt	,,	120
Merrimajeel	,,	.....	Gunnagia	Mossgiel	.....
Dry	,,	500	Dry	,,	.....
Bullogal	,,	570	Barneys	Manara	5,000
Ryans	,,	570	Moornanyah	,,	7,000
Bungarry	,,	320			

4034. And the Murray? Yes.

LAKES ALONG COURSE OF MURRAY RIVER.

Name of Lake.	County in which situated.	Approximate area in acres.	Name of Lake.	County in which situated.	Approximate area in acres.
Moira	Cadell	.....	Genoe	Wakool	640
Tooim	Wakool	860	Geer	,,	320
Wollare	,,	490	Coomaroop	,,	880
Goonimur	,,	160	Wannah	,,	130
Talpile	,,	165	Noeyango	Taila	1,728*
Poomah	,,	450	Taila	,,	1,820†
Salt	,,	70	Gol Gol	Wentworth	800
Poon Boon	,,	1,120	Fletcher's	,,	2,170
Woromur	,,	800	Victoria	Tara	25,600

* Inlet runs when Euston gauge reads 19 feet. † Inlet runs when Euston gauge reads 18 feet.

THURSDAY, 21 AUGUST, 1902.

[*The Commission met at the "Euabalong Hotel," Euabalong, New South Wales, at noon.*]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).
FREDERICK N. BURCHELL, ESQ.

William Budd, mail contractor, Cudgellico, sworn and examined:—

W. Budd. 21 Aug., 1902.

4035. *President.*] What is your name? William Budd.
4036. How long have you been resident in the district? Fifty years.
4037. You know the Booberoi weir, and the work recently carried out there by the Public Works Department? Yes.
4038. Do you consider the effect of that work will be beneficial to the district, especially those who reside along the Booberoi Creek? Yes, I think so; it was a very great necessity. Booberoi Weir.
4039. In what way will it benefit them? They will have a permanent supply of water. At times of drought, I have seen the river dry for a mile at a gap, and in many instances the residents have had to leave and go to places more favourably situated. Permanent water supply.
4040. In what way will it give a permanent supply? By impounding the water.
4041. How will it be conserved in the Booberoi Creek? By private dams.
4042. At present there are no dams? There have been; but I think they have all been washed away.
4043. What will be the effect of the works that have been carried out in connection with Lake Cudgellico? They will be the means of supplying a reservoir there that, I think, will contain water for four or five years. The natural supply of water in Lake Cudgellico was a two years' supply, and now I think it will contain a sufficient supply for four or five years. Effect of works at Lake Cudgellico.

W. Budd. 21 Aug., 1902. Land values.

4044. What effect will that have on the value of the land, taking into consideration, first of all, the water diverted into Booberoi Creek, and then the additional water that will be conserved in the lake? It would add very much to the value of the land. The land principally sought after is land fronting the water. Land in these dry parts away from water is simply of no value at all.

4045. Could you give us the increased price of the land as the result of having a domestic and stock supply? No, I could not; there have been no sales here. But the frontage to water enhances the value of the land very much.

Recurrence of droughts.

4046. *Mr. Burchell.*] During your experience of fifty years in the district, how often have you known these droughts to occur? About every ten years. After this drought has terminated, there will be about two good seasons, and after that the seasons will get worse and worse until a severe drought eventuates.

Number of settlers.

4047. How many settlers are there between the Booberoi weir and the point where the Booberoi Creek enters the Lachlan again? Ten, I think.

4048. Do you know the distance from the weir on the Lachlan to the point where the Booberoi Creek runs into the Lachlan again? Twenty-five miles in a straight line; about 60 or 70 miles by river.

4049. Is there any wheat-farming done at all? No; the land has not been available for wheat-farming.

Wheat farming impracticable

4050. From what you say, do you think it would be safe for people to establish themselves as wheat farmers in a district like that? Not under the existing circumstances. The water has been the draw-back all along. The expense of conserving water in a private way is so great that they could never overtake it.

4051. How many settlers are there around Lake Cudgellico? Thirty or forty.

4052. What do they do principally? They go in for sheep, cattle, and crop growing. Their experience has been that they get about three crops in ten years.

Size of holdings.

4053. What is the average size of their holdings? 1,920 acres.

4054. Is that enough in this district? No.

4055. What do you think would be sufficient? Nothing less than 3,000 acres for a mixed industry; the cropping alone will not pay here.

THURSDAY, 21 AUGUST, 1902.

[*The Commission met at the Court-house, Cudgellico, New South Wales, at 7·30 p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

John Knight, managing storekeeper, Cudgellico, sworn and examined:—

J. Knight. 21 Aug., 1902. Effect of works at Lake Cudgellico.

4056. *President.*] What is your name? John Knight.

4057. What are you? Managing storekeeper.

4058. How long have you been resident in Cudgellico and district? About twenty-three years.

4059. You, therefore, know the district pretty well? Yes.

4060. You know the works that have been carried out in connection with Lake Cudgellico? Yes.

4061. So far, owing to the fact of there being no water in the river, they have had no effect? No.

4062. What do you think the effect will be? They will be of advantage to the district.

4063. In what way? In conserving a larger supply of water.

4064. Have you any idea of the quantity of water that will be permanently diverted from the Lachlan through the new cutting at the head of the lake? No.

4065. In the past what water has found its way into the lake? Only flood water from the river.

4066. How long has that lasted when you have had a flood and got the lakes filled up as high as they could be? The last six or seven years we have had water coming in. It lasted when it came in, but, of course, it would get very green and weedy when not freshened up.

4067. What more do you expect from the new works? We expect to get a supply more frequently.

4068. Did the original diversion give you what you wanted? It did until the dry weather, such as this, came on.

Stock and domestic supply.

4069. How is the water used? For stock and domestic purposes.

4070. Any irrigation? No.

4071. Do you know if any irrigation is proposed? The surveying of irrigation farms has been spoken of, but nothing has been done so far.

4072. What is your opinion about it? I think it would be a very good system.

4073. Do you know anything about irrigation? No.

4074. Do you regard the works, as they have been executed so far, as satisfactory? Yes; of course a flood will prove them.

Weir required.

4075. Do you think anything further is required? I think a weir is wanted to divert the water into the cutting at the head of the lake.

4076. And you think that will be satisfactory? I think so.

4077. *Mr. Burchell.*] With regard to the weirs that are constructed, do you pay any interest on them? We do not pay anything; we have not been asked to do so as yet.

4078. What is the nature of the settlement around Cudgellico? Sheep-farming principally.

4079. Are any cereals grown at all? Grain; wheat and hay are grown.

Area under cultivation.

4080. What area? Two to three thousand acres altogether.

4081. When did wheat-growing first start here? Ten years ago.

4082. The limit of the cultivation is 2,000 acres? I think so, for wheat.

4083. Does it pay to grow wheat in this district? There has not been a great deal sent to market from here; it costs too much.

4084. What is the average rainfall? I could not say.

4085. Had you any crops last year? I myself had no crops; the crops generally were small.

4086. What are the prospects this year? None at all.

4087. What is the population of the farming settlement growing wheat? About twenty-five.

Population.

4088. What is the population of the town of Cudgellico? About 400.

J. Knight. 21 Aug., 1902. Wells.

4089. With regard to the sheep-farmers, how do they obtain water for their stock when the river is dry like it is this season? Some of them have wells.

4090. Have they good stock wells? Yes, some of them.

4091. What depth have they had to sink? The wells vary from 40 up to 250 feet.

4092. Have the farmers to depend on wells also? Some have; they have tanks on their farms.

4093. Taking the locality generally, can good stock water be obtained by sinking within a radius of 10 miles from here? Yes; over 10 miles from here they may have to go deeper.

Robert Lindon, blacksmith and wheelwright, Lake Cudgellico, sworn and examined:—

R. Lindon. 21 Aug., 1902. Lachlan contributions to Murrumbidgee.

4094. What is your name? Robert Lindon.

4095. You are a blacksmith and wheelwright, at Lake Cudgellico? Yes. I only came here five months ago; but I have been living in the district since 1890.

4096. I suppose you know, roughly, the quantity of water that comes down the river from year to year? Yes.

4097. And you are acquainted with the different diversions that have been made along the course of the river? Yes.

4098. You know the diversion that has been made into the Booberoi Creek? Yes.

4099. And also the diversions that have been made into Lake Cudgellico? Yes.

4100. You know that the Lachlan flows into the Murrumbidgee? When it is in flood.

4101. And the Murrumbidgee into the Murray? Yes. My experience of the Lachlan is that there are only about six months in the year when it reaches the Murrumbidgee. In flood times, of course, a large body of water comes down.

4102. How often would that be? Once in every four or five years.

4103. But in an ordinary year? During such years as we have been having since 1894, the river is dry for six months in the year.

4104. Taking an ordinary year, how many months does the Lachlan flow into the Murrumbidgee? From five to seven months.

4105. So that it does contribute to the Murray? Yes; but we have had years similar to this, when the water never reached the Murrumbidgee at all. I do not think it reached the Murrumbidgee during last September.

Effect of Booberoi weir.

4106. *Mr. Burchell.*] Do you know the weir that has been constructed, diverting the waters of the Lachlan into the Booberoi Creek? Yes.

4107. Do you think it will have any detrimental effect on the Lachlan lower down? No.

4108. You think it is an improvement? Yes.

4109. Supposing it turned the water so that you could not get any down here—that is to say, in a dry year? If the water was turned from its main course, it would affect us down here; but as far as stopping the river running for a month or two is concerned, it would not hurt us.

Quality of well water.

4110. Do you agree with what the last witness said in regard to the well water being obtained in the district? Well water is obtained here, but it is no good for vegetation; it is fairly good stock water.

4111. Is not the water obtained from some of the wells good enough for domestic use? Some of it is, but we all prefer the fresher water if we can get it.

Rainfall not sufficient for wheat growing.]

4112. Do you consider the rainfall in the district sufficient for the purpose of growing wheat with certainty? No, not sufficient year after year.

Duncan Erskine McKellar, Manager of Wooyeo Station, Lake Cudgellico, sworn and examined:—

D. E. McKellar. 21 Aug., 1902. Dams important. Conservation of Lachlan water. Storages. Lachlan River. Irrigation possible in places. Storage at head of Lachlan.

4113. *President.*] What is your name? Duncan Erskine McKellar.

4114. You are manager of Wooyeo station? Yes.

4115. How long have you been in the district? Twenty-five years.

4116. Do you water your stock from Lake Cudgellico? Some from the lake, and some from the river.

4117. Are you acquainted with the river above and below your station? Yes, from Hillston to Condobolin, at all events.

4118. From what you know of the conditions of the country, what would you say as to water conservation on the river? I should say that dams are the most important things. We have done a little in that way ourselves; in 1888 we put a lot of dams in, and they answered very well.

4119. Do you think the waters of the Lachlan in an ordinary year could be conserved in the Lachlan country? I think so.

4120. Are there any lakes down the river such as Lake Cudgellico? None so large, but there are swamps and lakes that might be made use of in a similar way.

4121. I suppose in times of flood the water goes through into the Murrumbidgee for some months? Yes. The Lachlan in flood is a very big stream; it runs sometimes for months three parts a banker.

4122. Do you think the water of the Lachlan could be profitably made use of for irrigation, in addition to conserving it for stock and domestic use? There are lots of places where irrigation could scarcely be carried out; but, on the other hand, there are many places where it could be successfully carried out by gravitation.

4123. Supposing storage reservoirs were put at the head of the Lachlan so as to retain a portion of a large flood, and, perhaps, the whole of the winter rains in an ordinary year, and this water were let down into the Lachlan, and in that way used on the land;—what would you say? It would be of very little service unless there were dams to retain the water. Of course, the idea of conserving water at the head of the river is a very good one, as it would mean a supply at times when we could not otherwise get it.

4124. Your idea is that as much water of the Lachlan should be used in the Lachlan country as is required? Yes. I think a series of dams should be put in, as they would be of very great value to all the settlers on both sides of the river, both for watering stock and also irrigation; but merely to conserve water at the head of the river would be of no assistance to us.

4125. *Mr. Burchell.*] Would many people be benefited if the water were impounded in that way? The settlers on both sides of the river would benefit.

D. E. McKellar. 21 Aug., 1902.

4126. Would there be many? In the central division, on the southern side, there are a great number, but on the other side there would not be so many.
4127. How would you expect that work to be carried out;—do you expect the Government to do it, and hand it over to you without being recouped in any way? If the people get the water I think it would be a fair thing to charge them a reasonable rate for it.
4128. Sufficient to pay interest on the work? It might take the form of a small tax on the land.
4129. Have you any wells on your run? No; we have tried to get water, but have been unsuccessful.

SATURDAY, 23 *AUGUST*, 1902.

[*The Commission met at Tocabil Station, Lachlan River, New South Wales, at* 9 *a.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Alexander Cumming, grazier, of Tocabil Station, sworn and examined:—

A. Cumming. 23 Aug., 1902.

4130. *President.*] What is your name? Alexander Cumming.
4131. You are the owner of Tocabil Station? Yes.
4132. What is the area of the station? 20,000 acres.
4133. You have had considerable experience of the Lachlan district? Yes, for many years. I was manager of Uabba station, and have been resident in the district for thirty-two years.

Lachlan floods.

4134. How often is the Lachlan River in flood? About once in every three years, and a very high flood once in every ten years.
4135. Can you reckon on a flow in the Lachlan every year? Yes.

Period of flow.

4136. What period does the river flow? Nine months in every year, and I have only known it to stop running five times in thirty years.

Willandra Weir.

4137. What has been the effect of the weir at the entrance to the Willandra Billabong? It has sent water down the Billabong a distance of 50 miles, and once the flow reached Mossgiel, 100 miles down.
4138. How many weeks in the year does the creek flow on an average? Five months in every year, but in 1900 it flowed the whole of the year and did not stop running until the end of January this year.

Level of weir.

4139. What is the level of the crest of the weir in relation to the bed of the creek? Approximately the same level.
4140. When is the water diverted into the creek? Not until the water in the Lachlan reaches Oxley; then the boards are lifted and the water allowed to flow into the creek.

Use of water.

4141. Do you think waters in ordinary years can be used profitably for irrigation? I think it would be better for the country if surplus water could be diverted into creeks for stock and domestic supplies.

Weirs and storages.

4142. Do you consider weirs necessary? Yes; but I consider they would be of little use unless permanent storage is made at the head of the river.

Taxation.

4143. From what you know of the land, do you think it could bear taxation if given an adequate water supply? Yes; with a guaranteed water supply the land would increase in value, and the Western Land Board derive more revenue.

Rainfall.

4144. *Mr. Burchell.*] What is the annual rainfall of the district? Between 14 and 15 inches for the last twenty years.

Droughts.

4145. How many good seasons have you compared with bad? One drought in every seven years.
4146. Do you consider wheat farming profitable? No.

Wells.

4147. Have you any wells? Yes; and I can get fresh water on any part of the run from 100 to 120 feet.

SATURDAY, 23 *AUGUST*, 1902.

[*The Commission met at the Court-house, Hillston, New South Wales, at* 3·30 *p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Robert Walter Stewart, Mayor of Hillston, sworn and examined:—

R. W. Stewart. 23 Aug., 1902.

4148. *President.*] What is your name? Robert Walter Stewart.
4149. You are Mayor of Hillston? Yes.
4150. How long have you been a resident at Hillston? Twenty-three years.
4151. You are well acquainted with the district, as well as its requirements? Yes.

Works at Lake Cudgellico, Willandra Billabong, and Middle Creeks.

4152. You know that certain works have been carried out in connection with Lake Cudgellico? Yes.
4153. Do you think those works will be of national good, in the sense of the State only? Yes.
4154. You know also the works that have been carried out at the head of the Willandra Billabong or Middle Creeks? Yes.

Effect of works.

4155. How far has the water got down over the country as the result of the works on those creeks? I believe that Willandra Creek has reached Kilfera, about 100 miles westerly from here.
4156. Any water that is turned down those creeks can be used to advantage? Yes. On the Willandra Creek there are many dams, and the water is stored for the use of the settlers on either side.
4157. Can you suggest any way of improving the supply of water in that country? No; I think everything has been done by the weir at the head of the Willandra.

4158.

R. W. Stewart. 23 Aug., 1902.

4158. Could you suggest any works, other than that, for the improvement of the country west of the Lachlan? Those are the only two creeks of any extent, except Merrowie Creek, that run out of the Lachlan westerly. The Middle Creek has been connected with the Merrowie Creek by a cutting, so that Merrowie Creek is also supplied from the Middle Creek. The three creeks therefore now receive water from the Lachlan River.
4159. Do the settlers on those creeks get as much water as they can make use of? That would depend upon the length of time the Lachlan River continued in flood.
4160. How many months in the year do you think it would be necessary for the creeks to run from where they take off from the Lachlan, in order to give the settlers sufficient water? If a good flood ran for six weeks I think it would supply those creeks with sufficient water.
4161. How far would that bring the water down? One flood has already taken it as far as Kilfera.

Flood at Kilfera.

4162. Would six weeks be sufficient to take it down to that extent? I think so. I believe the whole of those creeks finally find their way back into the Lachlan.
4163. What is your reason for saying that? I do not know of any other place for the water to flow into, except back into the Lachlan.

Surplus water returns to the Lachlan.

4164. Your idea is that any surplus water not required for the district west of the Lachlan would come back to that river before it joined the Murrumbidgee? Yes; in a southerly and south-westerly direction, the country is pretty well defined, and in the 1870 flood the waters of the Lachlan went within 30 miles of the Darling; that was before the Willandra cutting was made.
4165. Are there any other weirs that you propose on the Lachlan which you think would be of benefit? Not for the purpose of carrying water out to any extent, but for the storage of water in the Lachlan River.

Dams proposed on Lachlan.

4166. Where would you propose to place them? At inervals of 20 miles, overshot dams, costing from £500 to £600 each.
4167. How far down would you go with them? There are already overshot dams on the Lachlan, on Tyson's property, and I would carry them up to Hillston.
4168. How many are there on Tyson's property? I think four or five.
4169. How far apart? I could not say.

Head storage required.

4170. Supposing the dams you have indicated were constructed, do you think there would be any necessity for storage at the head of the Lachlan system? Yes, I think, for the purpose of flushing, storage at the head is a good thing. We had one flushing from the Cudgellico storage, when the river would have been dry without it. Sufficient water came down to allow the river to run right through.
4171. *Mr. Burchell.*] What quantity of water do you think would be required to be diverted from the Lachlan into those two creeks? I could not form an idea, but I think you could obtain particulars as to the quantity from the Department in Sydney.
4172. You mentioned to the President that the water gets back to the Lachlan River;—at what place? I am not quite sure, but I believe it does.
4173. How do you know that it goes down in sufficient quantities? I am quite certain that the quantity would be sufficient.

Low-lying country.

4174. At what point does it go back? There would be no particular point; the country is all low-lying—lower than it is here.
4175. You do not know of your own knowledge? No.

Willandra and Middle Billabong Weirs.

4176. Respecting those weirs that you suggest at intervals of 20 miles, are they similar to those at Willandra and Billabong? No; the money spent on those two weirs would have done what I want from the Lower Lachlan beyond Cudgellico. The only justification for expending £20,000 on those two weirs was that they supplied the two creeks.

Cost of weirs.

4177. How do they cost £20,000? I have heard of the contracts that were let, and the sums of money that were paid for them.
4178. Would you be surprised to know that they did not cost more than half that amount? I know the first weir was let at something like £5,000, and there has been a good deal of money spent on it since then.
4179. From information I have received, the two weirs have been carried out at less than what you say? Possibly.
4180. What kind of weir would you put in for £500 to do the same work as they are doing? What I propose to do is to conserve water in the Lachlan.

Cost of proposed dam.

4181. Do you know, from any knowledge of engineering, that you could put in a similar structure for £500? We have ascertained that an expenditure of £500 would put in the kind of dam we propose.
4182. Have you seen any like it? There are dams on the Edwards River, near Deniliquin, that have been constructed for less than £500. We have had a plan sent to us, and the work is estimated to cost not more than £500.
4183. Could you get a copy of the plan and send it to the Commission? Yes.

Effect of construction of additional weirs on Lachlan.

4184. If additional weirs are constructed below the present one at Middle Billabong down to Hillston, do you not think the Booligal and Oxley people will suffer in the case of an ordinary season? Not if we commence at the right end. I would commence at the lower end of the Lachlan and come upwards.
4185. You would not suggest constructing those weirs you speak of unless you had storage at the head? The storage would be better, but I think it would be a good thing to have the dams in any case; it would mean storage in the bed of the river.
4186. What is the nature of the culture here? Wheat-growing.

Proportion o bad seasons.

4187. What are the average seasons:—how do the good compare with the bad seasons? In twenty years we have had about four years in which wheat-growing has not been a success.
4188. Did you have a good crop last year? No. 1900 was good, but 1901 and 1902 have not been successful.

Rainfall.

4189. What is the average rainfall? Fifteen inches.
4190. Is that sufficient for growing wheat? Yes.
4191. How many settlers are there in the district growing wheat within a 10-mile radius? About forty.
4192. What water supply have they? Wells and tanks.

Wells.

4193. Have you good wells in the district? Yes; good fresh water.
4194. At what depth? About 100 feet; in the flood-water line, about 35 feet.
4195. Does that apply to the whole district? Yes.
4196. At what radius from here? Fifty miles.

4197.

R. W. Stewart. 23 Aug., 1902.

4197. *President.*] What do you say in regard to the navigation of the Lachlan? It is out of the question.
4198. Any water that is used in the Lachlan must be used either for water conservation, domestic and stock purposes, and irrigation? Yes; but irrigation on a very small scale.
4199. Why do you say that? Because there is not a sufficient supply to carry it on to any great extent. No water should be allowed from the upper part of the Lachlan to carry on irrigation after the gauges on the lower part of the river show, say, 8 feet.
4200. Where would you say would be a suitable place for irrigation? I know of none.

Thomas Brooks, landowner, &c., Lake Cudgellico, sworn and examined:—

T. Brooks. 23 Aug., 1902.

4201. *President.*] What is your name? Thomas Brooks.
4202. You are a landowner and resident of Lake Cudgellico? Yes.
4203. For how many years have you been resident in the district? Twenty-two.

Possibility of irrigation.

4204. With regard to the surplus waters of the Lachlan;—can they be used other than for stock and domestic purposes? Yes; I think the surplus water could be used for irrigation, provided the weirs which you have inspected are raised high enough.

Diversions should be increased. Raising of weirs.

4205. Is it your idea, then, that more water should be diverted from the Lachlan into the Willandra and Middle Billabong Creeks and others connected therewith? I am of that opinion.
4206. What would you propose? Raising the weirs.
4207. You do not think that the people owning land abutting on the river below the Middle Billabong weir would have cause to complain if more water was diverted? I do not think so. An immense quantity of water goes to waste down the Lachlan. As to what reaches the Murrumbidgee, I could not say.
4208. Are you acquainted with the country in the vicinity of Kilfera? No.
4209. You do not know what becomes of the water that is diverted into Middle Billabong and Willandra Creeks? I have heard of it going down as far as Kilfera, but no further.

Willandra and Middle Billabong Weirs.

4210. To what extent do you think the Willandra weir should be raised? Four feet.
4211. And the Middle Billabong? Three feet.

Storage at head of river.

4212. Do you think that by raising the weirs to that extent sufficient water would be given to those creeks without storage at the head of the system? *No; I would advocate storage at the head of the system.*
4213. So that the supply could be maintained practically the whole year round? Yes.

Land suitable for irrigation.

4214. The land that has been cut off from Lake Cudgellico by an embankment and is therefore low-lying and commanded by the water stored in the lake;—do you think it suitable for irrigation? I do.
4215. What are your reasons for saying that? The land is very rich; no doubt it would require drainage.
4216. Have you had any experience in irrigation? Not on a large scale. I have irrigated 3 acres of garden.
4217. *Mr. Burchell.*] Would not the raising of the weirs, as suggested by you, be likely to flood the surrounding country? I do not think it would have that effect. I have noticed in flood times, when the river has been coming down a banker, that there has not been 3 feet of water going over those weirs—the weirs are 200 feet wide, while the river is only 70 feet wide.

Cudgellico swamps.

4218. Where would you carrry out irrigation from those weirs? *There would be no possibility of* irrigating from those weirs. In speaking of irrigation, I was merely referring to the swamps at Lake Cudgellico. We have cut them off with large dams and put pipes in the dams. We have left the swamps dry.
4219. Have you had any experience of irrigation? No; with the exception of the 3 acres I have referred to.
4220. What would you irrigate for? I would grow barley or wheat and store it for hay.
4221. By gravitation? Yes.

Thomas Whitchurch Seaver, B.E., Assistant Engineer, Public Works Department, Sydney, sworn and examined:—

T. W. Seaver, B.E. 23 Aug., 1902.

4222. *President.*] What is your name? Thomas Whitchurch Seaver.
4223. You are an assistant engineer in the Public Works Department? Yes.
4224. In the course of your duties you have had occasion to examine the country west of the Lachlan, in the vicinity of Kilfera? Yes.

Flow of various creeks. Macommon, Canaway, and Ptarpunga Lakes.

4225. Do you know, of your own knowledge, whether the creeks, Willandra Billabong, Middle Billabong, and Merrowie Creek, eventually discharge into the Lachlan, Murrumbidgee, or Murray Rivers? The Willandra Creek does not, at any time; the other creeks do during high floods. They go into the Lachlan by a great many channels about Oxley, and also into the Macommon Lake, Canaway Lake (where Box Creek flows into), and Ptarpunga Lake. It is only in very wet seasons that there is a flow right down to those lakes, and a flow into the Murrumbidgee. Generally speaking, the waters of those creeks do not get back again. The Willandra never does, and the others only in very exceptional instances. When they do, they form one large swamp in the counties of Caira and Waljeers.
4226. *Mr. Burchell.*] You are acquainted with the weirs across the Lachlan, at Willandra and Middle Billabongs? Yes.
4227. Did you have anything to do in the construction of them? No.
4228. You are aware that they feed three diversions from the Lachlan? Yes.

Length and flow of Willandra Billabong.

4229. What is the length of the Willandra Billabong? It is clearly defined for about 120 miles in a straight line.
4230. How far have you known the water to flow down that creek? About 150 miles in a straight line. I have seen evidences of it much further than that. The Willandra Creek runs out, and gradually gets smaller and smaller towards Euston.
4231. What is the water of that creek principally used for? Stock purposes, and irrigating gardens on the stations all along the banks.
4232. Are there any persons down there, requiring water for those purposes, who are not served? I would not imagine that they have any water in the dams at present.

4233.

T. W. Seaver, B.E. 23 Aug., 1902.

4233. Do you think the creek is sufficiently large to supply those people's requirements? I think so; but the weir across the river is not sufficiently high to turn the water.
4234. If the weir were a little higher, would it answer the purpose? I think so—when there was sufficient going down the river so as to provide a greater head. The water took three or four months to get down to Kilfera.
4235. What quantity of water passes down in an ordinary season? I could not say from memory.

Flow of Billabong Creek.

4236. How far does the water flow down the Billabong Creek, which leads from the Lachlan? About 100 miles. It flows down the Middle Creek, and we divert it then into Merrowie Creek. It then flows into Box Creek, and a whole series of creeks in the vicinity of the lakes.
4237. Do those people get sufficient? Not at present. There is a break-away into Box Creek, which comes back into the river.

Requirements of Willandra, Middle, and Billabong Creeks district.

4238. Will you let us know the volume of water, required for domestic and stock use, to be diverted from the Lachlan to supply the district served by the Willandra, Middle, and Billabong Creeks? Assuming the flow to be constant, I consider that a flow of 50 cubic feet per second should be sufficient for the purposes named, and also to supply the loss due to evaporation and soakage.

WEDNESDAY, 27 AUGUST, 1902.

[The Commission met at the Athenæum Hall, Hay, New South Wales.]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).

FREDERICK N. BURCHELL, ESQ.

Robert Gibson, Mayor of Hay, and Member of the Hay Irrigation Trust, sworn and examined:—

R. Gibson. 27 Aug., 1902.

4239. *President.*] What is your name? Robert Gibson.
4240. You are Mayor of Hay and a member of the Hay Irrigation Trust? Yes.
4241. You have had experience as an irrigationist on the Hay irrigation area? Yes.

Hay Irrigation Trust.

4242. How many years have you been connected with it? Since the formation of the Trust. When the scheme was started the municipal council was formed into an irrigation trust, and the Government placed about 10,000 acres at the disposal of this trust. The promoter of the irrigation scheme was the late Mr. John Andrew. He went security to the Union Bank for whatever money was required. The present pumping plant was erected, and other expense incurred, and eventually the Government took the scheme over.

Works.

4243. Was anything done before the Government took the scheme over? The present pumping plant was established. A big reservoir was made, and fluming erected to carry the water into the reservoir.

Constitution of present trust.

4244. Was anything done in the way of irrigation? No. When the Government took the scheme over, a fresh irrigation trust was formed, comprising three Government officers and three local residents. I was appointed as one of the latter, and I am still a member.
4245. How many acres do you hold? An irrigation farm of 27 acres.

Soil.

4246. What has your experience been as an irrigationist on those 27 acres;—have you found the soil and the conditions such that you may regard it, so far as you are concerned, as a success? I consider the soil is adapted for irrigation, and I have confidence in the scheme if we only had practical men on the area—men who understand fruit culture and the growing of crops by applying water to the land. Unfortunately, we have had drought ever since this irrigation scheme was initiated, and we have all had to learn from experience. We have found that land and water in themselves are not sufficient; that there is a proper method of putting the water on, and that method had to be learnt by experience. A good many people, who put in crops regardless of method, found that they got no result—simply from inexperience. The Irrigation Trust have now offered the Government from 25 to 30 acres, fenced-in allotments, for the purpose of forming an experimental farm, as we think that an experienced person here, while working an area of that size, could give advice to the settlers as to the best crops to grow, the best time to put them in, &c.; and that would be a great help to make the scheme a success.

Experimental farm.

4247. Could you give us any information as to the return from your 27 acres for the year ending 30th June last? I have had practically no return. I have put in about 8 acres of fruit-trees; the oldest trees are only three years old, and they are only coming into bearing now. I have put about 7½ acres under lucerne, which I consider has been most successful. I have carried a large number of stock on those 7½ acres, and I am only sorry that I did not put at least 20 out of the 27 acres under lucerne five years ago.

Lucerne successful.

4248. You are encouraged by the result? Yes. I have had land prepared for the last three months for the purpose of putting in 10 more acres of lucerne; but owing to the want of rain I have not seen my way to sow the seed.

Period during which Murrumbidgee is navigable.

4249. How many months in the year is the Murrumbidgee navigable to Hay? From June until October or November.

Insurance on wool by rail and river.

4250. Is it very much used? Yes; a large number of the wool clips from the smaller settlers pass through my hands, and, taking the river insurance into consideration, the wool can be landed in Melbourne or Sydney at about equal rates. So the question that owners of wool have to consider is, which is the better market.
4251. Is there any insurance on the wool carried by rail? We cover clips from off the sheep's back to arrival at the wool stores in Sydney at 2s. 6d. per cent.; and from off the sheep's back to Melbourne, by river and rail, speaking from memory, at 13s. per cent. The total cost is practically the same. The only difference is that the railways make concessions. They have an imaginary line, in which they make a concession of 5s. a ton. We can get that concession for one man and not for another, the two men practically adjoining. That 5s. sometimes makes the difference between sending to Sydney and Melbourne.

Differential railway rates.

4252. Where is the imaginary line? Take a line from Hay to Mossgiel. For all clips west of that line there is no difficulty in getting a smaller rate, because some of that wool could strike the river below Hay, say at Maude, and I take it the Railway Commissioners are anxious to get as much freight as they can; but east of that line we have been able to get the lower rate for some owners, whilst it has been impossible to get it for others alongside.

4253.

R. Gibson. 27 Aug., 1902.

4253. How does the navigation question bulk in your mind? I think that navigation is of considerable importance to the district. I think that the rivers should be locked for the purpose of conserving water, and it would then be available not only for navigation, but also irrigation; but the supply in the river should be maintained by a storage in the mountains.

Irrigation *versus* navigation.

4254. Do you regard navigation as of equal importance to irrigation? I consider irrigation more important so far as this district is concerned.

4255. Supposing it were a question of using the water either for navigation or irrigation, and that there was *not sufficient* for both purposes, what would you say? I would say undoubtedly it should be used for irrigation.

Effect of locks.

4256. Do you think the district would be fairly well served by the railways? Yes; but if the river were locked, and storage provided for the purpose of maintaining the supply, I think both navigation and irrigation would be provided for.

4257. I understand that there has been no traffic on the river so far, with the exception of one boat which came up, and which was unable to get back? Yes.

4258. Has the district been suffering as a consequence? No; but the settlers to the west of Hay are no doubt inconvenienced.

4259. In what way? By having to cart their supplies from Hay by teams, instead of having them supplied by boat; but that is only a section of the district.

4260. Does it make any difference as to the cost of getting the goods through? Yes.

Cartage.

4261. To what extent? At present the cartage is extremely high, owing to the high price of fodder. One shilling per ton per mile is considered a very good rate; it is a higher rate than carriers get as a rule.

4262. Would that represent the difference, in goods coming into the district and produce going out of the district, between the river being usable for navigation and not usable for navigation? I have land 35 miles west of Hay, and situated within 6 miles of where I can land wool on the Murrumbidgee River for 6s. a ton, but to deliver it in Hay would cost 35s. a ton.

Difference in water and road carriage.

4263. Supposing you deliver it on the river bank in the way you have indicated, and you deliver it to Hay in the way you have indicated, what would be the difference in the cost of getting it to market? 29s. a ton.

4264. That would be absorbed in what way? In land carriage alone.

4265. *Mr. Burchell.*] Do you not think that a navigable river is a feeder to the railway in every instance? Yes.

Country benefited by navigation.

4266. That would apply as far as Balranald, would it not? Yes. All to the west of Hay the country would be greatly benefited by a navigable river.

4267. Do you think much would be wasted in maintaining a navigable river if water was supplied by means of storage reservoirs for that purpose, and also for irrigation? I do not think it would be wasted if it could be used for irrigation, and the river kept in a navigable state.

Irrigation essential to small holdings.

4268. You do not think there would be very much wasted to keep the river navigable? No. Unless irrigation is made available this district must revert to large holdings. Since 1885, when the area of land for selection was extended to 2,560 acres, 500,000 acres were selected by 216 holders on ten runs, viz., Pevensey, Toogimbie, Tchelery, Canoon, Gelam, Benduck, Ulonga, Illillawa, South Thononga, and Wooloondool. Five years ago only seventy of those remained on the land or in possession of their holdings; of those seventy, eleven held less than 5,000 acres. 203,000 acres, out of the total area selected, were bought by the stations on which the selections were situated, and the remainder has been absorbed by smaller settlers. During the last three or four years there have been very few sales in the district, owing to the drought. I think, if there is to be any small settlement in this district, to be successful, irrigation must be worked in connection with farming and grazing. The smallest area a man can do with without irrigation is, in my opinion, from 10,000 to 15,000 acres.

Freight on wool.

4269. What is the freight on wool from Hay to Sydney by rail? About £3 roughly, and then there is this special concession at £2 15s.

4270. Is it the same rate for greasy as for scoured wool? Very little scoured goes through my hands.

4271. Do you know the distance by rail? 454 miles.

4272. Is any concession made on river-borne wool, say between Hay and Balranald? No doubt it could be got in at the cheaper rate.

4273. What does it cost to send your wool to Echuca from here with a good river? With the insurance included, about £3.

Town water supply.

4274. Is there anything else you wish to add? I may say the river has been very low every summer for the last five years, and, as a Council, we have been forced to incur considerable expense in keeping up our water supply. We have had to put dams across the bed of the river, and these had to be renewed every year. Two years ago we put down a trough in a lagoon that led up to our waterworks, and we have found that successful in so far that we have been able to keep the town supplied with water, but at times we have not had more than 6 inches of water running up that trough.

Duty of water.

4275. As far as your experience goes, how much water do you find necessary in the Irrigation Trust area? About 15 inches will grow two crops.

4276. Should provision be made for 15 inches over the whole of the area—4,400 acres? No; I think if provision is made for 10 inches it will be sufficient.

James Newton, Secretary to the Hay Irrigation Trust, sworn and examined:—

J. Newton. 27 Aug., 1902.

4277. *President.*] What is your name? James Newton.

4278. You are Secretary to the Hay Irrigation Trust? Yes.

4279. How long has the Trust been in existence? The Act was passed in 1892, but for five years after that, practically nothing was done.

Original Trust.

4280. What was done then? The original Trust (which was the municipal council) started the work in 1893. They cut up portion of the area into allotments, and in 1894 borrowed some money and put down an engine. They then got into difficulties and were unable to carry on the work any further. In 1896 an Amending Act was passed which gave the Government power to appoint a fresh Trust, and this was done, the Trust consisting of three Government officials and three residents of the district. Then the Government advanced some money, portion of which—about £4,500—went in paying off the old Trust's liabilities.

Present Trust.

J. Newton. 27 Aug., 1902.

Then the channels were constructed, and the engine connected with the channels by means of a mile of pipes, and operations were commenced by the present Trust in November 1897.

Hay irrigation settlement.

4281. What is the area of the settlement? About 4,400 acres.

4282. What area of that has been taken up? Roughly, about 800 acres.

4283. What portion of that is under cultivation? About 500 acres.

4284. What area did you irrigate last year? It would be difficult to say; sometimes one portion of a man's holding is irrigated and sometimes another.

4285. Will you give us the area for which irrigation was paid up to the 30th of June last? About 600 acres.

Waterings.

4286. How many times do you think, on an average, those 600 acres would be irrigated during the year? We supply each holding once a fortnight, if necessary.

4287. Do most of the holdings take advantage of that? Yes.

4288. Do I understand that you give twenty-six irrigations during the year? Not necessarily, because during the winter months we do not pump so often.

4289. How many months in the year would that apply? We commenced last September and we practically finished in July, but that is the longest season we have had.

Pumping seasons.

4290. May we take it that, on an average, you pump eight months in the year? I think since we started we have pumped, on an average, for nine months.

4291. How much do you put on each irrigation? It is hard to say; some use a great deal of water and some not so much. There is one holder here who took about 15½ inches in eight months; others have taken more, and some considerably less.

4292. How do you arrive at that? The water is measured over a small weir as it is delivered to each holding.

Average yearly supply.

4293. What would you put down as the quantity that each holding on an average takes during the year? It would be hard to answer that, because the last five or six years have been so very dry.

4294. Give us the average for a dry year? I suppose we have given as high as 36 inches in the year.

4295. That is to say, you have actually applied to the land 36 inches? Yes, in some cases. About 15 inches would be a fair average.

Losses in channels.

4296. What do you estimate would be the loss due to soakage, seepage, and evaporation in the channels, before the water reaches the holdings? About 60 per cent., but that is not due altogether to seepage and evaporation; it is due to defective measuring boxes and stops.

Pumps.

4297. What is the capacity of the pumps? With the river at about 2 feet above summer level, 4,000 gallons per minute.

Pumping hours.

4298. How many hours per day do you work the pumps during the nine months that you say you irrigate? From 1st January to 30th June, 1901, the average was 10½ hours for 52 days; for 1902, nearly 14 hours for 60 days.

4299. May we take it that for the number of hours the pumps have been working they have been throwing the quantity that you have given per minute? No; for a considerable portion of that time the river has been below summer level.

Average discharge.

4300. What do you estimate they have been throwing? About 3,500 gallons per minute would be about the average, taking it right through.

Cost of pumping. Maintenance.

4301. Have you the cost of pumping for the year ending 30th June, 1902? Yes, £309.

4302. What other expenses did the Trust incur besides that £309, in maintenance and management for the same period? About £250.

Total annual expenditure.

4303. That is a total cost for working the whole concern of £559 for that year? Yes. The total cost in connection with pumping, from 1st January to 31st December, 1902, was £336 9s. 5d.; that includes additions to plant and various other things, and the total expenditure, including everything, was £646 3s. 6d.

Cost of works.

4304. What was the total cost of the works, comprising the debit against the Trust? The amount paid by the Government was £9,228, and out of that £4,500 went to pay off the debts of the old Trust.

4305. Is the £9,228 the whole of the amount advanced by the Government? Yes.

4306. For which the Trust is indebted? Yes.

4307. What interest does that bear? Four per cent.

Interest not paid.

4308. Are you paying interest? No; we have paid no interest.

4309. All that you are paying are simply the working expenses? Yes.

Revenue.

4310. How is the revenue of the Trust derived? From rent and water rates.

4311. What is the water rate? The present rate is 10s. per acre.

4312. What does that produce? The revenue, from 1st January to 31st December, 1901, was £703 4s. 10d., made up of—rent, £434; water rates, £263 6s. 2d.; and miscellaneous, £5 18s. 8d.

4313. I understand that the working expenses for the year ending 31st December, 1901, amounted to £646, the revenue £703, and that that would leave a balance on the year's transactions of £57, which could be devoted to the repayment of capital and interest on the capital cost? £57 1s. 4d.

4314. What would be the interest at 4 per cent. on the capital cost of the works;—on the sum of money which you owe the Government? About £370.

Financial position.

4315. I understand that your Trust is not financially sound? The Trust has something like £700 owing to it for arrears of rates, which it has been unable to recover on account of the defect in the Act.

4316. Is there any prospect of the Trust being in a better position financially than it is at present? Yes; I believe the Trust will ultimately pay the interest.

4317. What are your hopes founded upon? The Act has been altered in such a way that it will enable the Trust to recover the rates, and, with a better class of people settled on the area, I believe the interest will eventually be paid.

4318. Do you regard the area as a whole as suitable for irrigation? Not altogether.

4319. What portion out of the 4,400 acres do you consider unsuitable? About 500 acres.

4320. Have you had experience in irrigation areas before? No.

Quality of land.

4321. Can you compare the area in your Trust with other irrigation settlements;—Mildura, for instance? Yes; taking it altogether, the land is not so good as that found at Mildura.

4322. How many acres do you consider a settler should have in order to make a living, supposing he works it properly? Twenty acres.

William

William Holden Watt, owner of Howlong Station, Carrathool, sworn and examined:—

W. H. Watt. 27 Aug., 1902.

4323. *President.*] What is your name? William Holden Watt.
4324. Are you owner of Howlong Station, Carrathool? Yes.
Area of holding. 4325. What is the area of the holding? 51,000 acres of freehold and some 11,000 acres of Crown lands [C.P. and C.L.]
Stock. 4326. What frontage have you to the Murrumbidgee? About 6 miles.
Irrigated area. 4327. What stock do you run in an average year? About 30,000 sheep.
4328. Have you done any irrigation? Yes; since 1894 I have irrigated 38 acres of lucerne and 11 acres of prairie, and over a series of years the results showed on an average that each acre of lucerne carried six sheep, besides giving 1¼ tons of ensilage or hay per annum; each acre of prairie grass carried four sheep, and gave five-sixths of a ton of ensilage or hay per annum.
Pump. 4329. What is the size of your pump? Eight-inch.
Pumping season. 4330. How many months in the year do you run it? It varies very much. This year I have been running it continually night and day since March, and average about twenty-two hours in each twenty-four; in that time covering 8 or 9 acres of grass land.
Results of irrigation. 4331. Do you know what it lifts? Taking the present state of the river, I estimate under 800 gallons per minute. Owing to the exceptionally dry winter experienced this year, I attempted watering natural grass, with the result that one paddock of about 80 acres carried breeding ewes, equivalent to two sheep per acre, for seventeen weeks during the worst growing period of the year—April to July—at a cost of 2d. per head. These ewes went on to the land practically poor, and seventeen weeks later came off fat, and with 70 per cent. of lambs. At the same time I was artificially feeding 12,000 sheep at a cost of 3d. to 5d. per head per week; they remained poor, and I did not get a lamb from them.
4332. Will you tell us, then, why you do not extend your irrigation? I have not got the pumps to do it; I am doing all I possibly can, but lifting the water on to the land in the way I am doing is very costly.
Proposed diversion from Murrumbidgee at Narrandera. 4333. You are aware that there is a proposal to divert water from the Murrumbidgee at Narrandera, and carry it along the northern side of the river, and I understand that the channel will pass through your run? Yes.
4334. How do you regard the proposal? I am anxious to see the proposed canal constructed, and would undertake to take water from it at a reasonable cost. I am interested in the scheme, and from Narrandera up to Hay every man whose run that canal would pass through shows an interest in the scheme, and says he will be glad to see it promulgated.
4335. To what extent would you be prepared to support such a scheme? I should say we would be ready to use any quantity of water at a fair price.
Price of water. 4336. What do you regard as a fair price per acre per annum? In a year like this it would pay better to give 4s. per watering per acre even for native grass than to feed sheep artificially, as many are doing;
Irrigation of natural grass. but this year has been quite exceptional. Under normal conditions it would only pay to irrigate natural grass with a cheap water rate, and it is doubtful whether natural grasses would stand continuous flooding. As to what a grazier could afford to pay for a water-right, it would not pay to give up to 2d. per head per sheep per week throughout the year, but for six months in each of two years out of a period of five years 2d. per sheep per head per week would not be too much for the advantage of being able to ensure a good lambing, or to top up sheep for market in a dry spring. To do this with my present plant, and with natural grasses only, I estimate that it would cost as follows:—2d. per head per week for six months (two sheep per acre), 8s. 8d.; 2d. per head per week for second year, 8s. 8d.; total for two years' use, 17s. 4d. Presuming water was not required for the other three years, five years would thus pay
Estimate of value of water per annum. 17s. 4d.—say, 3s. 6d. per acre per annum—and this, I think, is putting a low use and value on water, which would be better applied to lucerne and arable lands. I think if irrigation settlements are made by
Small holdings. the Government, that *bona fide* resident selectors, in dry country, should be offered the right to exchange their selections for 10, 20, 50, or 100 acres with water-right attached. Surrendered holdings should be grouped into areas sufficient to allow any selector preferring to remain in dry country to increase his holding to 5,000 or 10,000 acres. This State, in my opinion, is suffering from settlement of good men on areas just sufficiently big to make them sanguine in good seasons, but not enough to allow them to put by money in such seasons to carry them safely over the bad ones. Such selectors, if properly instructed, would be the best men to give life to, and ensure the future of irrigation. Though I admit that a policy
Light railways. of light railways is ultimately due to the Western Division, I am strongly of opinion that it would, under present conditions, do actual harm in such seasons as the past seven, chiefly to the western settler himself, who would be tempted to avoid the first loss and venture on a policy of taking his sheep to mountain country one year and importing fodder to his station at great cost another year; further, his advent would, by competition, increase cost of both country and fodder, already at almost prohibitive prices. I consider that my facilities, with a railway to my door, have in this way made my loss a far greater one than it would have been had my sheep been allowed to die on the run in 1896 and following years. It is because
Relief areas limited. the relief areas in time of drought are very limited, and the major part of the mountain country simply an expensive burying-ground for western sheep. This can be remedied, I think, only by the prompt
Storage and canal works. carrying out of storage and canal works to the fullest extent of the State's right to waters of the Murray and Murrumbidgee, thus watering an area of country sufficiently large to be able with certainty to assure a regular and normal supply of meat for the State's population, however severe the drought; and, further, to be able in time of stress to absorb and fatten off the starving sheep from the far west. When this area is ready, then, and not till then, I think, will light railways be of use to western settlers in time of severe drought such as the present one.
4337. Have you sufficient water for stock purposes under present conditions? No.
4338. Supposing the scheme that I have indicated is carried out, would it be of service to you for that purpose? Yes.
4339. *Mr. Burchell.*] How many years have you had Howlong station? Fourteen years.
4340. How do you water your stock at present? By means of tanks, for the most part.
Wells. 4341. Have you any wells on the station? Yes; three.
4342. What is the nature of the water? Good stock water.
4343. What depth have you had to sink? About 120 feet; and I can get water anywhere.
4344. How far is your station from Hay? Thirty-five miles.
4345. Is that the nearest railway station? No; I have a railway station on the place—Carrathool.
4346. So that you have never had occasion to avail yourself of the navigable river in order to get your wool away? No.

W. H. Wat. 27 Aug., 1902.

4347. I suppose the station was established a good many years before you came into possession of it? Yes; it was established in 1840.
4348. That was before the railway was constructed;—how did they get the wool away then? I could not say. I have no hesitation in saying that, in a dry country like Australia, irrigation must always be of greater importance than navigation.

John Dill, Manager of Toogimbie Station, Murrumbidgee River, sworn and examined:— J. Dill. 27 Aug., 1902.

4349. *President.*] What is your name? John Dill.
4350. You are manager of Toogimbie station? Yes.
Area of station. 4351. What is the area? Roughly, about 127,000 acres.
4352. Your station abuts on the Murrumbidgee River? Yes.
River frontage. 4353. How many miles? Fifteen miles frontage.
Flooded area. 4354. How many acres would there be flooded on that 15 miles length? It would vary from 15,000 up to 60,000 acres.
4355. How often would you get the 60,000 acres flooded? Very rarely. That area has only been twice flooded in the last twenty-one years.
4356. When was that? In 1890 or 1891.
Recurrence of floods. 4357. How often would you get the 15,000 acres flooded? There have only been five floods in the twenty-one years.
4358. Do I understand that your land has not been affected by floods, except five times in twenty-one years? That is so.
Effect of flood. 4359. What is the effect, when you get a flood? It makes the land ten times more productive.
Carrying capacity. 4360. How many sheep to the acre will the country carry, under ordinary conditions, without flood? An average of 7 acres to one sheep.
4361. How many sheep to the acre will it carry after a flood? Parts of it will carry two sheep to the acre.
4362. For how long? Three or four months.
4363. What would be the average carrying capacity of the flooded country? For the year after the flood, 3 acres to a sheep. The whole of the flooded land would not carry one sheep to 3 acres; some would, and with some it would take 4 acres, as the ground varies greatly.
4364. How long do you think the water should remain on the land so as to get the best results? After the land is once saturated, the quicker the water is off the better.
4365. We were told in evidence, on the Murray, that the longer the water remained on the land the better? I do not agree with that.
Effect of lengthened flood. 4366. We were told at Balranald that if the water remained on the land for any lengthened period that it soured the country? It not only does that, but it kills a lot of the seeds of the natural grasses, which would otherwise come up.
4367. Your evidence is, then, that if the floods were under proper control it would be an advantage to you? Yes.
4368. You know there have been certain works carried out at the head of the Yanko Creek, near Narrandera? Yes.
4369. You are aware that, as the result of those works, certain water has been diverted from the Murrumbidgee into the Yanko, Colombo, and Billabong Creeks? Yes.
4370. Have you been prejudicially affected by that? Yes.
Effect Yanko cutting. 4371. How can you prove that? To my mind, there is no shadow of a doubt about it. A certain height of the Murrumbidgee at Wagga Wagga used to give us a flood. Since the deepening of the Yanko cutting we get the same height at Wagga Wagga, but we do not get the flood.
4372. What was the height of the river at Wagga Wagga that gave you the flood that you speak of? 24 to 27 ft. gave us a flood; 28 to 30 ft. a better flood.
4373. In former years, do I understand that you got some of your country flooded when the height of the river at Wagga Wagga was 24 feet? From 24 to 26 feet.
4374. What are the conditions now? We get no flood; we get no back-water at all.
4375. Not even if the gauge shows up to 30 feet? Oh, yes.
4376. What is the difference between the reading of the gauge now and what it was years ago, when you got the benefit? I could not give you an answer to that. Twice during the last few years I fully expected a flood, judging by the height of the river at Wagga Wagga; but we did not get it.
4377. You have been irrigating for a number of years? Yes, about 15 years.
Irrigated area. 4378. What area have you irrigated? On an average, about 60 or 70 acres.
Cost of irrigation. 4379. How much does it cost you per acre per annum to irrigate? That I have not estimated. It costs 1s. 6d. per acre for one irrigation.
4380. How many irrigations, as a rule, do you give it, Two or three during the year.
4381. Do you also pump water for stock purposes? Yes.
Channels. 4382. What channels have you for conveying the water from the river to the back portion of your run? One main channel, and then branch channels.
4383. How many miles? The total mileage I could not give you; but the main channel is about 20 miles long, and I should say there are quite 20 miles of branch channels.
Pumps 4384. How many pumps have you? Two—one 15 inch, and the other 11 inch.
4385. Do you use the large pump wholly for irrigation? No. Our irrigation I look upon as a mere nothing.
4386. You use the large pump for irrigation and for watering your stock? Yes.
4387. Do you use the smaller pump for irrigation and watering your stock also? I mostly use it for scouring, and occasionally in conjunction with the other.
4388. What becomes of the water after it is used for scouring? I let it out on the land. It does not go back to the river again.
Pumping season. 4389. How many months in the year do you work the large pump? Last year I worked it all through.
4390. How many hours in the day? About eight hours.
Capacity of pump. 4391. What quantity does it lift? It varies. On an average, it would not lift more than 3,000 gallons per minute; if we had a high river it would lift 4,500.

J. Dill. 27 Aug., 1902.

4392. How many months in the year do you work the small pump? I suppose about two.
4393. How many hours in the day? About eight.
4394. What does that lift at a low and a high river? From 1,500 to 2,500 gallons per minute, depending on the river.

Proposed weir on Murrumbidgee at Gum Creek.

4395. You know there is some idea of putting a lock and weir near the Gum Creek, on your holding? Yes.
4396. What do you say the effect of that work will be? It will not benefit us very materially, but it will benefit those lower down.
4397. In what way? By flooding the land.
4398. Through the Gum Creek? Yes.
4399. Will it benefit you at all? Yes, but not to such an extent as those lower down.

Canoon and Nap Nap stations.

4400. In what way will it benefit you? It will benefit us along the frontage, but it will be of greater benefit to the selectors adjoining my run and Canoon and Nap Nap stations.
4401. Would the land that would be benefited be leasehold? It would be both leasehold and secured land.
4402. What area do you consider would be benefited by that lock and weir, taking the two holdings you have mentioned, and including the selections and your own holding? That is a question I could not answer. I do not know the country sufficiently well.

Increased rental values.

4403. What would the land be worth per acre per annum, supposing it were flooded each year by means of that lock and weir? The effect of an annual flooding would be to double the rental that the Crown is now receiving.
4404. *Mr. Burchell.*] Have you heard of any further proposed diversions near Yanko Creek in the way of the northern and southern canals from the Murrumbidgee? Yes.

Additional diversions should not be undertaken without storage.

4405. Do you think that they should be undertaken before any storage is provided? To my mind, they should not be undertaken. The Yanko Cutting should never have been undertaken.
4406. But supposing sufficient storage was provided at Barrenjack, or any other large storage reservoir, to keep the river maintained, what would you say? It would depend as to how that storage fed the river.
4407. Where do you send your wool? To Melbourne.
4408. Which way? By steamer to Echuca, and thence by rail to Melbourne.
4409. Has that always been the means of transit? Yes.
4410. Is that the cheapest way? Yes.

Freight

4411. What is the river and rail freight to Melbourne? For greasy wool £2 11s. per ton, delivered at the store in Melbourne, and for scoured £3 10s.
4412. Are there any other settlers that depend upon the same means of transit? They all depend on the steamers taking their wool away.
4413. Taking the river below Hay, to the junction of the Murrumbidgee with the Murray, and taking the Lachlan system as well, how many settlers are there dependent on that means of transit? I could not say definitely, but no wool comes this way at all.
4414. What would be the effect if they were deprived of that means of transit? It would be very disastrous to many, because the difficulty of getting wool in here is very great indeed.
4415. I understand that water carriage was one of the inducements which led settlers to take up land adjacent to the rivers, and that they have been maintained ever since by that means of transit? Yes. We get our supplies now mainly from Melbourne.

Non-navigable river would mean material loss to settlers.

4416. Can you add anything else that will assist the preservation of the navigability of the river? I can only add that if the river is so low, as to render navigation impossible, it will mean a very material loss to every settler on both sides of the Murrumbidgee, and it will have an almost equally bad effect on those settled on the Lower Edwards.
4417. Have you ever had any suggestion made to you as to sending your produce other than by the river? Yes. One of the railway officials suggested that I should send it to Hay, either by land carriage or by boat, and then by rail to Sydney.
4418. At what cost? It would have cost me at least £1 per ton more than by the river.
4419. For what reason was that suggestion made to you? To induce me to send to Sydney—in the interests of the New South Wales Government.

Drainage of Hay.

4420. Do you know that the drainage of Hay goes into the river? Yes.
4421. In the case of a low river, such as it is at present, do you not think that most objectionable? Yes.
4422. Have any of the other settlers mentioned their objection to it? No.

Construction of sewerage scheme proposed for Hay.

4423. *President.*] Are you aware that the Council and the Government conjointly have recognised that draining into the river is objectionable, and that the Council have entered into an agreement with the Government whereby certain sewerage works will be carried out, by which works the whole of the sewerage of Hay will be intercepted and purified, and that the effluent turned into the river will be of an unobjectionable character? Yes; I have heard so.
4424. *Mr. Burchell.*] You hand in reports of proceedings of the River Defence Association? Yes. [Exhibit 92.]
4425. *President.*] Are you a member of the River Defence Association? Yes.
4426. Who is the Secretary? Mr. Miller.
4427. Are you aware that he has been given an opportunity of laying the views and objects of the association before us, and that he has practically refused to come and do so? No; I was not aware of that.

A. Ronald. 27 Aug., 1902.

Angus Ronald, part owner of Nap Nap Station, Murrumbidgee River, sworn and examined:—

4428. *President.*] What is your name? Angus Ronald.
4429. You are part owner of Nap Nap station? Yes.

Area of station.

4430. What is the area of the station? About 250,000 acres.

Area of freehold.

4431. What portion of that is freehold, and what portion leasehold? Just over 50,000 acres freehold; the balance consists of Crown lands.
4432. Where is the station situated? The home station is 45 miles from here on the south side of the Murrumbidgee, about 9 miles below Maude.

River frontage.

4433 How many miles of frontage have you to the Murrumbidgee? About 20 miles in a straight line, that is to say, without going actually round the river bank.

4434. What portion of that is flooded occasionally? 130,000 acres are liable to inundation altogether, to a greater or less extent.

A. Ronald. 27 Aug., 1902.

Recurrence of floods.

4435. How often does the flooding occur? Within the last twenty-one years, that is, up to 1901, there were eight years of good flood, eight years of no flood at all, and five years during which the water went through the run but did not inundate the country. At the end of last year we had a flood, but it was not a big flood.
4436. At what level, referred to on Hay gauge, would the river require to be, for you to get the good floods you speak of? Twenty-two feet at Hay would make a fair flood down there.

Carrying capacity of holding.

4437. What is the carrying capacity of your holding, taking it as a whole? Before this drought, we put it at 7 acres to a sheep.
4438. Could you differentiate between the portion that is flooded and the portion that is not flooded? No, because we work them together.
4439. What is the effect of a flood on the lower portions of your run? If it goes over the country it grows good grass.
4440. What will it carry then? If a flood comes over in the spring or in the winter, for two or three months, I should think it would carry a little better than one sheep to the acre for three or four months.

Proposed Gum Creek weir.

4441. Do you know that there is a proposition to put a lock and weir near the Gum Creek? Yes.
4442. Would that have the effect of benefiting you to any extent? I hope so; it is one of those things which remains to be proved.
4443. Do you know the Gum Creek? Yes.
4444. So far as you know, how far would the water travel after it enters Gum Creek? It would have to go 25 or 30 miles, and then go on to the next run.
4445. And where does it enter the river again? I think it goes in this side of Balranald.
4446. So that, if sufficient water were diverted at the head of Gum Creek, the effect would be to divert water down as far as Balranald? Yes; so far as I know. It takes a long while to go through the run. An ordinary flood takes about a month to get through the run, travelling so slowly.

Effect of lengthened flooding.

4447. What has your experience been as to the effect of a flood on the land, supposing for the moment that the flood is of long duration—has it been of benefit or otherwise? It kills the grasses where it has been on no doubt, but the higher the flood the more it covers the country.
4448. *Mr. Burchell.*] How long have you been on your station? Eleven and a half years.
4449. Have you ever seen the water entering the Murrumbidgee at Balranald after leaving Gum Creek? I cannot speak for certain as to that.

Navigation.

4450. Do you value the navigability of the river? Yes.
4451. How do you get your wool to market? Down to Echuca by river, and then on to Melbourne by rail.
4452. Is that the cheapest way? Yes.
4453. Do you know of any others adjoining you who get their wool away to market by the same means? Yes; Toogimbie, Canoon, Pevensey, Glam.
4454. Do all the stations below Hay send their wool down the river to market? I think so.

Stations below Hay using river system.

4455. What is the number of the stations, right down to the junction with the Murray, that avail themselves of the river system? I should think twenty-five, counting those that come in from the Lachlan as well.
4456. What does it cost you to send your wool to Melbourne in the way you have indicated? £2 10s. per ton right through to Melbourne, including everything.

Yanko cutting.

4457. Have you heard anything about the Yanco Cutting? Yes.
4458. Do you think it likely to affect you? Any water that is taken out of the river higher up must affect us.

Further diversions.

4459. Do you think that, or any further diversion, should be carried out in a dry year like this, unless provision be made for storage higher up? It should not.
4460. You think it will seriously interfere with you? Decidedly.
4461. Have you noticed the difference on the gauge with respect to floods since that cutting has been made? Floods that we usually got down did not come down after that cutting was made.

Murrumbidgee flood waters.

4462. *President.*] When there is a flood, where does the water go to that flows into Gum Creek as a spill-over from the Murrumbidgee? It goes on to Yanga, but whether it goes into the lakes or not I could not say.
4463. Does it go into the river? I could not say.

Country unsuitable for irrigation.

4464. Is there anything else you wish to say? I might say that I do not consider our country suitable for irrigation. Our rainfall for the last twenty-one years has only averaged 12 inches 13 points. The land on our holding being so flat, every inch of water taken out above would affect us materially down there. It is naturally flooded country, and any water that is taken out of the river higher up is detrimental to us.
4465. *Mr. Burchell.*] If the navigability of the river were taken away how would your station fare? We would have to get our stores and everything else from Hay, and cart the wool.
4466. What effect would that have? It would make it very much more costly.
4467. Would it materially interfere with you? Yes.

Consider river should be locked.

4468. Have you anything further to say in favour of the preservation of the navigability of the river? I think the sooner the river is locked the better for that purpose, and the water utilised to the best advantage.
4469. Have you any knowledge as to the establishment of those runs;—as to whether they were established by means of the navigability of the river in the first place? I could not say.
4470. You know that the river has always been the means of getting your produce away, and also your neighbours'? Yes.
4471. Then they did settle there owing to the fact of the river being navigable? Yes.
4472. Does not that apply to all the stations adjacent to the river? They were probably taken up under those conditions, which people up above are trying to take away from us.

Wool-growing dependent on floods

4473. Would it mean prevention of wool-growing in this district if you were deprived of the navigability of the river? As far as Nap Nap is concerned it would, because the flooded country is absolutely no good without a flood.

George

George Horton, grazier and butcher, Hay, sworn and examined:—

G. Horton. 27 Aug, 1902.

4474. *President.*] What is your name? George Horton.
4475. You are a grazier and butcher, resident at Hay? Yes.
4476. Where do you get your supplies from? Principally from the flooded country on the Lachlan, commonly known as the "Reed Beds."
4477. Near the junction of the Murrumbidgee and the Lachlan? Yes.
4478. Have you found a dearth of stock in other places? Yes; that is the only place from which we have been able to get any fat cattle during the last eight months.
4479. What would you say as to the importance of the flooded country from your point of view? It is the only place I know of where there has been feed enough to fatten the cattle in this district.
4480. Does that apply to the Lachlan alone? Yes; there was no flood in the Murrumbidgee to inundate any country last year.
4481. Has there been sufficient water on the lower reaches of the Lachlan to flood the country there? It was flooded last spring, but it has not been flooded since.
4482. Do you know the flooded country on the Lachlan, near the Murrumbidgee, pretty well? Yes.
4483. Have any of the works that have been carried out on the upper portions of the Lachlan affected it at all? They have not done so as yet, but the owners consider they will affect it this year. There has not been any water down this winter.
4484. Is that not owing to the drought? I suppose it is.
4485. Are you acquainted with the Murrumbidgee below Gum Creek? Yes.
4486. In past years, have you got much stock in that direction? Yes; after a flood in the Murrumbidgee.
4487. What, in your opinion, would be the effect of putting in a lock and weir at Gum Creek? I think it would have the effect of flooding a very considerable area of polygonum country.
4488. Do you know Gum Creek well? Yes, very well.
4489. How far does it run from where it leaves the river below Mr. Dill's head station? I think it runs right through on to Yanga.
4490. Do you know how it terminates? No.
4491. From your knowledge of the value of flooded country, supposing, by the arrangement of a lock and weir, water could be diverted on to the country below the point to which I have referred, to what extent would it increase the value of land per annum? It would increase the carrying capabilities of the land more than three times.
4492. And what would the value be as the result of that;—would you say the land would be three times as valuable? It would be three times as valuable if they could depend on getting a flooding every year?

Lachlan flooded country.
Importance of flooded country.
Effect of works on the Lachlan.
Gum Creek weir.
Irrigation would increase.

Walter Wheeler, storekeeper, Hay, sworn and examined:—

W. Wheeler. 27 Aug., 1902.

4493. *President.*] What is your name? Walter Wheeler.
4494. You are a storekeeper in Hay? Yes.
4495. For how many years? Twelve.
4496. From which direction do you get your goods? Partly from Melbourne and partly from Sydney. During the time the river is navigable, we get all heavy goods by way of Melbourne.
4497. Do you prefer that route to the Sydney route? Yes, on account of it being cheaper.
4498. What is the difference in the cost to you per ton? It could be taken, approximately, at a difference of £1 per ton in favour of the river route, provided the goods are not covered by insurance.
4499. Do you usually take your own risk? Yes, except in the case of very heavy cargo.
4500. Supposing you do not take your own risk, what would be the difference? Fifteen shillings per ton generally.
4501. What quantity of stuff do you get through by rail from Sydney and by boat from Melbourne in twelve months? [*Witness did not answer.*]
4402. *Mr. Burchell.*] If the river were permanently navigable, which do you think would be the most favourable route? All heavy lines would come by way of the river on account of it being cheaper. As regards goods of a lighter nature, such as drapery, &c., where the value is great and the weight small, there would not be any material difference.
4503. Do you not regard insurance as being necessary for safety? I consider, for safety, goods should be insured; but our own experience, after twelve years' trading, has been that we have never met with a loss, and we came to the conclusion that it would pay us to take our own risk.
4504. Are not all goods brought by rail carried at owner's risk? Yes; but in that case there is not such a great danger as compared to water carriage.
4505. What is your view as to the navigability of the river as regards the town of Hay? I look upon the navigability of the river as being most important to this town and district. Many lines that we are depending on, such as red-gum from the Murray and forage and grain from the districts near the Murray, are brought here in large quantities, and considerable benefit accrues to the district in that way.
4506. Do you regard a navigable river as being of any value as a feeder to the railway as well? I think it would act as a feeder, provided it was permanently made navigable by locking, which I look upon as a very important and desirable thing.

Difference in freights to Melbourne or Sydney.
Navigation most important.

Owen Jones, bridge caretaker, Hay, sworn and examined:—

O. Jones. 27 Aug., 1902.

4507. *President.*] What is your name? Owen Jones.
4508. You are the bridge caretaker? Yes.
4509. For how many years have you been in charge of the bridge? Since 1887.
4510. Have you kept a record of the heights of the river during the whole of that period? Yes.
4511. Which you put in? Yes. [*Exhibit* 93.]

Record of river heights.

Daniel

Daniel Francis Cummins, engineer, Hay waterworks, sworn and examined:—

D. F. Cummins. 27 Aug., 1902.

4512. *President.*] What is your name? Daniel Francis Cummins.
4513. You are engineer to the waterworks, Hay? Yes.
4514. For how many years have you been in that position? Five.
4515. What is the capacity of your pumps? They are supposed to be 20,000 gallons per hour.
4516. Can you pump that quantity at all levels of the river? No.
4517. What can you pump at the present level? 18,000.
4518. And what at a high level? 19,000.
4519. You can never pump the 20,000? No.
4520. How many hours per day on an average do you run? During the summer months we run continuously the whole twenty-four hours.
4521. For how many months? On an average, four months in the year.
4522. How many hours a day do you pump during the balance—the eight months? It varies, according to the rainfall; on an average, about thirteen.

Capacity of pumps.
Pumping hours.

John Johnston, newspaper proprietor, Hay, sworn and examined:—

J. Johnston. 27 Aug., 1902.

4523. *President.*] What is your name? John Johnston.
4524. You are a resident of Hay? Yes; I have been a resident for nearly twenty-five years, and am interested in Hay, as having a business and property here.
4525. You have thought over the question of navigation as it affects Hay? Yes.
4526. What are your views? My views are, that when the Federal Interstate Commission gets to work and redetermines the railway freights, the freights to Hay and all along the South-Western railway line must be very materially increased, and then it will be of very great importance to Hay, and the graziers in the Hay district, that they should have the river as a means of transit to market.
4527. Would not that apply to some extent as regards the railway from Echuca to Melbourne in the same way as from Hay to Sydney? Yes, it will apply to *an* extent, but, in my opinion, not to such a great extent, because the distance from Melbourne to Echuca is only 156 miles, whereas from Hay to Sydney, or from Hay to Melbourne, *via* Tunee or Albury, it is about 435 miles. I may say, also, that the Government of New South Wales, though it appears to have no objection to diverting the river waters, has always objected to giving the people of Hay a railway to Deniliquin. There is no indication that that policy will be altered, and the people in this district will, if the navigability of the river is destroyed, have no option but to pay the very much higher rates on the New South Wales railways.
4528. Supposing the railway were extended from Deniliquin to Hay, how would that affect navigation? If the railway were extended from Deniliquin to Hay, and the line from Deniliquin to Moama purchased by the Government, and the whole concern run as a Government railway and at Government rates, the navigation of the river, so far as the town of Hay is concerned, would not be such a serious matter; but we have been agitating for that railway for over twenty years to my knowledge, without any promise of success.
4529. *Mr. Burchell.*] What about the squatters and sheep-farmers between Hay and the junction of the Murrumbidgee with the Murray? It would not satisfy them, certainly.
4530. Do you think that, to give each station an equal advantage to that which Hay would be receiving, they would have to be tapped by the railway? Yes; that would be necessary to give them an equal advantage.
4531. Do you think, before diversions are undertaken, that storage should be provided? I think so. I think that the natural river should be maintained, and that any diversions should not do more than take away surplus waters. I would also like to point out that the produce of this district is of such a character that it cannot stand heavy freights. Wool, sheepskins, wheat, hay, &c., cannot stand heavy freights; and then a great deal of the stuff that comes to the district—such as wire, woolpacks, &c.—will not stand heavy freights.
4532. In what way do they come? By the river whenever it is navigable. At one time the river was navigable for a much longer period than it has been of late years.
4533. To what do you attribute that? I think the seasons have had a good deal to do with it.
4534. Do you think the Yanko cutting has had anything to do with it as well? No. I think, now that the cutting has been widened, it might affect navigation; but, in my opinion, up to the recent increase in the size of the cutting, it had less to do with it than the shortage in the rainfall.

Navigation important to Hay.
Railway, Deniliquin to Hay.
Storages necessary before diversions made.
Yanko cutting.

FRIDAY, 29 AUGUST, 1902.

[*The Commission met at the Council Chambers, Narrandera, New South Wales, at 10·30 a.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

The Hon. Samuel McCaughey, M.L.C., grazier, North Yanko, sworn and examined:—

S. McCaughey, M.L.C. 29 Aug., 1902.

4535. *President.*] What is your name? Samuel McCaughey.
4536. You are owner of North Yanko, Coonong, and other stations? Yes.
4537. What is the area of North Yanko? About 95,000 acres of freehold, and 5,000 acres of Crown lands.
4538. What stock do you carry on that station during ordinary seasons? About 30,000 sheep; this year, about 36,000.
4539. What length of channels have you constructed for the purpose of distributing the water that you pump, and also the water that gravitates from the Murrumbidgee River? I estimate about 50 miles, including small drains to tanks, and about 10 miles of the Cudgell Creek in addition to that.

Length of channels.

S. McCaughey, M.L.C. 29 Aug., 1902.

4540. What are the sizes of the pumps? One 20-inch pump, with a 24-foot lift when the river is at a low level. When the water reaches about 9 feet, the gravitation drains run, and pumping becomes unnecessary.

4541. Taking last year, how many days in the year did you pump for irrigation? About a month; and for filling the tanks, perhaps another month.

Pumping hours.

4542. How many hours per day do you pump? Generally, about ten hours.

Capacity of pumps.

4543. What do you take as the capacity of your pumps during the time you are working? Last year, I do not think we were lifting more than 2,500 gallons. We were using the smaller engine in place of the stationary. At the present time, I should say from 4,000 to 5,000 gallons per minute.

Engines.

4544. You have two engines now? Yes; a stationary and a portable. Last year I had two portable engines of less power, and consequently lifted less water.

Gravitation season.

4545. How many months in the year did you get gravitation water? About two.

4546. On an average, what do you think you got per minute during those two months? I should think about 12,000 gallons.

Irrigated area.

4547. What area did you irrigate last year? *About 400 acres of crop—wheat and oats, and about 400* acres of lucerne.

4548. Did you irrigate any grass land? Yes; but we got no result from the grass land at all, being too late in the season.

4549. How many acres did you irrigate? Probably 1,500 to 2,000.

Depth of watering.

4550. Have you any idea what quantity of water you put on the crops? About 6 or 7 inches. We gave the crop one flooding last year.

4551. What quantity of water did you put on the grass land? It is scarcely possible to say; I should think about 4 inches.

4552. What area do you propose to put under irrigation this year? If we had the water by gravitation, we could put a large quantity under irrigation; but with the present pumping supply, about 400 or 500 acres is as much as we can do.

4553. If you got gravitation water, what would you irrigate? About 2,000 to 3,000 acres, under sorghum and lucerne.

Sorghum.

4554. So far as your experience on North Yanko goes, what do you consider the best crop to grow for irrigation purposes? Sorghum is the best for summer fodder. In a year like this, you get quicker results from sorghum than anything else.

Lucerne.

4555. Is that the best for sheep-feeding purposes? Lucerne would be the best to grow on a large scale; it does not require the annual expense of cultivation.

4556. What is the result of the experience you have had with irrigation;—do you regard it as satisfactory? Yes. I gave evidence here before Mr. Darley, and have a copy of that evidence which I would like to put in. ' [The *Secretary here read the evidence referred to*] :—

Murrumbidgee weir.

The proposed Murrumbidgee weir below the Yanko junction would be of immense value to the inhabitants of the towns and the owners of lands on the Yanko, Colombo, Billabong, and Forest Creeks.

Frontages.

I estimate that these creeks have about 2,000 miles of single frontage, and it would be hard to determine the value of permanent water throughout this distance for *domestic and stock uses only*; but as I understand that the proposed weir is only part of the scheme recommended by Colonel Home, I have compiled the following figures to show the value of the whole scheme if carried out.

Capacity of reservoir, area served, and results.

The estimated storage capacity of the proposed reservoir at Yass is about 18,000,000,000 cubic feet. This quantity of water would irrigate 275,482 acres to a depth of 18 inches, which would be sufficient to grow two crops of sorghum or four of lucerne. The former would carry fifty sheep to the acre for four months, and the latter fifteen to the acre for six months, or a total of 13,774,100 sheep if fed on sorghum, and of 4,132,230 sheep if grazed on lucerne.

Value of water.

To show the value that this water would be at all times, but *especially in seasons of drought*, I estimate that it costs the owners of stock 6d. per head per month for renting grass, including other expenses, to save their sheep; this would be equal to 2s. a head on sheep fed on sorghum for *four months, or £1,377,410*, which is more than double the estimated cost of the proposed Murrumbidgee canal and Yass storage reservoir, and if the same acreage were in lucerne (275,482 acres), estimated to carry fifteen sheep to the acre for six months at 3s. per head, it would amount to the sum of £619,834—about the estimated cost of the proposed Murrumbidgee weir canal and Yass reservoir. These figures do not represent one-half the benefit annually that would be derived from saving the stock in such disastrous droughts as those experienced of late years, as under present conditions it will take several years to breed up to the full carrying capacity of the country, whereas with the water supply mentioned sufficient stock could be always available to take advantage of good seasons when they come. There is always a deterioration in stock during *seasons of drought that could* be avoided if the higher method of stock farming were adopted by growing food as proposed.

Winter irrigation.

The amount of water proposed to be stored in the Yass reservoir to produce the results stated I estimate at about one-seventh part of the quantity of water which flows down the Murrumbidgee annually, and a portion of this surplus—say, two-sevenths—could also be utilised for irrigating winter crops, such as wheat, barley, and oats, the returns on which I estimate as follows :—

Two-sevenths of the waste flow would irrigate 2,203,856 acres of wheat, oats, or barley, to a depth of 4½ inches, which would, judging from my experience, give a return of 40 bushels of wheat or 60 bushels of oats to the acre, worth, say, 2s. for the former, and 1s. 4d. for the latter, or a gross return of £8,815,424 in either instance. The water would make a certainty of this return, whereas for the last five years the crops from Narrandera to Balranald have been almost total failures.

The estimate of fifty sheep to the acre fed on sorghum for the summer four months is only about half the stock carried per acre on a small paddock on North Yanko last year.

The average cost of growing sorghum would be about £1 per acre per annum, and of growing lucerne considerably less, as the sowing of the latter would only be required once in five years whilst *sorghum would require to be sown annually.*

Polygonum areas below Hay.

The amount of labour required to cultivate and water the areas referred to would bring unprecedented prosperity to the towns in the districts benefited by this scheme, as well as the whole community. I know of no soil better suited for the growth of sorghum than the immense polygonum areas below Hay. If supplied by gravitation with, say, 18 inches of water annually, it would increase its value tenfold.

Estimated yield per acre.

The estimate of 40 bushels of wheat and 60 bushels of oats to the acre is considerably less than some of the New Zealand yields; for there we often hear of 60 bushels of wheat and up to 100 bushels of oats to the acre, and I believe with irrigation equally good yields would be obtained here.

Interest and guarantee.

The interest on the cost of the Southern Murrumbidgee canal at, say, £600,000 at 4 per cent., would amount to £24,000 annually; and I would undertake to pay £2,000 *a year for a right to one-fiftieth part of the flow*, or a little below 16½ per cent. on the outlay.

That evidence contains particulars of my experience—experience when there was sufficient rain during the winter to give the crops a good start.

Cost of pumping.

4557. How would the experience that you have had since you made that statement affect the statement itself? It would require double the quantity of water now to *produce the same result; but in* an ordinary year the same results would hold good, and in a good season irrigation would not be required at all.

S. McCaughey, M.L.C. 29 Aug., 1902.

4558. What is the land that you are irrigating at Yanko costing you per acre to irrigate by pumping? I consider, in wages, firewood, and oil, it costs me about £1 a day to keep that pump going night and day.

4559. How many acres would that irrigate in the day? About 50, if the ground was properly prepared. I daresay 3s. per acre would cover everything except interest on plant.

4560. What would be the interest on the capital expended on channels, pumps, &c.? I consider it costs, including channels, about £1 per acre to prepare ground like that at North Yanco and level it. The interest would be another 1s. per acre. I think 4s. to 4s. 6d. per acre would pay interest on the cost of pumping machinery, distributing the water, and preparing the ground.

4561. That is per irrigation per acre? Yes.

4562. *Supposing you irrigated twice*, it would cost double that? Yes, except as regards interest on plant.

Price of water per acre.

4563. What do you say you could afford to pay per acre, supposing the Government constructed the northern Murrumbidgee canal and supplied you with water from the national channel into your own *private channels?* We *should be glad to pay* 2s. per acre for each watering.

4564. Are you in favour of the construction of this canal? Yes.

Irrigation could be practised in conjunction with navigation.

4565. Have you thought over the question of navigation, in view of the importance of the water for irrigation? Yes; I have given it a little consideration. I think, in an ordinary season, irrigation would interfere very little with navigation. In seasons of drought, if irrigation and navigation had to be considered on equal terms, some scheme would have to be adopted in the way of locking the rivers to prevent water running rapidly to waste to the ocean. With the exception of the last five years, crops could be grown here without irrigation, every alternate year.

4566. *Mr. Burchell.*] From your experience in this district, do you consider, in the event of there being sufficient rainfall, that you would require irrigation? Not for crops.

4567. Would you be prepared to pay the interest on the works all the time without using the water? I am prepared to pay my fair share of the interest on the works whether the water is used or not.

Proportion of dry seasons.

4568. What has been your experience with regard to the duration of good seasons—when you would not *have required to irrigate? Seven years ago* we used to consider one dry season in five, on an average.

4569. And that was the only time you would require to irrigate for crops? Yes; but lucerne could always be irrigated to advantage in summer.

John Huie, manager of Buckingbong Station, Murrumbidgee River, sworn and examined :—

J. Huie. 29 Aug., 1902.

4570. *President.*] What is your name? John Huie.

4571. You are manager of Buckingbong station, on the Murrumbidgee River? Yes.

4572. How far is that station situated below Narrandera? It abuts Narrandera.

Area of Buckingbong.

4573. How many miles of frontage have you? Ten miles direct.

4574. What is the area? 70,000 acres of freehold and conditional purchase land.

Stock.

4575. What stock do you ordinarily carry? 60,000 sheep, and about 500 head of cattle.

Irrigated area.

4576. Do you irrigate? Only a small area of 90 acres.

Size of pump.

4577. What sized pump do you use? Ten-inch.

4578. What is the capacity? The full capacity with an 8-foot lift is 1,600-gallons per minute.

Pumping season.

4579. How many days in the year do you work the pump as a rule? It is only worked for very short *periods; perhaps one month* in twelve.

4580. For how many hours a day? Twenty-four.

4581. Do you use the water pumped for any other purpose than for irrigation? Yes, we have a system of small canals for filling tanks.

Crops.

4582. What do you grow on your irrigated area? Wheat this year; oats the year before last.

4583. Have you formed any idea as to the quantity of water you put on? No.

4584. How many times do you irrigate? Twice.

Irrigation profitable.

4585. Are you favourably impressed with the results? Yes. I think a small irrigation settlement of 100 acres a very profitable undertaking indeed.

Area suitable for irrigating.

4586. Supposing you had gravitation water sufficient to enable you to irrigate as much country as you would *require for stock purposes on your station*, what area in ordinary years would you consider it economical and prudent to irrigate? Last year, by natural gravitation, we irrigated almost 1,000 acres, owing to the overflow of the river at a high level, and those 1,000 acres carried nearly three sheep to the *acre for six months. It would depend on the circumstances* under which we got the water as to the area that we would irrigate. I would undertake to irrigate the same 1,000 acres, as it is suitable *country for* irrigation.

What could *afford to pay* for irrigation.

4587. What would you be prepared to pay for the privilege of irrigating those 1,000 acres? I think 2s. an acre would be as much as I could afford.

4588. *Mr. Burchell.*] For one irrigation, or for the whole season? One watering for grazing purposes only.

4589. What depth of water? Say 4 inches all over the land.

4590. *President.*] I would like your opinion as to whether you consider one-seventieth part of the station a fair proportion for the purpose of irrigation? I could not express an opinion on that point. In a good *season we would not irrigate* at all. With a rainfall of 20 inches in this district, we would not require irrigation.

4591. You know that certain proposals have been made for constructing a canal along the southern side of the *Murrumbidgee River, starting* at Narrandera, and extending down in a westerly direction? Yes.

4592. You know the country well? Yes.

Southern Murrumbidgee canal should take off at "The Old Man Creek."

4593. What do you say as to the proposal? I think a very much better scheme for increasing the flow of water in the channels [*as indicated on Exhibit* 94] on the southern side of the Murrumbidgee River would be to obtain the water at a higher level, and from the locality known as "The Old Man Creek." An expenditure of £5,000 between Narrandera and the off-take of "The Old Man Creek" would bring the water practically on the surface at Narrandera, or 14 feet above summer level; whereas, in carrying out

J. Huie. 29 Aug., 1902

out the scheme (as indicated on *Exhibit* 94), I understand a cutting some 14 miles long would have to be made to accomplish the same end, that is, to bring the water to the surface at Narrandera. That would apply to the southern side of the Murrumbidgee only.

4594. You have prepared a statement, have you not? Yes.

Few advantages in navigation. Low railway rates. Irrigation has much to commend it. Land suitable for irrigation. Experimental irrigation settlements. Gravitation possible

4595. Will you please read it? Under existing circumstances there are few advantages to be gained by a system of navigation. The population is scattered, the country arid, and the land in its present state essentially a sheep and cattle walk. The Railway Department now carry the products of the land at exceedingly low rates, and it is doubtful, in view of the interest on the cost of making the river navigable, and the charges incidental to locking and wharfage exacted, whether there would be any gain to the producer in taking advantage of water carriage. The greatest source of revenue to the producer being obtained from his sales of fat stock, water carriage in this respect would have nothing to commend it. Irrigation, although in its infancy in the district, has much to commend it. The river requires an increased flow, and a series of weirs. I am of opinion that by a comprehensive system of water conservation a great impetus would be given to settlement, and the State greatly benefited. The land in many parts of the district has everything to commend it, and is essentially irrigable land—rich, chocolate, friable soil, naturally graded, and a good subsoil for drainage. There are many settlers with both capital and enterprise to enter upon and carry out systems of irrigation without any State aid, provided some permission were given for the control of the water. I would suggest that the Federal Government pass a short bill, giving private individuals power to utilise as much water as may be required for irrigation settlements, which would indirectly mean increased revenue to the State. I would also suggest that, in order to demonstrate to the settlers what the land can be made to produce under a system of irrigation, settlements should be formed in different centres of population, and placed under the control of experts. In addition to the great advantages to be gained from this class of irrigation, there are great, if not greater, advantages to be gained by a general system of canals for the watering of stock alone. The character of the country being so adapted for channelling, water can be carried by gravitation channels over very extensive areas of country between the Murray and the Murrumbidgee in Southern Riverina, and the Murrumbidgee and the Lachlan in Northern Riverina. Channels of this description could be worked to advantage with weirs, and could be made to distribute the great body of surplus water over arid plains, and be an increased source of revenue to the State.

Navigation not so important as irrigation. Fat stock cannot be carried by boat. Wool from stations on Lower Murray and Murrumbidgee conveyed to market by steamers. Water carriage of less value than irrigation.

4596. *Mr. Burchell.*] You mentioned in your statement that you did not regard navigation as being of any great importance? I do not consider navigation so important as irrigation.

4597. Do you know anything about navigation and the locking of rivers? I have practically no knowledge of navigation, but know that benefits would accrue from locking the rivers.

4598. Do you know anything about the navigation of the Murray? No, I could not say much about that. I know that it would be practically impossible to take fat stock by steamer.

4599. Where to? To the different markets I am only speaking from what I know of this district.

4600. When you speak of "navigation," what do you mean? For the purposes of commerce; for carrying the products of the land chiefly.

4601. How do the stations on the Lower Murray and Murrumbidgee get their wool to market? They may get it down by steamer.

4602. You do not know from your own knowledge as to whether it is sent by steamer? Oh, yes. Steamers have taken wool away from Buckingbong.

4603. Was water carriage of no value then? It was of value, certainly, but I do not consider it of equal value to irrigation.

4604. Do you know that there are scores of stations on the river that have no other means of sending their wool to market except by the river? I am speaking of this particular district only.

4605. Do you know of wool being carried down the river for more than 1,000 miles? I am not aware of that.

4606. When you spoke of the navigability of the river, I presume you had in view the district in which your station is situated? Yes.

James John Baylis, Licensed Surveyor, &c., Narrandera, sworn and examined:—

J. J. Baylis. 29 Aug., 1902.

4607. *President.*] What is your name? James John Baylis.

4608. You are a licensed surveyor, member of the local Land Board, owner of Goonahra Estate, and also a resident of the district for the last twenty-two years? Yes.

4609. Professionally you have been engaged here? Yes; I have done a lot of levelling all through the district west of Narrandera.

4610. In that way you are acquainted with the surveys of the country? Yes.

Proposed system of distribution expensive. Alternative proposal.

4611. On the exhibit you see before you there are indicated certain lines showing a proposal for distributing the water from the Murrumbidgee on the southern side;—do you agree with the proposal as shown? No; I think that would be an expensive proposal; I think it could be done much cheaper.

4612. In what way? By tapping the river where the Old Man Creek comes out of it. There is another creek further east which comes into the Old Man Creek. Either of those creeks would be very suitable. A rise of 7 feet in the river runs the water now into those two channels, and if the point of effluence were deepened a bit the water would be on the surface 15 to 20 miles east of Narrandera. From there it could then be taken on the surface down to Urana, perhaps Berrigan.

4613. It is proposed to use the water from the Murray in that district—Urana and Berrigan—and the water from the Murrumbidgee in the Murrumbidgee District? Yes.

Fall of Yanko Creek from Murrumbidgee to Yarrabee station. Irrigation more important than navigation.

4614. I gather that your idea is to bring the water, after tapping the river at Old Man Creek, on to the surface in the locality at Narrandera, instead of, as shown, some 20 miles west of Narrandera? Yes. Another simple scheme would be to put a dam on the Yanko Creek and send the water out in that way; there is a fall from the mouth of the Yanko to Yarrabee of about 20 feet.

4615. Do you know of your own knowledge that there is such a fall? I have heard expert evidence given before the Land Board to that effect.

4616. How do you regard the question of navigation as compared with irrigation, so far as this district is concerned? Irrigation is of the most importance here. We have an existing railway that will take all our stock, but west of Hay I should think navigation would be a very important factor. As far as this district is concerned, from Hay to Narrandera, irrigation is before navigation.

J. J. Baylis. 29 Aug., 1902.

4617. So far as you know, is there any proposal to make the river navigable above Hay? Not that I know of.

4618. Which are the natural trends of the country? South of the river, from north-east to south-west; north of the river, from south-east to north-west.

4619. *Mr. Burchell.*] Did I understand you to say that the water could be taken down to Berrigan? I fancy it could be if taken off the Murrumbidgee at the Old Man Creek.

John Waugh, grazier, Gogeldrie Station, Whitton, Murrumbidgee River, sworn and examined:—

J. Waugh. 29 Aug., 1902.

4620. *President.*] What is your name? John Waugh.

4621. You have been a resident of Riverina for how long? About forty-six years.

4622. You are part owner of what station? Gogeldrie and also Clare Station, in the Western Division.

4623. Where is the latter situated? One hundred miles north of Balranald.

4624. What frontage has Gogeldrie station to the Murrumbidgee? About seven miles.

4625. Where is it situated? Twenty-four miles west of Narrandera, at Whitton.

Area of station. Stock. Area irrigated. Size of pump. Pumping season. Capacity of pump. Crops.

4626. What is the area? 76,000 acres of freehold land and about 4,000 of leasehold.

4627. What stock do you carry? In an average season about 60,000 sheep.

4628 Do you do any irrigation at Gogeldrie? A little; about 100 acres.

4629. How do you get the water on to it? By pumping.

4630. What sized pump? Thirteen-inch.

4631. How many days in the year do you work the pump? For irrigation and supplying tanks and channels, about three months.

4632. How many gallons per minute does it throw? I am not quite sure; I think about 2,000.

4633. How many hours in the day do you work the pump? Twenty-four hours.

4634. What do you grow? A little lucerne, sorghum, and wheat.

Irrigation by gravitation.

4635. So far as your experience goes, do you consider irrigation a success? I think so.

4636. Supposing you got water by gravitation, would you be disposed to increase the area irrigated? Yes.

4637. To what extent? About 1,500 acres.

4638. Do you think that would be a fair proportion in an ordinary year to provide for irrigation out of your 80,000 acres? I do not think it would be enough, but until we saw how we got along it would be quite enough.

Cost of irrigating.

4639. What do you consider it costs you in pumping for irrigation now? Ten pounds per week.

4640. How many acres can you irrigate in a day? Six acres, working day and night.

4641. That is to say, it costs you £10 to irrigate 36 acres? That is just about it; 4s. or 5s. per acre, irrespective of interest on plant, &c.

Price of water.

4642. Supposing you got a plentiful supply of water for the purpose of irrigating the 1,500 acres, what would you be prepared to pay per acre? In good and bad years about 3s. Of course, there would be many years during which I would not want to irrigate—say three out of every six.

Proposed distributing channels.

4643. You see the exhibit before you;—on that are indicated proposals for distributing the water intended to be diverted from the Murrumbidgee River at Narrandera, on the southern and northern sides of the river? Yes.

Suggested deviation.

4644. So far as the northern side is concerned, do you consider the channels are located properly? As far as down to the North Yanko wool-shed the proposal is all right; then I think it should go as far north as the fall will allow it to run well. At Whitton I think it should be 8 miles back from the railway. It should then touch the Little Mirool, and the water would run by gravitation into the Lachlan.

4645. Is it your idea that the artificial channel should join the Little Mirool? It should run along the south side of the Little Mirool, but not join it. It should run along the Big Mirool on the south side, and the people who wanted the water could then take it as required.

Willandra Billabong.

4646. Is your station on the Willandra Creek receiving any benefit as the result of the weir that has been constructed across the Lachlan for diverting the water into the Willandra Billabong? No; that portion of the station has been taken away from me, but a great benefit has been received in the locality.

4647. Have you any suggestions to make in regard to that locality with a view of giving it a better supply of water than it has at the present time? Yes. I would like the water to be taken out south of the Willandra, brought down through Molbong, and brought on to the Government well known as "The Lignum," on the Booligal road.

Artificial channels.

4648. Your idea is to divert water out of the Willandra Billabong, and put it into artificial channels? Perhaps out of the Lachlan, somewhere about that weir.

Natural depressions.

4649. What is your objection to using the natural depressions and creeks? They waste too much water.

4650. Is that your only objection? That is my objection.

4651. Have you considered the question of cost side by side with the question of the water, because it is obvious that to excavate channels, extensive as they would have to be, would be expensive? You can see the water running at a point in the Willandra Creek one day, and go back the following day, and it is not half a mile from the spot.

4652. I understand you to say that the natural channels are not sufficiently defined? Yes; they are no good at all; they are full of box timber, and they spread out very much.

Navigation and irrigation.

4653. You have thought over the question of navigation, so far as the Murrumbidgee is concerned? Yes. I think we should have navigation on the Murrumbidgee, and I do not think that navigation will spoil irrigation at all. If you keep water in the river for navigation purposes, you must have plenty of water for ordinary pumping. I have sent wool by steamer for twenty years on the Murrumbidgee and Murray.

4654. Where do you ship your wool? At Balranald.

4655. Would navigation be of any service to you so far as your Whitton station is concerned? Not much.

Navigation important on Lower Murrumbidgee.

4656. When you get down below Hay, then you say navigation is of importance? Of great importance after you leave the junction of the Lachlan.

Henry Daniel Adams, land-owner, &c., Narrandera, sworn and examined:—

H. D. Adams. 29 Aug., 1902.

4657. *President.*] What is your name? Henry Daniel Adams.
4658. You are a land-owner, at Narrandera? Yes.
4659. How long have you been resident in the district? I have been for fifty-two years between this and Albury.

Irrigation and navigation.

4660. Have you made a study of the question of irrigation and navigation in connection with the proposals that have been made for diverting the water by means of a weir at Narrandera, and the establishment of locks and weirs below Hay, in conjunction with the storage of water at Barrenjack, on the upper reaches of the Murrumbidgee, for navigation purposes? I have not made a great study of the question, and my experience as regards irrigation is limited; but I have seen the results of irrigation in a small way at a great many places, and I have seen some wonderful results in this district.
4661. Do you favour the northern or the southern canal? I am more in favour of the northern.

Water obtainable by sinking in country south of Murrumbidgee.

4662. For what reason? One great reason is that once you get south-west of Narrandera, beyond the Yanko Creek, a good, serviceable supply of water is obtainable almost at any place at a moderate depth; whereas north of Narrandera it is almost impossible to get water—the depths are very great, and when water is obtained it is of an inferior quality, and almost useless.
4663. For those reasons, you favour the northern canal? Yes; and the Barrenjack scheme.

FRIDAY, 29 *AUGUST*, 1902.

[*The Commission met at the Council Chambers, Berrigan, New South Wales, at 7·30 p.m.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Nav

Emanuel James Gorman, President of the Murray River Main Canal League, Berrigan, sworn and examined:—

E. J. Gorman. 29 Aug., 1902.

4664. *President.*] What is your name? Emanuel James Gorman.
4665. You have been a resident of the Berrigan district for how many years? Roughly, about twenty-five years.
4666. Are you acquainted with the district situated, say, between here and Albury? Yes.
4667. And between here and Echuca? Between here and Wanganella, 20 miles north-west of Deniliquin.
4668. You have taken an interest for some time past in the question of irrigation and in the use of the waters of the Murray, have you not? Yes, for about ten years. About five years ago we held a local conference with the object of furthering a canal scheme. A deputation was sent to Sydney, consisting of representatives from Corowa, Berrigan, Jerilderie, and other centres. I was one of the Berrigan representatives. We impressed upon the Minister in power the necessity of carrying out the project. As a result of that deputation, a permanent survey of the canal was made as far as Berrigan, and I believe other work was done in connection with storage and reservoirs, but practically nothing was done to push the matter forward. So that last November Mr. O'Dwyer and myself canvassed the district with the object of finding out what support would be accorded the scheme. It was then decided to convene a conference at Corowa. The conference was held on the 2nd, 3rd, and 4th of April last, and your Commission is the outcome of it. What actuated me, as one of the conveners of the conference, was the succession of dry seasons which we have experienced. For seven years the rainfall has been considerably below the average, and we found wheat-growing a very precarious industry. To grow wheat successfully in this district we require about the average rainfall. The average for twenty-seven years works out at 18 inches 92 points; but for fifteen out of the twenty-seven years it has been below that; for the last seven years the average has been 15 inches 36 points, and for the last three years it has been less than that. So that we feel the great necessity of a water conservation scheme. I have been in the Rodney district in Victoria, and saw there the results of irrigation, and, from my knowledge of the district, and of the soil at Rodney and here, I am satisfied that everything is in favour of this scheme being a success, provided we are supplied with the water. The soil is suitable, and I believe water could be applied with the very best results. I have figures here, supplied by Mr. Coghlan, which show that in the four counties that would be affected by this scheme—Hume, Urana, Denison, and Townsend—the average yield of wheat in 1896 was 11⅛ bushels; in 1901, 8¼ bushels; and the average for ten years, 9¼ bushels. There has been a decrease of 30,000 acres of wheat in the last two years, and I feel certain that if this year proves as disastrous as it promises, there will be a considerable decrease next year on this year's figures. Most of the wheat-growers have come to the conclusion that wheat-growing does not "pay" in the dry seasons. And the dry seasons preponderate. I have been growing wheat for ten years, and my father grew it five or six years before, and I am convinced that it does not pay in these dry seasons. For the last ten years there has been a large decrease in the number of sheep in the three districts of Deniliquin, Jerilderie, and Corowa.

Local conference.

Corowa Conference.

Rainfall in Berrigan District.

Soil suitable for irrigation.

Wheat growing does not pay in dry seasons.

Average size of holdings.

4669. What is the average size of the farms in the district? In this district they run from 320 acres up to about 3,000 acres.
4670. What proportion is usually cultivated for wheat? In many cases about two-thirds of the smaller holdings, and up to one-third where the holding is 3,000 acres.
4671. Would you say that the whole of the wheat crop of the district would require to be irrigated each year? When the rainfall is below the average, but not otherwise. In 1900 we had nearly 18 inches of rain; we had very good rains in the autumn, but the spring was very dry. The autumn rains kept the wheat going, but if we had had water we would have applied it in the spring.

Proportion of land requiring irrigation.

4672. What I want to get at is, what proportion of the land do you estimate would require to be irrigated each year? All the land under wheat would need water in a dry season.
4673. What proportion would that be? In this district I suppose, roughly, about one-fourth—that is, taking the large in with the small holdings.

4674.

E. J. Gorman. 29 Aug., 1902.

4674. What proportion of years would the district do without irrigation? I find that we would have used water three out of every five years for the last twenty-seven years.
4675. Three-fifths? Yes.

Price of water.

4676. What do you consider would be a fair price to pay per acre per annum for irrigation? I should say that it would carry 3d. per acre for domestic and stock supply, and that the land to be irrigated would pay—as I understand they pay in the Goulburn Valley—1s. per acre for each watering.
4677. How many waterings would you require? I understand about two waterings per annum. Mr. Pagan, who is a recognised authority on irrigation, stated that one watering in January and another about April or March in ordinary seasons would be sufficient for lucerne, and that, perhaps, only one watering in the year would be sufficient for wheat just before ploughing.
4678. Is that the fullest extent that you think the land in this district could pay for irrigation? Of course, during the present season one could pay almost any sum, but taking an ordinary year with the ordinary run of prices, I should say that that is about what we could pay.
4679. You do not think that the water would be of more value to you than 1s. per acre per watering? Taking two waterings per annum, it would work out at 2s. per acre. One watering would be of very little use if lucerne was being grown. I am basing my calculations on the rates charged in the Goulburn Valley.
4680. How much would 3d. per acre be in the £ on the unimproved value? Taking the average unimproved value of land in this district at 30s. per acre, it works out at 2d. in the £.
4681. Is that what they are paying in the Goulburn Valley? I understand that 3d. per acre is what they pay there for the domestic and stock supply.

Bungowannah and Tocumwal proposed diversions.

4682. You know that it is proposed to divert water from the Murray at Bungowannah? Yes.
4683. What would you say to a proposal to divert it at a very much lower point, say in the vicinity of Tocumwal? It would be of no use at all; it would only serve a very small portion of the area which would be served by the main canal, and a most thinly settled area, consisting of, I should say, the least suitable land.
4684. You would not favour it? No; I would be very much against it. It would only benefit two or three large holdings.

Water supply limited.

4685. You also know that the water that we can obtain from any of these rivers is necessarily limited, and it would be to the advantage of New South Wales, or any other State, to put whatever water is available to the best use. Now, supposing it could be put to the best use by diverting it at Tocumwal instead of Bungowannah, what would you say? Personally, I do not think it would be putting it to the best use.
4686. Will you give us your reasons? I think the land between Finley, and, say, 30 miles east of Berrigan, is more suitable for irrigation, and there is already a good population of practical farmers on the land who are prepared to utilise the water if they get it.
4687. *Mr. Burchell.*] Is the rainfall at Tocumwal as good as at Berrigan? I think there is very little difference.

Insurance against droughts.

4688. *President.*] Is there anything further you would like to add? I would like to say, in connection with my estimate for the price of water in a year like this, that it is worth a great deal more than I stated, but I made the estimate for all time. Further, I do not think we would get the full benefit; future generations would derive much more benefit than we would. There would be a great deal of expense incurred in getting our land prepared. I think the insurance it would be to New South Wales in a time of drought to have a strip of country to provide green fodder for valuable sheep is a factor which the Government should take into consideration. It is well known that stud sheepowners would give any price to be able to rear their stud lambs, and it is only green feed that that can be done on. Artificial food cannot compare with green fodder.

Permanent water would tend to closer settlement.

In this district, with a permanent water supply, I believe we could carry the whole population of New South Wales, and the price of water would compel all the large holders to cut up their land. A man with 20,000 or 30,000 acres would have to throw open his land to closer settlement. I hold myself about 17,000 acres, and I could not handle that area and irrigate. The population is practically at a standstill; in fact, the country population is going back. At the local railway station in 1896 there were 120,000 bags of wheat trucked, whereas in 1898 there were only 12,000. It is the fluctuation that affects people. A few years ago we had people coming here from all parts of Victoria. Owing to the bad seasons now, the place has a bad name, and I know from experience that, unless we get this water scheme, we shall have no influx of population. The country will, practically, revert to sheep pasture. The district is splendidly adapted for pig-farming and the cultivation of fruit.

Berrigan district suitable for pig farming or cultivation of fruit.

4689. *Mr. Burchell.*] Do you remember the extent of the proposed Bungowannah channel? 110 miles.

Bungowannah channel.

4690. And the quantity of water? 1,300 cubic feet per second.
4691. Do you remember the area proposed to be supplied? 1,620,000 acres.
4692. Supposing it were undertaken, and it was found that there was not sufficient water to supply that area, would any less quantity be of value to you? Yes; if we could get a domestic and stock supply for the whole area, if we could fill the tanks once a year, it would be of some service.

Stock and domestic supply of value.

4693. If there were not enough for irrigation, but enough for stock and domestic use, would you feel the benefit of that supply? I do not think the people would favour a scheme unless they could irrigate a portion of their land.

People require scheme for irrigation as well as stock and domestic supply.

4694. They would recognise the value of any irrigation scheme, even if it were not of the dimensions mentioned by Mr. McKinney or Colonel Home? Yes; but I am sure the people would not favour a scheme unless a certain area could be irrigated.
4695. Say 250,000 acres? I understand that was the area that sufficient water would be obtainable for. My estimates were based on that area; the balance of the water to provide a domestic supply.
4696. Do you think a channel to supply 50,000 acres continuously would be recognised as of permanent value? It would depend on the cost.
4697. If there were not water enough to supply everyone, rather than be without it, you would prefer to have it on a reduced scale? Yes; I think if we could irrigate 1 acre in 10 it would provide sufficient fodder to tide our stocks over a period of drought. [*Witness then handed in a number of returns and statistics in connection with the Berrigan District.*]

George

George Reynoldson, landowner, Berrigan, sworn and examined:—

G. Reynoldson. 29 Aug., 1902.

4698. *President.*] What is your name? George Reynoldson.
4699. You are a landowner in the district of Berrigan? Yes.
4700. How much land have you? With my partner, Mr. Russell, a little over 3,000 acres.
4701. What portion do you cultivate? This year we have very nearly 2,000 acres under wheat, and 160 acres of barley.
4702. Do you consider that you are inconvenienced as the result of the small *rainfall*? Yes.

Deficient rainfall.

4703. What would you consider a sufficient rainfall to enable you to get along without anxiety? A good deal depends on the time of the year in which it falls. We commenced to cultivate wheat about fourteen years ago, and the first three or four years the rainfall was satisfactory, inasmuch as it fell in the autumn and carried us through, but for the last five or six years, with the exception of the year before last, the crops have been almost a total failure. For two years they were, and this year they promise to be much in the same condition.

Irrigation desirable.

4704. What is your opinion as to supplementing the present rainfall by irrigation;—do you think it desirable? Yes; I think it is desirable if the district is to hold the present population, and most desirable if we wish to increase it.

District going back.

4705. Is the district going back at all as the result of the recent droughty conditions? I think so—outside of the little townships. As for settlement on the land, I think it has decreased considerably in the last twenty years.
4706. What do you think would be the effect of irrigation in that respect? I think it would have the effect of increasing settlement wonderfully.

Size of holdings.

4707. Supposing irrigation were available, what do you think would be a fair amount of land for a man to have in order to get a decent living? A good deal would depend upon the industry that he followed. If he went in for wheat and grazing, I think a fair living could be made on 640 acres; but if he went in for intense culture or lucerne, I think a considerably less area would be sufficient.
4708. On what area, under present conditions, would it be necessary for a man to reap the same advantage as the one that you have spoken of? I believe that we could do as well on 640 acres as we are now doing off the 3,000. I believe that we would fatten more stock and grow more wheat.

Price of water.

4709. That being the case, what do you consider would be a fair price to pay for the water, supposing the State incurred the expense of bringing it to your door, so to speak? I cannot speak from any practical knowledge as to what we would be able to pay for it, but I know from observation and the evidence given by other people as to what they are prepared to pay in similar country; at the Corowa Conference there were some gentlemen from Renmark who assured me that they could pay £1 per acre to irrigate lucerne, and it was stated at the recent Farmer's Conference at Shepparton that 10s. or 15s. an acre could be paid and then leave a profit. I am prepared, if this canal is brought down through the country, first, to pay a reasonable rate for a domestic and stock supply, and then I am prepared to pay a rate sufficient to cover the interest on the cost of the work, provided that the Government will construct the reservoir and the head works as a national work. Unless these works run into an enormous cost, which I do not think will be the case, there is little fear but what we will be able to meet the interest right from the start, and in a very short time provide a sinking fund to defray the principal.

Probable requirements.

4710. How many settlers are there at the present time who would be prepared to do the same as yourself? I could not say how many. The irrigation question has only come before the people of this district practically within the last four months. A good many of the people know that it would "pay" them to have it, but in the last few days an opinion has been expressed that they will have too long to wait. Having regard to the enterprise of the people in the district, however, I believe if the water were here most of it would be used, and a fair proportion of the land would be irrigated every year.

Country affected by Bungowannah canal.

4711. Could you tell us, as near as you can, the acreage of wheat that would be affected by the channel from Bungowannah? No, I could not tell you the exact area; but, taking the channel as surveyed, the whole of the country to my knowledge south of the Billabong Creek on the north, and on the south to the Murray—with the exception of some outcrops, ridges, sandhills, and a little low-lying land along the creeks—is fit for irrigation. It is just the sort of land that I think suitable for irrigation.

Tocumwal scheme.

4712. You heard the question that I put to Mr. Gorman in regard to the point of diversion from which water was to be taken from the Murray? As regards the weir at Tocumwal, I may state that I was one of those who tried to urge upon the Government the erection of a pumping plant at that particular point when the Goulburn Valley policy was started. A survey was made, and it was recommended to the Government that a pumping plant should be erected; that was for the Victorian side. The majority of the farmers looked upon it with suspicion; when they wanted it afterwards, however, want of funds on the part of the Government of Victoria prevented them going on with it. As far as this side is concerned, from my knowledge of the country, and the small amount of channelling that has been done, it would be impossible from that point to get water into Berrigan.
4713. You do not favour it? No. The land that it would embrace is in the hands of a few, and a very large proportion of it would not be suitable for irrigation.

Rate.

4714. Referring to the question of rates to be charged in the event of water being brought into the district, what would you be prepared to pay yourself? I would be prepared to pay on one-third of my land—supposing that I irrigated in March—1s. per acre over and above the domestic and stock rate.
4715. What rate would you be prepared to pay for stock and domestic purposes? Three pence per acre over the whole of the ground, and I may say that I already have a fair domestic and stock supply already provided.

Edmund Daniel O'Dwyer, landowner, Warmatta, sworn and examined:—

E. D. O'Dwyer. 29 Aug., 1902.

4716. *President.*] What is your name? Edmund Daniel O'Dwyer.
4717. You are a landowner in the Berrigan district? Yes; at Warmatta, about 11 miles from here.
4718. How much land have you? In conjunction with my brother, 4,171 acres of conditional purchase and freehold land, and we are renting 882 acres.

Area cultivated.

4719. What proportion of that do you cultivate? Generally about 1,200 acres; at the present time about 600 acres.
4720. Do you consider that a water supply would be an advantage to you? I do.

E. D. O'Dwyer. 29 Aug., 1902.

4721. Supposing the channel from Bungowannah, as proposed, and the branches connected with it were constructed, how would you be affected? This year if we had had water and could have irrigated, say, 1 acre in 10, thousands and thousands of pounds would have been saved in this district. As showing the loss we have sustained, we put down 2,000 ewes for breeding purposes; in the ordinary course of things, we should have got 80 per cent. of lambs from them, say, 1,600 lambs. In marking the sheep the other day we found 1,100 of the ewes dead, and the whole of the lambs with the exception of 160.

Effects of drought.

4722. To what do you attribute that? To the drought and overstocking. A season of drought affects all of us; we are all sellers, there are no buyers, and, as a result, we are left with surplus stock on our hands. If my neighbours had been able to irrigate and grow hay this year, instead of paying £7 and £8 per ton, which we have now to pay for chaff, I would have been able to get it for £3, and that would have been a profitable investment to the man who gets some 10 or 12 tons to the acre. If this season keeps on the way it threatens we will simply have to go elsewhere.
4723. Supposing you got irrigation, how would you be situated? I think it would be the salvation of the country.
4724. Would you irrigate the whole of your wheat crop each year, supposing you were able to do so? No; in some seasons irrigation in this district would not be required at all.

Irrigation five years out of six.

4725. What would be the proportion of seasons in which you would want to irrigate? Taking the last six years, we would have had to have irrigated five years out of the six.

Price of water.

4726. What would you be prepared to pay yourself for the privilege of irrigating your crops? I would favour irrigating for lucerne here more than anything. It would have paid me to pay this year £4 an acre, and if I had been able to irrigate 100 acres I would have been money in pocket; I could have saved my stock. Of course, it will fluctuate. In a dry season we will all be fighting for it, but in a wet season there will not be such a demand for it.
4727. You understand that if the works are carried out a large amount of money will be expended, and that the interest on this amount of money will have to be paid each year whether the water is used or not;—now what would you be prepared to pay, taking one year with another? Already we are paying a land tax of up to 3d. per acre, and we landholders think that it is very hard on us to have to contribute to the revenue and get nothing in return, and, therefore, I maintain that we are entitled to this canal as a national work. In a new country like Australia it is very hard on the people who are opening up the country to have practically to carry it along. My idea is that, if we get the canal, we should impound that land tax to start with. At the present time the city people are paying three times more for their meat than they should if we were producing what we would be able to produce if water were available. The drought has very seriously affected our fattening lamb industry, with the result that the firms who do this business found, when they had ordered space in ships, that we had not a lamb for them.

Canal should be a national work.

4728. What would you be prepared to pay? I should say about 2s. 6d. per acre for each irrigation, and a tax over the whole area of 1d. per acre for stock and domestic purposes.
4729. How many waterings per annum do you consider would be required? That would depend on the season; for the last six years at least two would have been required; this year, three.
4730. That is, you would pay 5s. per acre per annum? Yes.
4731. What proportion of your land would you require to irrigate? I think one-tenth.

John Langtry, share farmer, Finley, sworn and examined:—

J. Langtry. 29 Aug., 1902.

4732. *President.*] What is your name? John Langtry.
4733. You are a share farmer? Yes, at Finley.
4734. How many acres have you? Our family cultivate 1,200 annually.
4735. Have you any other land besides that? Only a small area.
4736. What do you grow? Wheat.
4737. Are you satisfied with the results? Not of late years.
4738. How do you think they could be improved? Only by one means—irrigation.

Experience in irrigation.

4739. Have you had any experience in irrigation? I have. I resided in the Goulburn Valley from 1873 up to within seven years ago.
4740. You know, if you are acquainted with the Rodney Trust, that the conditions are such there that it is surprising how few of the landowners and farmers avail themselves of irrigation? I am aware of that.
4741. What do you think the reason for that is? The reason is the very comfortable position in which most of the people there are in. This year the people who never used the water previously are very anxious to use it.
4742. Will you tell us, supposing you get irrigation, how it would affect you? As applying to our family, the position that we are in is that we do not own any land; we are working simply on the share system. If we were supplied with water, we are satisfied that we could make good wages for each individual member of the family; the land would show a good profit, and also give a permanent return to the owner. If we do not get water we must leave this country altogether. I have been here for seven years, and came here with a family of eight working brothers, with £1,000. We have lost all that, and I am satisfied that we will never recover that amount without working the soil with the benefits of irrigation.

Amount prepared to pay for irrigation.

4743. What do you consider a permanent and reliable water supply would be worth to you? As regards the Crown lands in this locality, I would willingly undertake to pay 10s. an acre to the Crown for the benefit of using the land, and 10s. per acre per annum more for a supply of water.
4744. You would be prepared to pay to the Crown for the use of the land on lease 20s. per acre per annum? Yes; provided that I was supplied each year with a watering of 7 inches.
4745. Is there anything else you wish to say? I would like to say that the evidence I have given is based upon facts in my experience on the other side of the Murray. I was rate collector and shire valuer there for a number of years, and had every possible opportunity of knowing exactly what the people who were using the water were making, and my evidence is based on my own experience there.
4746. As a rate collector you would be acquainted with the values of land? Very well.

Effect of irrigation on land values in Rodney Trust.

4747. Do you know what the increase in values was as the result of irrigation? When the Echuca and Waranga Trust was first started, that portion which now constitutes the Rodney Trust was valued at £5 per acre. I know that at the present time that very land, the best in the Rodney Trust, is worth about £14, and there is no reason for that increase in value except the existence of irrigation.

J. Langtry. 29 Aug., 1902.

4748. Have you sufficient knowledge of the locality to be able to give an expression of opinion as to the advisability of making the diversion in the vicinity of Tocumwal, instead of Bungowannah? I have. My experience of the Echuca Shire led me into constant contact with all stations along the river frontage from Koondrook almost to Tocumwal, consequently I am well acquainted with the frontage situated in that locality. The site at Tocumwal is altogether too low for the purpose of a weir being built there, without causing immense loss of property by flooding. There is the cutting that comes away from the river just below Tocumwal, at Tuppal Creek. I believe the present Government propose to place about that point an obstruction in the river so as to supply Tuppal Creek with water; but it seems to me that no weir could be constructed there without doing an immense amount of damage to territory that could be supplied for irrigation purposes.

Tocumwal site unsuitable.

John Richard Reynoldson, landowner, near Berrigan, sworn and examined:—

J. R. Reynoldson. 9 Aug., 1902.

4749. *President.*] What is your name? John Richard Reynoldson.
4750. You are a landowner? Yes.
4751. Where is your land situated? About 3 miles due west from Berrigan.
4752. How many acres have you? 1,700 odd.

Crops.

4753. What do you do with it? Farm it—wheat, oats, or barley, and grass.
4754. How many acres do you use for the former purpose? From 600 to 800 acres a year for wheat-growing, &c.
4755. Are you satisfied with the results under present conditions? I was, until the last six years.
4756. Has that been in consequence of the shortage in the rainfall? Yes.

Reduced yield.

4757. In what way has it affected the crops;—has it reduced the yield, or destroyed the productiveness of the soil altogether? Yes; it has destroyed the productiveness of everything that grows on the place.
4758. What do you consider the remedy? Water.
4759. Would you be materially affected if you got a supply from the Murray, from Bungowannah? Yes.
4760. How many acres would you cultivate, supposing you could depend on getting a crop after you have put in your seed? I would cultivate one-third—that is, irrigate it.
4761. Do I understand that to cultivate means necessarily to irrigate? Yes; I would irrigate every year, good or bad.
4762. You would not depend on the rainfall? If I could, I would make the supply of water a certainty.

Price of water.

4763. What do you think the water would be worth to you per acre for your cultivation? I would be prepared to pay 1s. an acre on the whole of my land at present if I got the water—that is, for a domestic and stock supply. I understand that in Rodney they charge so much for the water first. That debarred a lot of people from irrigating. If they had charged so much per acre on the whole of the country it would have been a better way.
4764. That is to say, pay for the water whether it is used or not? Yes.
4765. Your view is, that the works having been carried out for the purpose of supplying you with water, it is only a fair thing to make you pay for them? Yes.

Fertilisers useless without irrigation.

4766. Is there anything else you wish to say? We are told, as farmers, by the Press, that we must use fertilisers; but it is impossible to use them without water; it would be throwing money away. If we had irrigation, it would increase the value of my land 100 per cent. I am interested in a place at Rodney. A lot of the farmers there have not availed themselves of irrigation, because they were almost afraid to spend the money to try it. I took around a petition a few years ago to get that scheme started, but they would not sign it. I know for a fact now that their land in some instances has gone up 150 per cent. in value.
4767. What do they say about it now? They are availing themselves of it. I am only afraid that we are not going to get this water quick enough—that our lives are too short for it.

No justification for amounts written off Victorian irrigation Trusts by Government.

4768. *Mr. Burchell.*] With regard to your statement to the effect that the value of the land in Victoria where irrigation has been carried on has increased 150 per cent., how do you account for the fact of so much capital and interest being written off? In the first place, the engineers came up and said, "We will give you a domestic supply"; and for that purpose the water was carried in the lowest channels. After a while we could see that that would not do, and that it would be of no use unless we could get water in the higher channels for irrigation. An irrigation area was then formed, and subsequently the amounts were written off; but I maintain there was no justification for that course. The advantage of irrigation is shown in the increased value of the land. It is being sold to-day at an increase of more than 150 per cent. as compared to that time.
4769. Does that apply to the whole of the Rodney Trust? Yes.
4770. But all the Trusts have been served alike? They went in for making channels when they had no water to fill them, and when the people could not get the water, they could not pay for it. In Rodney they have any amount of water, and although they have not used it as much as they might have done, they are now commencing to take advantage of it. I think if water were available in this district it would mean closer settlement.

Prepared to pay 1s. per acre per annum for irrigating natural grasses.

4771. *President.*] Do you wish to supplement the evidence you have given in any way? I desire to say that I would be prepared to pay 1s. per acre per annum for irrigating natural grasses.

John Blair, landowner, near Berrigan, sworn and examined:—

J. Blair. 29 Aug., 1902.

4772. *President.*] What is your name? John Blair.
4773. You are an owner of land? Yes.
4774. Where is your land situated? Midway between Berrigan and Finley.

Area.

4775. How many acres have you? 4,500. [Part rented with option of purchase.]
4776. How much do you cultivate? Up to 3,500.

Crops.

4777. Do you grow wheat? Wheat, hay, and a few oats so far.
4778. Have you been satisfied with the result of late years? No. I have been thirteen years in the district. I came here from a State where we never required irrigation—Tasmania—and I thought the prospects in this district as good as anything I had at home. I have been an agent for some landholders in

J. Blair. 29 Aug., 1902.

in the district since, and was the means of bringing a great many Tasmanians over—about thirty families altogether. But I am sorry to say they are all like myself; our expectations have not been realised, and a great many of them have left the district and gone back to Tasmania. For four or five years we could have wished for nothing better, but the tide turned, and we have now had a succession of droughts for five or six years.

Yield.

4779. What is the difference in the yield between what you may regard as a bad season and a good season? Four years ago I had 3,500 acres under wheat; from that I got 9,600 bags, besides 300 tons of hay. The following year, a year of drought, off the same area I got 330 bags of wheat and about 35 tons of hay.
4780. What would that amount to? About £3,000.

Effect of irrigation.

4781. Supposing you got water, what do you think would be the effect? I consider with water the same as they have in Tasmania it would grow ten and twelve bags to the acre instead of three. I consider the yield of wheat here falls off for want of moisture just at the very time it should receive it.

Price of water.

4782. What do you think would be a fair charge to pay for the privilege of getting water? I would pay any rate that might be struck. I am satisfied that no matter what water I put on the land it would repay me. If it were in the district, and there was a chance of getting it near my place, I would have it.
4783. What do you think would be a fair price per acre per annum? I would be willing to pay 2s. for each watering, and I do not think one would be sufficient.

Amount prepared to pay for irrigation.

4784. Do I understand you to say that you would be prepared to pay up to 5s. per acre? Yes. An outlay of 4s. or 5s. per acre would never be missed when we got a good return of wheat. It is generally when we have not got it, when droughts are prevalent, that wheat is a good price.
4785. Have you had any experience in irrigation? No.

Berrigan district splendid irrigable land.

4786. Have you anything further you wish to say? Yes; a man has his family, and they have to be considered. That in itself should make the Government do something to keep the people on the land in this country. I am satisfied that there is no better land in Australia than in this particular district through which the proposed canal will run, and it will be one of the greatest cereal-producing parts of New South Wales—It is now in good seasons; but we cannot maintain it every year; with irrigation we could.

James Edward Moodie, landowner, near Finley, sworn and examined:—

J. E. Moodie. 29 Aug., 1902.

4787. *President.*] What is your name? James Edward Moodie.
4788. You are a landowner? Yes, in partnership with my brother, 4 miles from Finley.
4789. How many acres have you? 1,300.
4790. What portion do you cultivate? Only 100 acres this year. I have only been two years in this district.

Previous farming experience.

4791. Where was your experience before? At Coleraine, in the Western District of Victoria.
4792. Have you had any experience in irrigation? No.
4793. Have you been satisfied with the results since you came here? I came here in a very good year—the year before last; but I was not at all satisfied with last year, nor am I satisfied with the prospects of this. I have never seen any country in Western Victoria that would produce as much as this district would, given sufficient moisture.
4794. Do you think irrigation would put the finishing touch on it? Yes.

Price of water.

4795. What do you consider would be a fair charge, provided the water was supplied? I can endorse the evidence given by Mr. O'Dwyer, that 1 acre in 10 would be a fair thing to irrigate. I am engaged in the fattening of lambs, and given good seasons, this will become a very big industry in the district. I also think 1 acre in 10 would be a fair average to take for the production of lucerne and crops, and then we would be sure of getting all our lambs fat. If we do not get rain within a couple of months, it will pay us best to cut their throats in order to save the ewes.
4796. What do you say would be a fair price to pay per acre per annum? Five shillings for irrigable land, and 1d. per acre for stock and domestic supply.

John Jones, landowner, near Berrigan, sworn and examined:—

John Jones. 29 Aug., 1902.

4797. *President.*] What is your name? John Jones.
4798. You are a landowner? Yes, 3 miles north-west from here.
4799. What area have you? 640 acres.
4800. How long have you been in the district? Fifteen years.
4801. What proportion of the 640 acres do you cultivate? We have 400 acres in this year. Owing to the dry seasons I am cultivating less now. During the dry seasons I was losing money by renting land, and so I curtailed my operations.
4802. Have you had experience in irrigation? No practical experience.

Insufficient rainfall.

4803. In many years you do not consider the rainfall is sufficient for the purpose of wheat-growing? There have been very few years in my experience during which the rainfall has been sufficient. In almost any year water could be applied with profit during some period of it.

Value of irrigation.

4804. What would water be worth to you, supposing you got sufficient to enable you to apply it for the purpose of wheat-growing? I think the people on the smaller areas of land would be prepared to pay more for the water than those with larger areas. I would be prepared to pay 5s. per acre for the portion cultivated.
4805. What about the general rate? I would pay a 3d. rate for a domestic supply, notwithstanding the fact that I already have a domestic supply.

Effect of bad seasons.

4806. Is there anything else you wish to say? If the seasons remain like they have been for the last six or seven years, a man will be very foolish to stop here.

Richard

Richard Francis Gorman, landowner, near Berrigan, sworn and examined:—

R. F. Gorman. 29 Aug., 1902.

4807. *President.*] What is your name? Richard Francis Gorman.
4808. You are a landowner? Yes, 11 miles east of Berrigan.
4809. How many acres of land do you own? 3,700.
4810. What use do you put it to? Grazing and farming.
4811. What proportion of the land do you use for farming? About one-sixth.
4812. Do you find that wheat-growing has been in any way interfered with by the drought? Yes.
Effect of drought. Yield.
4813. What has been the effect, in point of yield? About five-sixths less than in good seasons.
4814. Taking an average price for your wheat, what would that mean per acre? In good seasons the yield would be about 20 bushels to the acre; in bad seasons my crop did not average 6.
4815. What would be the monetary value of that? A difference of about 42s. per acre.
4816. Do you put the same amount of labour into the ground during a good and a bad season? The same amount of labour to put in the seed, but not so much to take it off, owing to the reduced size of the crop.
Effect of irrigation.
4817. What do you think would be the effect of irrigation on a crop of wheat? We would have been able to get a good wheat-crop this season, given sufficient water and irrigable land.
4818. Would the yield be equal to 20 bushels? With sufficient water, I think so.
4819. Do I understand you to say, then, that it would make a difference of 40s. per acre in a year like the present? Yes; that is, if the season continues as it promises at present.
Price of water.
4820. What do you think would be a fair price to pay for the advantage of irrigation? I think 5s. per acre on every acre of irrigable land that the State is capable of supplying with sufficient water.
4821. Would you be prepared to pay that? Yes, for what land I could work; any land that I could not work I would either sell or hand back to the State at its market value.
4822. Supposing you had irrigation, the effect would be to split up your present holding if you could *not* make use of it? It would not be possible for me to irrigate all my land, and it, therefore, would not pay me to keep the land and pay 5s. per acre.

Lazarus Harris, storekeeper, Berrigan, sworn and examined:—

L. Harris. 29 Aug., 1902.

4823. *President.*] What is your name? Lazarus Harris.
4824. You are a storekeeper in Berrigan? Yes.
4825. Are you interested in land? Yes; my brother and myself own 125 acres.
4826. Have you had any experience in irrigation? None whatever.
Effects of drought.
4827. As a storekeeper, have you been affected by the condition of things owing to the drought? Yes, considerably. The business people of the town have been affected during the past four years to the extent of 65 per cent.
4828. Do you think that could be effectually cured by irrigation? I am sure of it. If the bad seasons continue, this part of the district will become depopulated.
4829. Have you noticed any tendency in that direction? Yes.
4830. When did the tendency set in? In 1898 we lost a great number of our farming population.
4831. Has it continued since then? Not to any great extent,—not to the extent of 1898.
4832. Do you know why they left? Owing to the bad seasons—no crops.
4833. They could not make a living? It was impossible.
4834. Is there anything else you wish to add? As a business man in the town for the last fourteen years, I would like to see irrigation carried out, and am quite satisfied that the Government, even if the rental received for the use of the water is not great, will receive very great benefit in the way of population.
4835. Your idea is that if the Government does not get a direct benefit it will get a large indirect benefit? Yes.

Edward McGrady, hotelkeeper, Berrigan, sworn and examined:—

E. McGrady. 29 Aug., 1902.

4836. *President.*] What is your name? Edward McGrady.
4837. Where do you reside? Berrigan.
4838. What are you? Hotelkeeper.
4839. Is the town of Berrigan properly supplied with water under present conditions? No, it is not supplied with any water at all at present.
Water supply.
4840. How is water obtained for domestic purposes? By underground and house tanks; and the Government tank, when there is anything in it, but it has been dry since last February.
4841. Supposing a channel were constructed from Bungowannah to Berrigan, is it your idea to make use of it? It is the only hope we have of a water supply for the town.
4842. Is there no water within easy distance? The nearest is the Murray, 22 miles away. We are getting water at the present time from Jerilderie, and it is costing us 5s. for 180 gallons.
4843. What is the population of the town? Six hundred.
4844. Is it increasing? Yes. I have been here five and a half years, and I think there has been an increase of 200 in that time. I have spent £150 in making a water supply in the way of underground tanks, &c. The first eighteen weeks I was in Berrigan it cost me £3 10s. per week to get water. Since then I have been struggling along, and at present have only three weeks' supply in the tanks. I would be quite prepared to pay £40 per annum for a water supply.
4845. What would that amount to on the ratable value of your property? I do not know; I was offered £3,800 for my hotel property three weeks ago.
4846. That would be about 2s. in the £? Yes; I would pay that willingly. Some of the other hotelkeepers are worse off than I am; some of them have been paying 30s. per week for water since last November, and are still paying it.

William

William James Greggery, junior, landowner, Berrigan, sworn and examined:—

W. J. Greggery. 29 Aug., 1902.

4847. *President.*] What is your name? William James Greggery, junior.
4848. You are a resident of Berrigan? Yes; in conjunction with my father and brother, I have 4,200 acres within a quarter of a mile east of Berrigan.
4849. What portion do you farm? Six years ago we went in for the share system, and cultivated 3,500 acres altogether; latterly, on account of the dry years, we have reduced the area considerably. Last year we had about 1,500 acres in. During the good years we had thirteen families on the land altogether, and in harvest time we had sixty men employed on the place. As a result of the dry season, last year we only had nine men on the place altogether. Unless we get irrigation, we will have to reduce the area under cultivation still further. Effect of drought.
4850. Your experience is that the land is gradually going out of cultivation, owing to the bad seasons? Yes.
4851. Do you think that state of things would be remedied, if water were available? Yes.
4852. Have you had any experience in irrigation? Not in this country; but I have seen a lot of it in other countries.
4853. *Would you be prepared to pay a fair price for the use of water?* Yes; I consider it is worth 5s. per acre—that is, if we can irrigate at the proper time of year; and I would be prepared to pay that for it. Amount prepared to pay for irrigation.

Thomas George Phelts, storekeeper, Berrigan, sworn and examined:—

T. G. Phelts. 29 Aug., 1902.

4854. *President.*] What is your name? Thomas George Phelts.
4855. You are a resident of Berrigan? Yes; for seven years.
4856. What are you? A storekeeper and property owner.
4857. Are you affected, in common with your fellow-townsmen, by the want of water? Yes.
4858. In what way? By the shortage of water for household and domestic use, and by the lack of business, owing to the bad seasons.
4859. What difference has the drought made to you as a business man? I have experienced one good year since I have been here, and the bad seasons have made a difference of 50 per cent., as compared with that. Effect of drought.
4860. Is the population of the district decreasing? Yes; it has decreased since I have been here.
4861. Owing to the land going out of cultivation? Yes.
4862. Do you think that the town would be willing to pay a rate, if they got water by means of the channel from Bungowannah? I do. Water rate.
4863. What do you think they would be prepared to pay? I have twenty-one dwellings and shops, and would be prepared to pay 1s. in the £.
4864. Does water cost you any more than that now? No; I would be prepared to pay that for tenants as well as myself.

SATURDAY, 30 AUGUST, 1902.

[*The Commission met at the Town Hall, Deniliquin, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).
FREDERICK N. BURCHELL.

Robert Officer Blackwood, grazier, Hartwood Station, Billabong Creek, sworn and examined:—

R. O. Blackwood. 30 Aug., 1902.

4865. *President.*] What is your name? Robert Officer Blackwood.
4866. You are part owner of Hartwood Station, on the Billabong Creek? Yes.
4867. You have made the question of irrigation and water conservation a study for some long time past? Yes. *Realising the difficulties under which we are labouring, I have studied the question closely, believing that it is really the only way to ensure ourselves against similar severe losses in the future to those which we are now suffering.*
4868. *Have you prepared a statement to read to the Commission on the subject?* Yes.

The enormous losses incurred by both pastoralists and agriculturalists during the past few years, and also in past decades as well, are only too well-known to need more than this bare reference.

One feature connected with these losses must not, however, be overlooked, as I imagine the vast importance of it to the entire Commonwealth has not yet been fully realised. I refer to the loss, either by deaths or owing to lack of increase, there has been amongst the old-established stud flocks in the Deniliquin district, also to the loss there has been amongst what are known as the flock-breeding ewes in the same district. For the last fifty years or more these sheep have been most carefully handled, and partly owing to that, and to the fact that the country between the Murray and the Lachlan, west of a line running north from Albury, is, possibly, unequalled in the world for merino sheep, a higher class of sheep is now to be found in the district named than in any other part of the Continent. This particular area is called upon to *supply rams and high-class flock ewes to almost every part of the country.* It stands to reason, therefore, that any serious diminution in the numbers of these sheep must not only be a very serious loss to the owners of them, but to all those also who depend upon them for the improvement of their own flocks, which, in the absence of the importation of high-class blood, must either advance but slowly by the process of selection or else, possibly, go backwards. Such a state of things must be very prejudicial to the prosperity of a great number of those engaged in sheep-raising, and the loss to the States owing to the non-improvement of the flocks—if, indeed, not also to the retrograde movement of them—can only be looked upon as a national disaster. Losses of stock. A national disaster.

Owing to the decimation that has taken place in this particular district amongst the wethers, all the thousands of persons in Victoria and the higher places in New South Wales who utilise their properties for fattening, must suffer *considerably, for if the large-framed and heavily-woolled sheep, which it has paid them so well in the past to purchase as* stores and then fatten, are no longer available in the same numbers as before, they will have to content themselves with a smaller type of sheep which eats just as much grass, but which will not yield nearly the same profit.

It must surely be patent to all that it is in the interests of the States, and of every person within them, that if any known means exists for, if not entirely preventing, at least minimising the losses in a particular district which has such far-reaching consequences, it undoubtedly behoves those in power to see it carried out with the least possible delay. Preventive methods should be adopted.

The fodder bill paid by Riverina to Victoria is a very material loss to New South Wales. Up to July last the *Victorian railways had carried fodder for Riverina to the value of about half a million pounds, and thousands of pounds* worth also must have entered this State without passing over the Victorian railways. With irrigation facilities all this might readily have been produced on the north side of the Murray. Fodder bill.

The

R. O. Blackwood. 30 Aug., 1902.

The losses amongst the stock have arisen generally, of course, owing to the absence of both feed and water, but before the present drought reached its more acute phase, thousands of sheep were lost on places in this district where there was still sufficient grass to keep them alive, but no water. On the deep black soil, found so frequently on the plains, and on the red loamy soil of the forest country stretching from the Murray northwards for 40 miles or more, it is almost impossible to get tank drains to carry water unless the rainfall is very heavy, and so it is often impossible, except in good years, to conserve sufficient water for the summer. Where the hard red clay patches, with but an inch of loam on the surface, are found within the black soil or forest country areas provision can be readily made for catching and storing the surface water, but, as these patches are often not to be found, it is essential that the State should lead water to the dry areas described. On the black soil plains it is the grazier, be he large or small, who suffers, while in the forest country it is both the farmer and the grazier who feel the inconvenience and loss. To the farmer, with his small means, the loss is very large indeed, for, when he should be making the greatest possible use of his soil, he has to spend half his time instead in carting water for his stock and household from some far-distant source of supply. This simply means that his time is being expended on unproductive work, and, possibly, he is only able to put in about half the area of crop he would have done under more favourable conditions.

State should provide stock water.

Water supply would induce prosperity.

A comprehensive scheme would enable a supply of water to be placed in every paddock, and so prevent losses of stock during droughts of moderate severity; and in times of severe and prolonged droughts the sheep, instead of having to be taken out and hand-fed near water at an early stage of the dry time, would be able to shift for themselves for a good while, and thus shorten the time in which expensive hand-feeding would have to be resorted to. The farmer would be able to devote all his energy to the putting in and harvesting of his crops, knowing that his stock and household were plentifully supplied with water. Not only, then, would there be a much more prosperous set of farmers in the country, but more labour would be employed, and the national wealth would be largely increased.

Feeding stock by irrigated produce.

The benefit to Riverina which would arise from a supply of water sufficient for irrigation would be enormous. To illustrate the vast saving there would be by growing our own fodder under a scheme of irrigation instead of purchasing it, I have prepared a short statement (marked Schedule A) by which it will be seen that whereas it would cost, at any place (say) 35 miles distant from Deniliquin, with fodder purchased at current rates, £717 10s. (or 7½d. per head of stock) per week to feed 22,400 sheep on only 1 lb. of hay per day per head, it would only cost £73 10s. (or considerably under 1d. per head of stock) per week to feed the same number of sheep on 2 lb. of hay per day per head, if produced at home by irrigation.

It will thus be seen, not only that the fodder bill would be enormously reduced were we able to grow the feed ourselves, but everyone would be able to supply their stock with sufficient to keep them in good heart, instead of (as is the case in the 1-lb. per day allowance) merely keeping them alive, and very often not even succeeding in doing that.

Lucerne and sorghum.

Besides producing fodder for use in time of drought, wonderful results could be shown by putting in and irrigating both lucerne and sorghum. In order to illustrate this, I will use figures from evidence tendered at Narrandera, before the Board inquiring into the subject of a proposed weir on the Murrumbidgee, by the Hon. S. McCaughey, who is so well known as an able and practical exponent of all matters connected with irrigation.

By Mr. McCaughey's figures it is shown that an acre of lucerne or sorghum can be produced for 20s. per acre, which cost includes watering to a depth of 18 inches.

On the acre of sorghum fifty sheep could be carried for four months. This is at the rate of sixteen sheep to the acre for twelve months, as against the full carrying capacity of good land of about 1¼ acres to the sheep in an average year.

On the acre of lucerne fifteen sheep could be carried for six months. This is at the rate of seven and a half sheep to the acre for twelve months, and after the first year the cost of watering and maintaining the lucerne would not amount to very much.

Result if water distribution carried out.

These figures speak volumes, and not only show what the land is capable of, but also what a vast change would come over Riverina if a proper system of water distribution is carried out. The stock in the district are so valuable that apathy would not prove a factor adverse to advancement, and very soon large use would be made of any facilities provided for turning the water on to the land, and thousands upon thousands of most valuable stock would be maintained in safety, not only for the benefit of the actual owners, but of countless other pastoralists, and for that of the State.

There are some who, through ignorance of the subject, hold the opinion that irrigation is not succeeding in the Goulburn Valley in Victoria. As a matter of fact, it is succeeding wonderfully well in all cases when taken up by those who considered they knew enough about it to make a start; and a gentleman representing the *Argus*, when making a tour through the district, remarked that "No single man was found to have given up irrigation after having once started it."

Farmers conservative.

Farmers are essentially a conservative and cautious class, and as the irrigation scheme was launched amongst them as something entirely new, not only new to them but new to Australia generally, it was only natural that they should be slow at first to take it up; but gradually the more enterprising amongst them began to utilise the water, and the object lessons taught by them have been so unmistakable that many more are quickly awakening to the fact that they are allowing golden opportunities to slip by them; and I am confident the cry will, in a few years, be, not that the water is not being properly made use of, but that there is not nearly enough of it to supply all the requirements. The statements, all teeming with success, made to the *Argus* representative when touring through the Goulburn Valley, by different irrigationists there, amongst them being Messrs. Pagan, Cussen, Gaffy, West, and Cavanagh, show what an immense success is being made of irrigation, and the report of an *Age* representative who made a similar tour, only confirms the same story.

Irrigation an immense success.

When irrigation is started in Riverina, instead of having to handle an unknown subject, we will have all the experience gained in the Goulburn Valley to guide us; and as the soil in the two districts is identical and climatic conditions very similar, we will, without a doubt, almost immediately make full use of whatever water is given to us.

Soil remarkably rich.

I have already mentioned the black-soil plains of this district when dealing with the water supply for stock. This country is remarkably rich, much more so than the loamy land in the forest country, and with water applied to it would undoubtedly yield crops of grain, lucerne, or sorghum which could not be surpassed anywhere else in Australia. The soil is of great depth, and so the danger of ever overflooding it would be very remote.

Navigation and irrigation.

I consider both in the interests of the States, the producers, and of the vested interests, that navigation should go hand-in-hand with irrigation.

There is a total length of 3,213 miles on the rivers that is now navigable, viz.:—

*Goolwa to Wentworth	617 miles
Wentworth to Mungundi...	1,356 ,,
Do Junction of Murray and Murrumbidgee...	255 ,,
Murrumbidgee Junction to Narrandera	500 ,,
Do to Corowa	485 ,,
Total	3,213 ,,

* I am indebted to Mr. D. J. Gordon's "The Gateway of the Interior" for the figures relating to navigation.

Homesteads, &c. on rivers.

As practically all homesteads and most wool-sheds are situated on these rivers, they serve the requirements of the settlers and townsmen for the removal of produce and the receipt of stores in a way that no railway can do.

Water carriage cheaper than rail carriage.

The carriage of goods or produce by river is vastly cheaper than by rail. For instance: one of Capt. King's boats, on Murray or Murrumbidgee, charges 4s. 6d. per ton for wheat for 500 miles, while the train rate for same distance in South Australia is £1 4s. 1d., and in Victoria £1 3s. 2d. per ton.

By making provision for the utilisation of these rivers for navigation, the producers and manufacturers would greatly benefit, and the State would be enriched.

Vested interests.

The vested interests must either be considered or compensated, and they are by no means an insignificant quantity. In 1901, the vessels registered on the Murray and Darling alone were as follows:—

Steamers	87	...	With a tonnage of 7,709 tons.
Barges	80	...	,, ,, 8,600 ,,
Total vessels	167		Total ... 16,300 ,,

Navigation less important than irrigation.

Besides these vessels, a very large sum of money has been invested in wharfs, &c., and in the snagging of the rivers.

I believe that, were it necessary to choose between irrigation and navigation, the latter would have to go in the interests of the country as a whole, but compensation would have to be given. It is evident, however, that the two can go quite well hand-in-hand, and each will thrive the better owing to the presence of the other. Estimates have been prepared by able engineers for making provision both for irrigation and for navigation. It is the duty of the States to protect and develop both the irrigation and navigation interests, and not to sacrifice the one to the other.

I

I can say with confidence that one and all will only too gladly pay any reasonable rate levied for the payment of interest on the capital expended and for maintenance. Our one hope is that the work, or some portion of it, may soon be sanctioned and carried out, believing, as we do, that the very salvation of this district depends upon it.

R. O. Blackwood. 30 Aug., 1902.

SCHEDULE A.

Cost per acre of irrigated crop.

Putting in and harvesting an irrigated crop.	s.	d.	
Ploughing, pickling, and putting in	7	0	an acre.
Harvesting, inclusive all costs...	4	6	,,
Seed wheat	3	6	,,
Rent of land—5 per cent. on £3	3	0	,,
Water rate	1	0	,,
Water used (three waterings at 4d. per acre)	1	0	,,
Cost applying water (labour)	1	0	,,
	£1	1	0

Yield.

A very moderate irrigated crop would yield 2 tons to the acre, and so each ton would cost 10s. 6d.

Purchased fodder.

Purchased fodder now costs £8 15s. in Deniliquin, and to land it at a place 35 miles distant costs 30s. a ton—total cost, £10 5s. per ton.

Feeding on purchased fodder.

It would cost £10 5s. per day to feed 2,240 sheep on 1 lb. per head, or £71 15s. per week.

Home-grown fodder.

Feeding on home-grown fodder.

It would cost 21s. per day to feed 2,240 sheep on 2 lb. per head, or £7 7s. per week.

Cost of feeding sheep.

For a large mob of sheep.

Fed on purchased fodder, 22,400 sheep would cost £717 10s. per week, with a 1 lb. per day allowance, or over 7½d. per head.

Fed on home grown fodder, 22,400 sheep would cost £73 10s. per week, with a 2 lb. per day allowance, or considerably under 1d. per head.

Area of station. Stock.

4869. What is the area of your station? As nearly as possible, 100,000 acres.

4870. What sheep do you run on it? In a good year we shear 100,000 sheep including lambs.

4871. What are you shearing this year? It is very doubtful if we will shear more than 70,000.

4872. What is the difference due to? To the loss caused by the absence of feed.

Irrigation not practised.

4873. Do you irrigate on your holding? No. We have never had an assured supply of water, and have, therefore, been unable to do so. We have a small plant there but cannot proceed, for the simple reason that we have not got the water.

4874. Have you a fair stock supply? Yes; at present.

Water supply.

4875. Where do you get it from? The Billabong and Yanko supply the two creeks we have.

Yanko cutting.

4876. What has been the effect of the diversion from the Murrumbidgee at the head of the Yanko, so far as you are concerned? It has benefited us very greatly, and also about 2,000 miles of single frontage to the creeks in question.

4877. Take last year;—how far did the water run? Right through to the Edwards.

Surplus water.

4878. Was there a surplus of water? There was a certain surplus which reached the Edwards, which might have been conserved with great benefit to everybody. There are conservation dams on these creeks for stock purposes, but nobody has erected dams sufficient for irrigation, for the simple reason that they know the water cannot be depended upon. The absence of a regular flow of water in those creeks is what has prevented the settlers on the Yanko, Billabong, and Forrest Creeks from going in for irrigation.

Cannot be depended on.

Reduction of stock due to drought.

4879. Have you any means of making an estimate of the difference in the stocking of the country, lying between the Billabong and the Murray, between the present year and a good year when the runs may be said to be fairly stocked? In our particular case, where we have fared rather better than most places, we have about 33 per cent. less stock now than we would have in a good year when there was lots of water and grass; but, from what I hear on all sides, I should think the decrease in stock is nearer 50 per cent. than 33 per cent.

Bungowannah diversion.

4880. In your opinion, what would be the effect of the construction of the canals, as proposed, to carry the water from the suggested weir at Bungowannah? In good years it would undoubtedly have the effect of enabling everybody to carry a much greater number of stock than they do now, because, having crops either growing or that have been cut and stacked ready to hand, people would stock up more heavily than they do for the summer months. Now, in a good year the country is very much understocked, because the people cannot see far enough ahead. They fear that the autumn rains may be late, and they therefore think it is better to put too few stock on their runs than too many. But if the fodder is there they could stock their runs up to their full carrying capacity, and in a bad year like this, instead of there being possibly a diminution in the flocks of something like 50 per cent. in this district, possibly a 10 or 15 per cent. diminution would cover it.

Proportion of land which should be irrigated.

4881. What do you think would be a fair proportion of the land in a large holding, such as yours, to set aside for irrigation purposes and the cultivation of crops in that way? To maintain stock on a place in this district up to its good season carrying capacity, I consider that on a place of 100,000 acres, if a man had 500 acres of lucerne, 500 acres of sorghum, and possibly 100 or 200 acres of cereal crops, such as wheat or oats, he would be able to maintain his stock up to the proper number. But, of course, if he wished not only to maintain his sheep up to the present number, but to increase the carrying capacity of his property, then I think, instead of 500 acres of lucerne, 500 acres of sorghum, with 100 or 200 acres of cereals, you would find there would be on a place of 100,000 acres a good many thousand acres put under irrigation.

Charge for irrigation.

4882. In making an estimate of the quantity of water required for irrigation in the district, would you consider 20 per cent. of the land too high a figure? Twenty per cent. is in excess of what I have already stated. Whilst it is very probable that people may utilise 20 per cent. of their holdings for irrigation, before the experience has been gained, it is very difficult to say what portion of their holdings would be utilised for that purpose.

4883. What do you consider a fair charge per acre per annum to make for irrigation? The charges made in the various trusts in Victoria—Rodney, for instance—where I understand the rate per annum is 8d. per acre, and then a certain charge in addition to that for the use of the water. I think 4d. per inch per acre is charged for water used for irrigating lucerne, sorghum, or stubble, and that rate appears to

me

R. O. Blackwood. 30 Aug., 1902.

me extremely reasonable, and if a similar rate were charged here we might all consider ourselves very fortunate.

4884. It has been given in evidence that all that is paid for each irrigation is 3 inches, no matter what amount of water is put on;—does that at all modify what you have said? In the absence of practical experience, I should think a rate of 1s. per acre, and 1s. per acre for watering, would be ample until it had been proved what benefit could be derived; at the same time I have not the slightest doubt that, rather than have no water at all, those in the district would be prepared to pay even a higher rate than that.

Charge for stock and domestic supply.

4885. What would you say would be a *fair charge to make for the use* of the water for stock and domestic purposes? The general rate would have to be paid, and then I would charge so much per cubic foot for water taken to fill tanks or for ordinary domestic purposes, and I would levy that rate in the same proportion as for the flooding of a field.

4886. I understand that you propose first of all a general rate on the whole of the land of so much in the £, that you would charge per cubic foot for any water put into tanks, and that you would charge per acre per annum for the irrigations that are asked for by the squatter or farmer? Yes, with this reservation: In charging the rate for the land it should be for land which may reasonably be supposed to be commanded by the main channel, because in certain instances you may get land far distant from the main channel, yet within the same holding, which cannot be reached by the water.

4887. *Mr. Burchell.*] How long have you been resident on your station? My father bought the property in 1861, and I was there as a boy. In 1889 my brothers and myself purchased it from my father's trustees.

Flow in Yanko Creek.

4888. How far has the water flowed down the Yanko Creek this year? As far as Widgiewa or Coonong, but the rise in the Murrumbidgee this year has been so slight that we could not expect it to flow very far. The highest was 1 ft. 9 in. above summer level, and it only remained at that a few days.

4889. Thirty miles? Possibly.

Wells.

4890. Have you any wells on your station away from the river? Five altogether.

4891. What is the condition of the water? Practically fresh. You can just detect a slight taste when you drink it; horses do not care very much about it, but sheep will drink it.

4892. What depth have you sunk? About 100 feet.

Rainfall.

4893. Have you any rain-gauge on your station? Yes. The average prior to this present drought was 17 inches per annum.

4894. Do you recognise that any irrigation must necessarily be based on the minimum volume of water available in the river? Yes.

Limits of irrigation.

4895. Also that, when the minimum volume discharged goes to serve all concerned, the areas cannot be very extensive? Certainly not.

Talmalmo works essential.

4896. What would you suggest to enable you to get your supply in a season like this? I think it absolutely essential, if this scheme is carried out on an extensive scale, that the proposed works at Talmalmo should be constructed.

Tocumwal diversion.

4897. *President.*] Is there anything further you wish to add? I would like to draw your attention to a proposition that has been made, I do not know whether it has been recommended, but at any rate it has been inquired into by the Public Works Department, and surveys have been made by one of the officers of the Department. The proposal is to bring water by means of a canal from a point about 8 miles from the intake of the Tuppal Creek, running in a north-westerly direction to a point on the Forrest Creek, a few miles to the south of Conargo (marked in blue on *Exhibit* 94). I understand that it is proposed to construct a weir on the Murray River below the intake of the Tuppal Creek, and then at a point 8 miles down the Tuppal Creek to erect another dam or weir with a regulator, and from that point, after a sufficient supply of water has been allowed to flow down the Tuppal Creek, to divert water down a canal running in almost a north-westerly direction to the point on the Forrest Creek to which I have referred. Of course this scheme is not to be looked upon as in opposition to the Bungowannah scheme. Whether the Bungowannah scheme is carried out or not, we hold that this particular scheme would still be of great use. The requirements of the district that would be served by this scheme are so pressing that a great many of us in this locality believe the country would benefit very materially if it were carried out at once, and that it would also have the effect, when the Bungowannah scheme is carried out, of relieving the larger scheme of a certain amount of work it would otherwise have to do. The canal I am now referring to would pass through exceptionally good country from its commencement to its termination; excellent in every way for wheat growing, and country where it is difficult to conserve water in tanks on account of the spongy nature of the soil. A great many of us here are very eager indeed to see this proposed canal constructed.

4898. What would be the object of the canal you have referred to, for the purpose of carrying the water into the Eight-mile Creek? The principal object would be to supply a dry area of country with sufficient water for stock and domestic purposes, so as to allow farming to proceed unhampered, and also the surplus water would then flow into Forest Creek and greatly improve the flow. If there were still sufficient water, it could then be led into the Billabong Creek, and greatly augment the supply of water at Conargo, Wanganella, and other townships along the course of the Billabong.

Holdings.

4899. Is the country settled or used for grazing purposes? There is a great deal of settlement along the course of the canal; there are certain large properties, but the country is interspersed here and there with smaller ones.

4900. What are the large holdings? Tuppal, Hartwood, and Quiamong, and then of course a number of smaller holdings.

Bungowannah scheme preferable to Tocumwal.

4901. It has been suggested to the Commission that the diversion you speak of at Tocumwal might take the place of the Bungowannah diversion;—what is your opinion about that? I think, undoubtedly, the Bungowannah scheme would serve a vastly greater area of country than the Tocumwal scheme.

4902. And your object in proposing the Tocumwal diversion into Forrest Creek is not in any way to substitute that for the proposed Bungowannah scheme? *In no way to do that.* I would rather withdraw such a proposal than see the Bungowannah scheme faced with any kind of opposition, because I believe the latter will confer enormous benefit to the country.

4903. *Mr. Burchell.*] Do you recognise that the *Tocumwal scheme would mean constructing* two locks and weirs across the Murray instead of one at Bungowannah? Yes; it would certainly do that, but in view

R. O. Blackwood. 30 Aug., 1902.

view of the *fact that navigation*, no doubt, will be considered in connection with the schemes now being put forward, it seems to me that a lock there will serve two purposes; it might very likely be a point where it would be found necessary to place a lock for the purpose of navigation, and, if so, there would practically be no extra expense. Of course, if navigation is not going to be considered, then a second weir there would undoubtedly increase the expense.

Navigation above Echuca.

4904. Do you think that navigation would be of any material value above Echuca on the Murray? I believe that navigation is valuable wherever one of those streams flows. Wherever there are settlers on the banks of the rivers, who require produce to be sent away or stores to be brought to them, I think navigation is of great importance and should be protected and safeguarded in every way.

Yanko Creek cutting does not greatly reduce river level below Hay.

4905. It has been given in evidence that the diversion which has been made at the head of the Yanko Creek has materially affected the level of the river below Hay; what is your opinion as to the causes of that—are they wholly due to the diversion in question or only partly due to it? In times of drought, such as we have had, when the banks of the river are dry, and the country on either side of the river dry, the soakage must be vastly *greater than in normal years*, and these people, I think, are comparing the readings at Wagga and the corresponding height of the river at their places during the good years of seven, eight, or ten years ago with the present time, when the loss by soakage is so much greater. And the disappointment they may feel at not receiving as much water as they might expect, after seeing the height of the river at Wagga, is more due to this loss by soakage than to what is taken away by the Yanko Cutting in excess of what it took many years ago.

Richard William Holmes, farmer and grazier, near Deniliquin, sworn and examined:—

R. W. Holmes. 30 Aug., 1902

4906. *President.*] What is your name? Richard William Holmes.

4907. Are you a resident of the Deniliquin district? Yes, since 1874.

4908. What are you? A farmer and grazier.

4909. Where is your land situated? Sixteen miles west of Deniliquin, down the Edwards.

4910. What is the area? My family and myself have 7,600 acres.

4911. Are you cultivating any portion? Not the last six or seven years.

4912. Owing to what? Owing to the frequency with which the droughts come. We have not been able to get any crop.

4913. Have you got water for stock and domestic purposes? Yes.

4914. Where do you get it from? We have a frontage to the Edwards and Wakool, and also a couple of wells.

Irrigation.

4915. Have you any idea as to irrigating on your property? I have had no practical experience of irrigation, but I *think it would be of great advantage* if we could be sure of growing some crop each year. If we could have had one watering in September we would have got a good crop.

4916. Would you be benefited by the proposed channel from Bungowannah? *I do not think so.*

Stock supply.

4917. What would you suggest to the Commission? I would suggest having the water ensured for stock purposes, if it was not available for irrigation.

4918. Even supposing there is not enough water for irrigation purposes, you consider it would be of very great advantage to the district to have a permanent and reliable supply for stock and domestic purposes secured? Yes. There is one point which I look upon as being very important, and that is that in five years out of six all the failures would not be failures if water could be obtained during the month of September. The crops come up, and there is a dry spring and they die off.

4919. Do you know what is being *done in the Goulburn Valley?* Yes; I have never lived there, but I have been through the district purchasing fodder, etc.

Proportion of land which would be irrigated.

4920. Have you formed any opinion as to what proportion of the land a farmer and grazier, such as yourself, would be *likely to irrigate? I should think* 5 per cent. where they are carrying on stock-growing as a principal industry and the cropping for an insurance.

4921. Supposing the land was used primarily for agricultural purposes, what would you say then? I think we would want to use 25 or 30 per cent.

Charge for irrigation.

4922. Have you any idea as to what would be a fair charge per acre per annum to make for the privilege of irrigation? For irrigating for crop, I think 1s. each watering would be very cheap, but if distributed over a holding where only 5 per cent. was irrigated, then I think 1s. per acre on the whole area would be too much. I think there should be a charge for the privilege of using it for stock, and an extra charge for irrigation.

Irrigation increases land values.

4923. Do you know of your own knowledge that the land in the Goulburn Valley has increased as the result of the irrigation scheme? Yes, immensely.

4924. To what extent? In many cases well over 50 per cent. Before the irrigation scheme was initiated, land was sold at from £4 to £8 per acre. It is now saleable at from £8 to £12.

4925. Do you know the land between the Billabong and the Murray, extending up towards Corowa? I know it from here to Finley and Berrigan.

Land equal to Goulburn Valley land.

4926. How does it compare with the land that is being irrigated in Victoria? I think the country from Finley to Berrigan, and then across on to the Murray at Tocumwal, is quite equal to the Goulburn Valley country.

4927. Do you consider it as suitable for irrigation? Yes; there is less hard country, and it is more densely timbered and more loamy.

Gabriel Casley, farmer, Hartwood, sworn and examined:—

G. Casley. 30 Aug., 1902.

4928. *President.*] What is your name? Gabriel Casley.

4929. You are a farmer at *Hartwood?* Yes.

4930. How many acres do you farm? 670.

4931. What portion do you cultivate? Eighty acres.

4932. Has the cultivation so far been a success? It was for three years.

4933. Where were you before you came to this district? Kerang.

4934. Had you experience in irrigation there? Yes; for twenty years.

G. Casley. 30 Aug., 1902.

4935. How does the soil compare, so far as Hartwood is concerned, with that which you have had experience of in Victoria? I have not seen any soil in Victoria that will compare with the soil between Hartwood and Finley. It is sandy, loamy soil, most suitable for irrigation.

4936. I understand that you advocate irrigation so far as you are concerned? Certainly.

Proportion of irrigable land.

4937. What proportion of the land do you think it would be fair to set aside for cropping? If water was brought down, the land would all be put under crop. It would not pay to graze if we could get sufficient water.

4938. What would be a fair area to expect a man to get a living on? 320 acres, if he could get the water when he wanted it, say, from the 1st of August to the latter end of October.

4939. How many irrigations would you want in that time? About two; with local rain, only one.

Crops.

4940. What do you think the soil would be suitable for growing? I think it could grow anything—maize, ambercane, wheat; in fact, any cereals whatever. I grew some turnips at Hartwood the year before last which weighed 14 lb.

Water charges.

4941. Have you had any experience as to the charges made in the Goulburn Valley and Kerang? In the Kerang district they charge 6d. to 1s. per acre for grass, and 1s. to 2s. per acre for crops.

4942. Per irrigation? Yes.

4943. What do you think a farmer could pay for the privilege of getting water during the months that you speak of? From 1s. 6d. to 2s. per watering.

4944. That is to say, 3s. to 4s. per acre per annum? Yes; and it would be cheap at that.

4945. *Mr. Burchell.*] What would you grow on the 320 acres? Wheat, lucerne, sorghum, and maize.

4946. What proportion would you grow of each? About 40 or 50 acres of wheat, 40 or 50 acres of lucerne, and a proportion under sorghum and maize.

4947. Have you had any experience in fruit growing? No.

Alfred Jameson, President of the Murray River Main Canal League, Deniliquin, sworn and examined:—

A. Jameson. 30 Aug., 1902.

4948. *President.*] What is your name? Alfred Jameson.

4949. You have been a resident of the district for 32 years? Yes.

4950. You are President of the Murray River Main Canal League, Deniliquin? Yes.

4951. Have you had experience in grazing and agriculture in the district? Yes.

4952. You are well acquainted with the district owing to the fact that you have had business relations with the settlers? Yes; I am a land agent, and have an extensive practice.

Present condition of country.

4953. Will you tell us what the condition of the settlers is at the present time? Speaking of the Deniliquin district, almost without exception, every settler at the present time is unable to carry stock, owing to there being no water supply. That condition has been more or less maintained for the last eight seasons. In my opinion, it is quite impossible for small settlers to occupy these lands profitably unless a permanent water supply is available.

4954. You are speaking now of a water supply for stock and domestic purposes? Yes.

4955. Do you regard that as being of greater importance than irrigation? I regard that of primary importance.

Size of holdings.

4956. What area can a selector make a living on by using it for grazing purposes? With water, 1,000 acres. The country varies considerably; in the immediate neighbourhood of Deniliquin the carrying capacity of the land is much greater than what it is on the lower part of the Billabong.

Country served by Bungowannah canal.

4957. Do you consider the country traversed by the proposed canals from Bungowannah suitable for grazing purposes? Essentially so, I know all the country to within a few miles of Corowa.

4958. In your opinion, would it not be better for the State if a mixed class of farming were inaugurated, rather than that the whole of the land should be devoted by settlers to grazing? Yes; mixed farming—grazing and agriculture.

4959. Can mixed farming be carried on without irrigation? No; not successfully.

Rainfall precarious.

4960. You think that the rainfall is too precarious? I am absolutely certain of it.

4961. What in your opinion would be a fair proportion of land to set aside for cultivation? If a man had 1,000 acres he should be able to cultivate one fifth of it, provided it is agricultural country, which it is between here and Corowa.

Area necessary to a fair living.

4962. Have you formed any opinion as to the area that would be necessary for a man to make a fair living on, assuming that he cultivated 20 per cent. and devoted 80 per cent. to grazing? Yes; the answer to that question would depend upon the character of the country, which differs very much in this district. On Perricoota and Moira 320 acres would be quite sufficient to maintain a man, provided he had a permanent water supply. Between Mathoura and Deniliquin he would require at least 640 acres with an assured water supply. From Deniliquin to Tocumwal the lands are generally of a better character than between Mathoura and Deniliquin. But I think the minimum area he should have is 640 acres. The richest lands I know of are along the Bullatale Creek, a few miles south of the main canal.

4963. What would the water be worth to a selector per acre for stock and domestic purposes? I have not gone into that.

Irrigation and navigaton.

4964. Have you thought over the question of navigation? Yes; I should be averse to carrying out a scheme of irrigation which would be prejudicial to navigation, on the grounds that there are vested interests in existence, and navigation is a very cheap means of carrying freight to and from the settlements on the navigable rivers.

Edwards River navigable.

4965. Would you include the Edward in the navigable rivers? Yes.

4966. To what extent? From its mouth to Murga station, 40 miles below Deniliquin.

4967. How often is the Edward navigable? Every year for about three months.

4968. *Mr. Burchell.*] When was the last occasion on which a steamer navigated the Edward up as far as Moulamein? In November last. The condition of the river depends greatly on the rainfall and the snow upon the mountains; in other words, as the Murray rises and falls, so does the Edward. No water has flowed into the Edward this year from the effluence with the Murray. The water has lately run through the Edward at Deniliquin, but that was due to an artificial cutting on the Gulpa Creek.

Yanko Creek.

4969. *President.*] Is there anything further you wish to add? Since the alteration was made last year at the head of the Yanko Creek, the supply in the Billabong has been increased, and the water now comes quicker than it did formerly.

A. Jameson. 30 Aug., 1902. Flooding &c. from Edwards River.

4970. *Mr. Burchell.*] At what height does the water flow over the flats at junction of Edward and Murray, as referred to the Echuca gauge? I will get that information for you. There is a general tendency for all creeks and rivulets to be high at their in-take. Take the Wakool, for instance. Until last year it had not run since 1894, but the Government deepened the in-take, and for a length of 5 or 6 miles deepened the channel, which gave a splendid supply of water to all the down-stream owners of land on the Wakool River, and that river now takes water when the river gauge at Deniliquin shows 4½ feet above summer level as against 11 feet previously. The manager of one station alone—Cobran—told me that it had been worth £300 to him this year. That station is now suffering very badly for want of water, and has had recourse to making thirty wells.

Effects of drought.

4971. *President.*] Owing to the want of water, do you think that the settlement in the district has been affected? Yes, materially.

4972. To what extent? As regards the lands that have recently been acquired for small settlement, altogether there are fully thirty blocks or farms, the owners of which have not been able to occupy them this year through having no water, and they have been obliged mostly to reside in the nearest towns. They have not been able to conserve water by rainfall, and the borings have been unsatisfactory—they got salt water.

4973. *Mr. Burchell.*] At what depth? From 30 to 70 feet.

4974. Is 70 feet the deepest they have sunk? That does not apply generally. In some parts of the district they invariably get a good supply.

Canal at confluence of Murray and Edwards would assist navigation.

4975. *President.*] Have you any further statement to make? I am of opinion that, providing a proper channel were cut at the affluence of the Murray River with the Edward River, small trading steamers would be able to navigate the whole length of the Edward River, and thus afford a cheaper means of delivering settlers' stores and station requirements, besides taking away grain, wool, and other products of the country lands. This course would also greatly facilitate and cheapen the trading in red-gum timber and the more readily obtaining of it along the river, apart from the facilities it would afford to firewood getters. Some few years back a saw-miller used a small steamer and barge for several seasons in bringing red-gum timber from the Gulpa Island to Deniliquin. The distance that steamers navigate at present for trading purposes to Murga is 35 miles down stream from Deniliquin, and not 40 miles as stated in my general evidence before the Royal Interstate Commission on the Conservation of the Murray River and other Works. The making of the Tuppal Creek cutting from the Murray River, and of the Gulpa Creek cutting from the Murray River, has very materially increased the Edward River flow. I believe in the natural streams being made permanent and artificial channels therefrom to supply stock or provide water for domestic or household or garden requirements, or to allow a settler to flood a small area of cultivation as a safeguard against want of fodder in time of drought. In my opinion, only a proportion of the lands in this land district near to the natural creeks could be successfully treated for agriculture, if I except one or two important agricultural centres south of Deniliquin. The major part of the Deniliquin district is purely pastoral country.

Tuppal Creek cutting.

Frank Sparrow, hotelkeeper, Deniliquin, sworn and examined:—

F. Sparrow. 30 Aug., 1902.

4976. *President.*] What is your name? Frank Sparrow.

4977. You are a hotelkeeper in Deniliquin? Yes.

4978. How long have you been acquainted with the district? Over forty-five years.

4979. Do you know the country between here and Corowa? Yes, and the whole of the surrounding country.

Quality of soil.

4980. How does it compare with land on the Victorian side of the Murray? I consider that about 7 or 8 miles in the Finley direction, and away to the east up the Murray at Corowa, it is better land than that found in the Goulburn Valley.

4981. Do you think it suitable for irrigation? I do.

Stock and domestic supply.

4982. From what you know of the present condition of things, do you think the case would be met if the settlers and squatters had an adequate water supply for stock and domestic purposes? I think so.

4983. You think that the case would be met without irrigation? I think, if the creeks and lagoons that have been dry for years were supplied with water, the stock that are now perishing would be saved, and it would be of great benefit to the pastoralists and the large, as well as the small, holders.

4984. Is there anything else you wish to say? I believe that canalisation would promote settlement.

MONDAY, 1 *SEPTEMBER*, 1902.

[*The Commission met at the Mechanics' Institute, Cobram, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Robert Crowsdale Bourchier, farmer and grazier, Yarroweyah, Victoria, sworn and examined:—

R. C. Bourchier. 1 Sept., 1902.

4985. *President.*] What is your name? Robert Crowsdale Bourchier.

4986. You are a farmer and grazier in the parish of Yarroweyah? Yes.

4987. How many acres have you? 5,120.

4988. What do you graze? Cattle and sheep.

4989. What portion of that 5,120 acres do you cultivate? 3,560.

4990. What do you grow on the portion cultivated? Wheat chiefly.

4991. Have you found it a success without irrigation? Not during the last two years, owing to the extreme dryness of the climate.

4992. Otherwise, it has been fairly successful? Yes.

4993. Is it your opinion, if the rainfall was supplemented by irrigation, that the cultivated portion of the lands would be benefited? Immensely so.

R. C. Bourchier. 1 Sept., 1902.

4994. Have you sufficient water for stock and domestic purposes? Personally I have, because I live on the frontage; but many people in the district (whom I represent here to-day) have not.
4995. You are speaking also for the farmers in the parishes of Strathmerton, Yarroweyah, and Ulupna? Yes.
4996. What you say with regard to supplementing the rainfall by irrigation applies to the other farmers also? Yes.

Koonoomoo scheme.

4997. Have the people of the district come to any conclusion as to the best way of providing water by artificial means for stock and domestic purposes, as well as irrigation? Yes; by means of a lock and weir across the Murray to give a gravitation supply for the Koonoomoo scheme. The lock and weir would be in the neighbourhood of Koonoomoo or Tocumwal.
4998. Has the scheme been crystallised? Yes; by the Water Supply Department, many years ago.
4999. A proposal was made to them in terms of the Water Supply Act? I believe so.
5000. Could you tell us briefly what was proposed to be done? They proposed to establish a pumping plant on the Murray at Koonoomoo, and supply the country from the Murray south to the Broken Creek at Numerkah. The main channel was to run east of Numerkah from Koonoomoo to the Broken Creek, and supply the whole of the country between the Murray and Broken Creek, and between the first main channel and the Murray on the west side again. I put in a plan showing what was proposed. [*Exhibit* 95].

Cost.

5001. Was the estimated cost of that scheme £157,000? Yes.
5002. Was that for pumping or for the lock and weir? The pumping scheme alone.
5003. You have not got the cost of the gravitation scheme you speak of? It was originally mapped out on a pumping principle, but the people objected to the scheme on account of the great cost, so we are now asking for a weir to get over the cost of a supply by means of pumping.
5004. Do I understand, then, that you propose to divert water at Koonoomoo for the 314,000 acres shown on the plan which you have handed in, and that that scheme will be quite independent of the East Goulburn irrigation scheme, and also the Waranga, Cobram, and Tungamah scheme? Yes.
5005. Supposing, instead of diverting water at Koonoomoo, it was eventually decided to bring water from Bungowannah across the Ovens, would that not answer the same purpose that you have in view? Not being familiar with the levels, I cannot say; but I imagine not.
5006. Supposing the levels allowed it? If it gave us the same supply it would do just as well.
5007. There is no reason why the water should be diverted at Koonoomoo and Bungowannah? Our only hope of a supply is from the Murray at Koonoomoo. We have no other source we know of.
5008. Have you studied the Murray-Goulburn scheme? I just have a general idea of it.
5009. Do you know that it was intended to bring water from Bungowannah to supply the whole country between, say, a straight line drawn from Bungowannah to the Goulburn weir? I am aware of that, and, though I am not opposed to the country getting water, I think the money would be better spent in providing storage reservoirs on the Broken River or Buffalo Mountains.

Koonoomoo scheme preferable to Bungowannah.

5010. Your idea is, instead of having a big national channel from Bungowannah, it would be better to divert water at Koonoomoo, and make the best use of the rivers by providing storage? Yes.

Navigation above Echuca.

5011. Will you give us the views of your district in regard to the navigation of the Murray? In our district we consider that irrigation is first and navigation nowhere. There is practically no navigation above Tocumwal.
5012. Is there very much above Echuca? Not much. It is merely a timber trade to the Echuca mills.
5013. As a matter of fact, the only navigation traffic on the Murray above Echuca would be for timber? That is so.
5014. You do not express any view as to the navigation below Echuca? No.
5015. Your expression of opinion relates only to the Murray in the vicinity of Cobram, and downwards to Tocumwal and upwards towards Albury? Yes.

Rainfall supplied to Commission at Numurkah unreliable.

5016. Is there anything else you wish to add? Yes. A certain rainfall was given to the Commission at Numurkah, which showed that for a period of thirty-five and a half years the average was something like 19 inches. This cannot be regarded as altogether reliable, for the simple reason that on the Murray frontage here we have lagoons which I have never seen dry, and which have dry saplings standing in them now, showing that at some period or other, before white men came here, there must have been a terrific drought in this part of the country. From the size of the saplings they must have taken at least twenty years to grow. They have been there twenty-four years to my knowledge. One lagoon in particular during the whole of that time has never been dry. So I do not think the record can be regarded as reliable, for that reason.
5017. Anything else? Our State Government recently gave away a storage reservoir in the district. I think that policy is wrong. I think all these natural inland storages should be reserved for storage purposes, and in alienating Crown lands, where there are natural storages and water-courses, the Government should reserve to itself an easement over them.

McLeod's Swamp.

5018. What storage do you refer to? The storage I refer to in this district is known as "McLeod's Swamp."
5019. *Mr. Burchell.*] What is the average yield of wheat here in a good season? From four to five bags; with a fair rainfall we can manage that on an average.

Wells.

5020. Are there any wells in the district? The district is well supplied with wells.
5021. What is the water like? Good.
5022. What depth have you had to sink? An average of over 100 feet.
5023. Have you a good supply? Tolerably.

Stock supply insufficient.

5024. Would a thoroughly-equipped stock supply suffice for the district? Not at all. We want something more than we have in the way of moisture for our land.
5025. How many bad seasons have you experienced? This is the eighth now in which the moisture has not been sufficient.
5026. Have they been continuous? Yes; we have never had such a long spell of dry seasons in succession.
5027. What is about the average area on which farmers are growing wheat here? 320 acres or more.
5028. *President.*] You are acquainted with what is proposed to be done at Bungowannah—that is, to divert a certain portion of the water the whole year round on the New South Wales side of the river, another portion on the Victorian side of the river by means of a channel across towards the Goulburn, and the third portion to run down the river as heretofore? Yes.
5029. Mr. McGregor's proposition, I think, was to divert 40,000 cubic feet per minute on to the New South Wales side, 40,000 cubic feet per minute on to the Victorian side, and allow 40,000 cubic feet per minute to run down the river;—what have you got to say in regard to that? We do not wish to oppose any of these diversions, because we recognise the water is wanted; but, on the other hand, we consider that these diversions will lower the river here to such an extent that creeks which run now with an ordinary river will not run at all. A lot of the creeks in this neighbourhood only run when the river reaches about 15 feet to 19 feet.

R. C. Bourchier 1 Sept., 1902.

5030. Can you give us an instance now? The Sheepwash Creek, which supplies the Koonoomoo Lagoon and village settlement. The river has to be a fair height at Albury to supply that lagoon and the village settlement. There is another smaller creek which used to run at 9 feet 6 inches, but if these diversions near Albury take place we fear that it will not run at all. Then there is the Tuppal Creek on the New South Wales side; if these diversions are made, it will not run as quickly now with the cutting as it did before.

Effect of proposed Bungowannah diversion.

5031. *Mr. Burchell.*] Do you not recognise that that would apply to several places already established lower down the river, where water is required for irrigation purposes? Yes; no doubt it would.

William Henry Curtis, farmer and grazier, Cobram, &c., representing the Cobram Agricultural Society, sworn and examined:—

W. H. Curtis. 1 Sept., 1902.

5032. *President.*] What is your name? William Henry Curtis.
5033. You are a farmer and grazier of Cobram, Yarroweyah, and Berrigan? Yes.
5034. How many acres have you? 1,000.
5035. How much cultivation? Up to about 600 acres.
5036. Do you go in for fruit-growing? Yes, 30 acres.

Irrigation. Pump. Windmill.

5037. Do you irrigate that? Yes.
5038. How? At the present time I have a steam pump capable of throwing 5,000 gallons an hour.
5039. Did you irrigate with that pump last year? No; I had a windmill last year.

Number of waterings.

5040. How many times do you think it will be necessary for you to work the pump to enable you to irrigate the 30 acres? I think I would have to give it at least three irrigations in the season.
5041. How many days would it take to irrigate 30 acres? I have not had sufficient practical experience to say.

Extension of irrigation.

5042. Do you propose to extend the area for irrigation? Yes; I intend to put in about 20 acres of lucerne.
5043. You are speaking on behalf of twelve other property-owners, representing 11,000 acres? Yes; John O'Brien, 960 acres; Harry Tuck, 1,200 acres; — Dunn, 1,100 acres; T. Hanrahan, 960 acres; D. Miller, 640 acres; — Herd, 400 acres; — Guthrie, 400 acres; — McIntyre, 320 acres; — Mannix, 320 acres; George Walsh, 700 acres; Hugh Dick, about 2,400 acres; and Thomas O'Brien, 2,000 acres.

Koonoomoo scheme.

5044. Speaking on behalf of yourself and those gentlemen, what do you say in regard to the Koonoomoo scheme compared with the proposal to bring water from Bungowannah? The Koonoomoo scheme is of no use to us. It is below us. Allowing a fall of 1 foot to the mile, it would be of no value to us.

Bungowannah scheme.

5045. What do you advocate? The national scheme from Bungowannah.

Irrigation supply required.

5046. Do you think, if sufficient water is given for stock and domestic purposes, that the case will be met, or should provision be made also for irrigation? Irrigation undoubtedly. We have a domestic and stock supply now by means of fresh water in the wells.

Proportion of land that can be irrigated.

5047. What proportion of the land do you think would be irrigated? My fellow farmers state that they would like to have arrangements made for half their holdings—that is, 320 acres.
5048. 320 acres is the usual area? Yes.
5049. They ask that provision be made for 160 acres? Yes.
5050. Are there any other plants working in the district at the present time in addition to your own? Mr. Hugh Dick has a pumping plant irrigating an orchard.
5051. What area is Mr. Dick's orchard? About 20 acres.
5052. You see the *Exhibit* 95 before you? Yes.
5053. Was it intended to supply the area shown in green on that exhibit [*indicating the proposed Yarrawonga, Cobram, and Tungamah Irrigation Trusts*] from the Bungowannah channel, or was it proposed to have a separate off-take from the river? Bungowannah was to be our head works.
5054. What does the approximate cost of £161,500, as shown on that exhibit, represent? Ten shillings per acre.
5055. Does it mean that it would cost that much to distribute the water after the works have been constructed? I could not say.
5056. Whose estimate is that? I presume Mr. McGregor's.
5057. Are there any other points you wish to refer to? I do not want it to be understood that I am here to pledge Mr. Dick to irrigation. While on his present knowledge he is not in favour of advocating an irrigation scheme straight out, at the same time, if the farmers in his vicinity want it, he will not oppose it.

Increased land values.

5058. *Mr. Burchell.*] What will be the increased value of land as a result of irrigation? Mr. Pagan says that irrigation has increased the value of land from £2 to £3 an acre.
5059. What is the present value? About £6 an acre in this parish.
5060. So, according to that, with irrigation, it would be worth about £9? Yes.

Water charges.

5061. What would you be prepared to pay per acre for the use of the water? Taking the Rodney figures, I understand that they charge 1s. per foot for a watering there—that is, at the rate of 1d. per inch—and I presume the Government scheme would involve the same cost.
5062. In the Echuca and Waranga Trust a large amount of capital and interest has been written off;—do you know whether 1s. per acre would pay the interest on the amount not written off? I am willing to pay a sum that will pay the interest on the capital cost of the works.
5063. What would that be? I could not say.
5064. You have had experience of irrigation;—surely you must know of what value it is to you? Irrigating my 30 acres is worth at least £50 a year to me.
5065. Supposing you had a supply of water insured for irrigation purposes, do you think it would be worth £1 an acre to you? I would not be prepared to pay £1 an acre for irrigating a wheat crop.

W. H. Curtis. 1 Sept., 1902.

5066. What would you be prepared to pay for irrigating a wheat crop? Five shillings per acre—that is, if it could not be done for less.
5067. *President.*] What land have you got at Berrigan? 610 acres.
5068. Are you working it yourself? No; it is on the share system.

Bungowannah canal.

5069. Would the land be affected by the construction of the main channel from Bungowannah on the New South Wales side of the river? Yes; I am distant about 6 miles from the main channel.
5070. What are your views in regard to the work being put in hand? I am in favour of it, undoubtedly.
5071. May we take it that what you have said in regard to the price you are prepared to pay on this side would apply also to that? Yes; in years when irrigation is necessary, I would be prepared to pay 5s. an acre for the water over there.
5072. What would be the proportion of years in which you would want to irrigate? Of late years, every year it would have been necessary. About seven years ago we would not have wanted irrigation at all—that is, for wheat growing.
5073. You can understand that, whether the water is used on the land or not, if the channels are constructed and money expended in that way, interest would have to be paid each year? Yes.
5074. And, therefore, it resolves itself into this: that the rates—whatever they might be—would have to be collected to pay the interest, whether the water was used or not? I take it that I must pay a standing rate, and also a special rate if I use the water.
5075. *Mr. Burchell.*] Referring to the settlers whom you mentioned just now, where are they situated? On the Victorian side.
5076. Did you notice that 50 per cent. of the holdings would be more than 160 acres;—with the exception of two only, they are all over 320 acres? Yes; but in speaking to Mr. Dunn this morning, he said he thought 50 per cent. would be a fair proportion to take.

Navigation *versus* irrigation.

5077. *President.*] Is there anything else you wish to say? With regard to navigation, we consider irrigation first and navigation nowhere, as far as we are concerned here.
5078. That refers to the Cobram district? Yes.
5079. All your produce is sent by rail, and you get your supplies in the same way? Yes.

Albert Ruttle, farmer, Strathmerton, Victoria, sworn and examined:—

A. Ruttle. 1 Sept., 1902.

5080. *President.*] What is your name? Albert Ruttle.
5081. You are a farmer at Strathmerton? Yes.
5082. What area have you under cultivation and grazing? About 300 acres.
5083. Have you had any experience in irrigation? No.
5084. Have you visited any districts where irrigation has been possible and observed what is being done? Yes.

Effect of irrigation.

5085. What is your opinion of the effect that irrigation produces? During the present year, if we want any chaff, we have to send down to Tatura where they are growing it, and that is where they have irrigation. One person there recently sent away about 8,000 tons, and another 7,000 tons, within a radius of 15 miles of Tatura.
5086. And in your opinion that is due to the fact that the Tatura people have been favoured with irrigation? Certainly.
5087. Would you be prepared to irrigate, supposing that you had the facility for doing so? Certainly.
5088. What proportion of your land do you think you could irrigate? The lot of it.

Water charges.

5089. What would you be prepared to pay? I would be prepared to pay on the same terms as Rodney.
5090. Is there anything else you would like to add? I was sent here as the delegate of a meeting held at Strathmerton. All down the line here we have an idea that we will not get the water if we do not look out for a scheme between Tocumwal and Yarrawonga. We are paying for water now that we never get—that is, under the Water Trust in the Numurkah Shire.
5091. As the delegate of that meeting, what area do you represent? Three parishes—about 100 square miles.

James Harrison, farmer, Tocumwal, sworn and examined:—

J. Harrison. 1 Sept., 1902.

5092. *President.*] What is your name? James Harrison.
5093. You are a farmer at Tocumwal? Yes.
5094. What is the area of your farm? Altogether, 1,317 acres.
5095. Are you supplied with water for stock and domestic purposes at the present time? Yes, by means of a well and the river.
5096. Do you cultivate a portion of that area? Not at the present time. Owing to the drought, I have leased the land for grazing. I have cultivated up to 400 acres.

Tocumwal scheme.

5097. You know that certain works have been carried out at the head of the Tuppal Creek by the New South Wales Government? Yes.
5098. What was the effect of that work last year? It gave the people on the Tuppal Creek, and the Edwards and Wakool Rivers a supply sooner than they would have got it in any other way.
5099. Is there any irrigation on the Tuppal Creek? No.
5100. What is any water diverted down there used for? Domestic and stock supply.
5101. Are you aware that a proposal has been made for continuing the cutting across to the Forrest Creek, as shown on *Exhibit* 94 in blue? Yes.
5102. How would the country between the Edwards River and the Billabong below the proposed canal from the head of the Tuppal Creek into the Forrest Creek be affected? If the levels were high enough, it could be irrigated and would be greatly benefited by it.
5103. Otherwise, if the levels would not admit of the water diverted being used for irrigation, it could only be used for stock and domestic purposes? That is all.
5104. What is the distance from the termination of the present cutting at the head of the Tuppal Creek to the Forrest Creek? About 27 miles from where it would take off at the Tuppal cutting.
5105. Do you know the holdings that would be benefited by the proposed work? I could not enumerate them.

5106.

J. Harrison. 1 Sept., 1902. Navigation *versus* irrigation.

5106. In connection with the channel that you propose, is it the idea of the Tocumwal people to have a weir across the river? Lock or weir.
5107. What is the view of the Tocumwal people in regard to navigation? Irrigation first, navigation second.
5108. What navigation traffic is there below Tocumwal? Principally boats taking logs to the mills.
5109. Is that the only traffic that has to be considered? At one time there were boats bringing flour from Yarrawonga and Corowa.
5110. How long ago? Nine or ten years ago.
5111. What is your opinion as to provision being made for navigation up to Tocumwal? Speaking of the present, there is very little necessity for it.
5112. You put in as Exhibit 96 a statement embodying the views of the members of the Tocumwal Farmers Association, signed by the President, Vice-President, and one of the members? Yes.

Crops.

5113. *Mr. Burchell.*] What do you cultivate on the 400 acres? Wheat.
5114. Is that land considered good for wheat-growing? Yes.
5115. What is the biggest crop you have grown? Ten bags to the acre.
5116. You have never had irrigation there yet? No, it is impossible.

Harry Hussey Farrall, commission agent, &c., Cobram, Victoria, sworn and examined:—

H. H. Farrall. 1 Sept., 1902.

5117. *President.*] What is your name? Harry Hussey Farrall.
5118. You are a commission agent, resident in Cobram, and President of the Cobram Progress Association? Yes.

Bungowannah canal.

5119. As the representative of the Association, will you tell us what its views are in regard to the Bungowannah proposal? I cannot speak as to the views of the Association altogether, but, speaking for myself, I am in favour of the Bungowannah scheme, proposed by Mr. McKinney, and endorsed by Mr. McGregor and Colonel Home. I consider it would be a waste of public money to construct another weir, at Koonoomoo for instance, if the one weir at Bungowannah would serve the purpose and also serve the district right through to the Mallee.
5120. Have you taken into consideration the cost of the works? I have not gone into that. I have left that to the engineers, as I consider that that phase of the question ought to be left to them.
5121. Have you had any experience in regard to irrigation? No, except watering a small garden of my own.
5122. I suppose, in advocating a scheme which would involve irrigation and a charge on the land, you are impressed with the benefits that are likely to accrue? Yes; I have had conversations with farmers right through the district, between here and Kull's Range (where there is a lot of good country, suitable for irrigation), and they are very much in favour of it.

Pollution.

5123. Have you taken the question of the alleged pollution of the Murray into account? Yes; we received a circular from Albury about it.
5124. What is the view of your Association in regard to it? They are opposed to the pollution of the river.
5125. Has the town of Cobram or the district been affected by the pollution so far? No.
5126. So that what the Albury people complain of, so far as the Cobram people are concerned, they have had no experience of? None whatever. The only experience they have is in regard to the little towns along the river discharging filth into it.

Sewerage.

5127. What do you do with your sewerage in Cobram? It runs into the street, and can go where it likes when the rain comes.
5128. What land have you of your own? Thirteen acres altogether in the town of Cobram. I might say that I am strongly in favour of keeping the river open for traffic from Bungowannah to the mouth.

TUESDAY, 2 SEPTEMBER, 1902.

[*The Commission met at Modern Chambers, Collins-street, Melbourne.*]

Present:

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.,

George Pagan, landowner, of Ardmona, sworn and examined:—

G. Pagan. 2 Sept., 1902.

5129. *President.*] What is your name? George Pagan.
5130. You are a landowner residing at Ardmona? Yes.
5131. How many acres do you cultivate? Seven hundred and forty.
5132. What trust are you in? Rodney.
5133. What portion of your holding do you irrigate? I irrigated 440 acres last year.
5134. What do you grow? Lucerne, wheat, oats, and barley.
5135. You have practised irrigation some years? Yes, about twelve years.

Benefits of irrigation.

5136. Will you give us the benefit of your experience? I first tried irrigating lucerne, and found it satisfactory in every instance. We get most benefit from irrigation in the summer months, when the natural grass becomes dry. I consider that the soil of the Goulburn Valley is particularly suitable for irrigation, as there is a good drainage which carries away all surplus water. I generally irrigate lucerne twice in the season, the first watering in December and the second in February. I do not care to water much later than that, as the weather gets too cold. I go in for fattening stock, not dairying, and find I can make profitable use of the water in growing lucerne for that purpose. I can buy stock at a low rate when the natural pasture begins to fail, and fatten them by the end of the season—say, three to four months. This year I fattened and held them over for a time, and thus got better prices. Irrigating leaves a certain amount of moisture in the sub-soil, which also helps the natural spring grasses. In regard to cereal culture, I find that watering before ploughing is the best practice; the ground is thus softened and made easy to plough and cultivate, and you can thus ensure an early crop. I find one watering enables me to get good results from wheat or oats; barley requires a second watering in September. We seem to have had less than the average rainfall this past seven years, and thus the benefits of irrigation

Irrigation helps natural spring grasses.

G. Pagan. 2 Sept., 1902.

irrigation have been more marked. I would say that upon the whole the yield is just about doubled by irrigating. Green feed for milch cows can also be very profitably grown by means of irrigation, and I have grown mangolds successfully, a thing which would be impossible in our district without irrigation. Amber-cane can also be grown well. I have tried an experimental patch. It is good cow feed.

Depth of watering.

5137. What quantity of water do you put on each irrigation? I could not say positively. We pay 1s. per acre for watering lucerne, grass, or stubble land, and 2s. per acre for cereals.

5138. Do you know the land in the neighbourhood of Berrigan and Finley? Not of my own knowledge. I have been on the eastern side of the Goulburn and Murray, and consider the soil very similar to that in the Rodney Trust, and very suitable for irrigation.

5139. You mean the land to be served by the proposed Eastern Goulburn scheme? I allude to more than that, the district further north; but that which would be irrigated by the Eastern Goulburn scheme is also very suitable.

Rainfall.

5140. *Mr. Burchell.*] Do you know the rainfall in that district? Normally 18 inches, but we have not had so much for the past seven years.

5141. Is 18 inches sufficient for wheat-growing? We used to get very fair crops. In connection with irrigation, I find that equal, if not better, results are obtained by watering and ploughing immediately than by fallowing it; the land can thus be used for grazing until it is wanted for crop.

Water charges.

5142. You say the charge for watering crop is 1s. per acre;—is that as much as it is worth to you? I would not like to say that positively, but I am really paying more. There is a rate of 2s. in the £ in addition. Last year I paid £14 for rates, and £22 water charges, or about 1s. 6d. per acre for irrigation.

5143. By means of which you about doubled your crop? Yes.

5144. Then, would not the water be worth even more than the £36 you actually paid for it? Possibly; but I was speaking more in view of the recent dry season. If we had a better rainfall, we could get better results without irrigation, and the benefit would not be relatively so great. It would not do to take a run of bad years only as a basis of comparison.

Land values.

5145. What, in your opinion, would be the value of land in the Rodney Trust if you had no water for irrigation? It would be reduced by at least one-third. With irrigation it would run up to £10 per acre; without irrigation it would be about £7.

5146. Have you sufficient water at the present time? Personally I have, but I hear complaints from those who are further away from the source of supply.

Murray water should be used on land adjacent to the river.

5147. *President.*] Is there anything else you would like to add? Only in regard to the distribution of the water from the Murray. I am of opinion it will be found that there is not sufficient water to supply the districts immediately adjoining the river. I understand that the waters of the Murray will be utilised on the New South Wales side, also the territory between the Murray and the Goulburn, some 600,000 acres of which can be irrigated, and every drop of water that can be conserved will be required to supply that area alone, without taking it away across the Goulburn to the Mallee or the Terricks. It seems a most unreasonable proposal to carry the water so far away when it can be made use of near at hand.

5148. Your idea is that the water can be profitably used on the land adjoining the Murray before you get to the Goulburn? What I had in my mind was the land between the Goulburn and the Murray, also the land on the New South Wales side, where there is a vast territory which could be watered from the Murray, and it seems to me only reasonable to put the water on that land before bringing it across the Goulburn on to the land which should be watered from other sources.

Thomas Walker Fowler, M.C.E., F.R.G.S., &c., Civil Engineer and Surveyor, Lecturer and Demonstrato at the Melbourne University, sworn and examined:—

T. W. Fowler, M.C.E., F.R.G.S. 2 Sept., 1902.

5149. *President.*] What is your name? Thomas Walker Fowler.

5150. You have made a special study of the entrance to the Gippsland Lakes? I have.

5151. And although you have not visited the entrance to Lake Alexandrina, you think the condition somewhat similar? I do.

Entrance, Gippsland Lakes.

5152. Will you give us your views? I forwarded you a memorandum which I will put in as representing my views. [Exhibit 99.] Briefly: I found that the original expectation in connection with the Gippsland Lakes was that the entrance would be kept open by the upland waters, and it was designed with that view. Once the entrance was cut the lakes became tidal, and have been kept open by tidal action rather than by the upland waters. The works as designed there are scarcely in the most suitable position to admit of free tidal action taking place. Applying that briefly to the case of the Murray, it seems to me that if a well-placed entrance were cut through, those lakes would become tidal, and in that way would become sufficient to maintain an entrance of considerable depth. Any reports I have seen with reference to improvements have dealt with one of two schemes—either to improve the existing Murray mouth up to Goolwa, or to cut a canal from Goolwa to Victor Harbour. If my view be correct, both these schemes are running on wrong lines, because the channel past Goolwa is not one which would permit of an efficient tidal scour between the lakes and the sea. I may be permitted to point out that in Mr. Lindon Bate's report, plates 2 and 14, the general plan shows that at the extreme western end of the lakes there are a considerable number of small islands, the channel passing down to Goolwa and returning back in a southerly direction to the Murray entrance. In the present lakes approach the tidal action would have to sweep up through that tortuous channel past Goolwa and wind round Hindmarsh Island; whereas, if the entrance were placed nearer the southern end of the lake, there would be a more direct communication with sufficient width of channel. I have no doubt the lake would then become tidal and give the necessary scour. The tortuous end of the channel is fairly well shown on plate 14. The main channel sweeps up to Goolwa, and then round back again through a considerable distance. I think these are the principal points I have to mention.

Murray mouth.

Entrance should be at south end of lake.

5153. *Mr. Murray.*] Is your proposal to open the Murray mouth to navigation? Yes.

5154. What about keeping the water fresh in the lakes? If my suggestion were carried out the lakes would become salt. I consider that the benefit to be derived from navigation would more than counteract the disadvantage of making the lakes salt.

Entrance navigable by large vessels.

5155. Do you think the river boats would go out to sea? I should expect to get vessels up to 5,000 tons burden up to the eastern end of the lakes, where they could load direct from the river boats.

5156.

T. W. Fowler, M.C.E., F.R.G.S. 2 Sept., 1902.

5156. Do you think the river boats could discharge into ocean-going vessels lying there in all weathers? *Transhipment would principally take place at the point where the Murray discharges into the lakes.*

5157. Would not the boats require special protection to allow them to unload there? I have not visited the lakes, but my feeling is, taking the Danube as an illustration, that it would be possible to bring ocean steamers up to the eastern end of the lakes, where the Murray remains a river, and there would then be no difficulty about smaller boats discharging cargoes.

Murray and Danube.

5158. You recognise that the Danube has a much greater volume and depth than the Murray? The conditions are much more unfavourable than at the Murray, I think. There is no tidal action at the Danube, so that I consider the possibilities of improvement at the Murray mouth are greater.

5159. Upland water would have more effect in the Danube? Probably; it has a much greater volume.

5160. What about large vessels entering;—would it not be very dangerous? Certainly, at the present mouth; but with a properly-designed entrance I should say there would be no danger.

5161. Have you had any experience in work of that class? I have not carried out such works, but have studied them very closely. You, of course, understand I outlined this scheme as one possibly suitable for investigation.

5162. *Mr. Burchell.*] The main object is to keep the lakes fresh;—it would ruin hundreds of settlers if the lakes were allowed to become permanently salt? I think it would be much more beneficial generally to Australia if the lakes were opened to navigation.

James Ferdinand Bradly, Inspector of Customs, Melbourne, sworn and examined:—

J. F. Bradly. 2 Sept., 1902.

5163. *President.*] What is your name? James Ferdinand Bradly.

5164. What is your position? Inspector of Customs.

5165. You have, in your official capacity, prepared certain information for the Commission? Yes.

Shipping returns.

5166. Will you describe it? Returns of inward and outward shipping, and values of imports and exports for the years 1890 to 1901 from Wentworth, Mildura, and Echuca, and for the years 1896 to 1901 from Swan Hill. In regard to Swan Hill, I might explain that we have been unable to obtain the required information for the years prior to 1896, owing to the records having been destroyed by fire.

WENTWORTH.

Year.	Inward Shipping.		Outward Shipping.		Imports—Value of.	Exports—Value of.	Remarks.
	No. of Steamers and Barges.	Registered Tonnage.	No. of Steamers and Barges.	Registered Tonnage.			
					£	£	
1890	420	44,009	375	38,434	237,021	638,151	
1891	440	49,446	427	47,612	271,902	655,325	Up to 30th June,
1892	397	40,510	406	41,175	167,805	409,739	1894, the Import Sta-
1893	398	47,627	403	48,390	133,555	521,285	tistics for Wilcannia
1894	483	54,475	485	55,265	89,189	609,299	and Bourke were in-
1895	385	45,221	371	44,391	48,646	228,236	cluded in the Went-
1896	394	46,078	411	48,909	73,501	529,484	worth returns; from
1897	290	31,446	285	30,553	55,412	380,428	1st July, 1894, separ-
1898	292	28,606	282	27,712	47,019	170,195	ate Import Statistics
1899	296	29,722	306	30,416	47,663	280,996	were compiled at Wil-
1900	254	29,453	259	30,233	63,352	295,415	cannia and Bourke.
1901	236	25,340	222	23,801	54,492	181,694	

MILDURA.

Year.	Inward Shipping.		Outward Shipping.		Imports—Value of.	Exports—Value of.	Remarks.
	No. of Steamers and Barges.	Registered Tonnage.	No. of Steamers and Barges.	Registered Tonnage.			
					£	£	
1890	.....	.....	.....	.....	.....	.....	
1891	.....	.....	.....	.....	.....	.....	
1892	174	14,755	A	B	17,463	23,913	Records for A and B
1893	121	18,245	.....	.....	14,743	22,486	cannot be found.
1894	179	24,741	.....	.....	16,491	26,717	
1895	136	13,071	.....	.....	16,660	22,912	
1896	95	18,782	.....	.....	16,822	12,759	
1897	64	11,683	.....	.....	13,095	19,640	
1898	63	9,593	.....	.....	11,775	18,871	
1899	51	12,743	.....	.....	10,013	25,638	
1900	63	10,053	.....	.....	18,078	16,363	
1901	62	9,885	.....	.....	10,544	13,237	

SWAN HILL.

Year.	Inward Shiping.		Outward Shipping.		Imports—Value of.	Exports—Value of.	Remarks.
	No. of Steamers.	Registered Tonnage.	No. of Steamers.	Registered Tonnage.			
					£	£	
1896	220	25,784	218	26,367	44,685	8,208	
1897	160	26,127	161	25,812	33,341	15,686	
1898	196	28,615	196	28,498	36,884	17,051	
1899	230	35,592	226	35,338	65,033	21,972	
1900	250	41,715	249	40,550	75,641	36,266	
1901	287	42,447	289	43,171	71,670	31,761	
Total	1,343	200,280	1,339	199,736	327,254	130,944	

J. F. Bradly. 2 Sept., 1902.

ECHUCA.

Year.	Inward Shipping. No. of Steamers and Barges	Inward Shipping. Registered Tonnage.	Outward Shipping. No. of Steamers and Barges.	Outward Shipping. Registered Tonnage.	Imports—Value of.	Exports—Value of.	Remarks.
					£	£	Efforts have been made to obtain the value of imports and exports per the river only from the railway officials and local agents, but without success. The figures, therefore, are taken from our own records, and represent goods per river, road, and railway, and are imports and exports only.
1890	138	25,428	134	23,865	2,256,435	161,520	
1891	154	31,071	160	31,238	1,950,346	143,174	
1892	119	24,958	129	26,496	1,567,523	96,924	
1893	117	22,084	125	24,218	1,385,987	79,108	
1894	136	24,733	139	24,944	1,354,337	62,819	
1895	110	21,198	104	19,612	1,199,814	47,242	
1896	94	16,848	100	17,558	1,909,751	71,817	
1897	96	18,002	107	18,974	893,287	110,417	
1898	95	17,059	102	20,052	820,314	89,017	
1899	153	28,284	152	26,496	877,036	104,622	
1900	137	26,097	141	26,595	925,495	196,524	
1901	169	28,801	173	28,769	933,218	103,409	
Totals	1,515	284,563	1,566	288,817	16,073,533	1,266,503	

MONDAY, 15 SEPTEMBER, 1902.

[The Commission met at their Offices, Modern Chambers, Collins-street, Melbourne.]

Present:—

JOSEPH DAVIS, Esq. (PRESIDENT).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Alfred Stephen Kenyon, *Assistant Engineer*, Department of Mines and Water Supply, Melbourne, further examined:—

A. S. Kenyon. 15 Sept., 1902.

5167. *President.*] You were asked to explain the apparent discrepancy that exists between your evidence and that given by Mr. McClelland, the Shire Engineer at Kerang;—have you looked into the matter? Yes. With reference to the questions asked on the 23rd July as to the discrepancy between the figures given by me for the diversions by the Cohuna Trust in the year 1901 and those given by the Trust Engineer, Mr. McClelland, I have, as requested, communicated with that gentleman, and learned from him that the Cohuna Trust had *kept no records beyond those giving areas of land irrigated.* He, therefore, had to assume an approximate depth of watering, and therefrom estimate the volumes of water used. The Department obtains records from its own officers of the gauge readings of the channels and of the hours of pumping, and on which the figures given were based.

Discrepancy between Messrs. Kenyon and McClelland's figures.

5168. Have you prepared particulars as to the capacity of diversion channels on the Campaspe and Loddon Rivers? Yes; they are as follows:—

Diversions, Campaspe and Loddon.

CAPACITIES OF DIVERSION CHANNELS ON THE CAMPASPE AND LODDON RIVERS.

Campaspe River.

Coliban Main Channel, at Malmsbury Reservoir, on the Coliban River, 2,000 cubic feet per minute.

Eastern and Western Channels, at the Campaspe Weir, for the Campaspe Irrigation Trust, 3,000 cubic feet per minute each.

Loddon River.

Bullock Creek Channel, at Bridgewater Weir, for the Loddon United Waterworks Trust, 1,500 cubic feet per minute.

Serpentine Creek, at Serpentine Weir, for the Tragowel Plains Irrigation Trust, 11,000 cubic feet per minute.

Kinypanial Creek, at Kinypanial Weir, for the North and East Boort Irrigation Trusts and the Loddon United Waterworks Trust, 5,000 cubic feet per minute.

Twelve-mile Creek, near Leaghur Dam, for the Twelve-mile Irrigation Trust, 1,000 cubic feet per minute.

Wandella Creek, at Leaghur Dam, for the Wandella and Leaghur-Meering *Irrigation Trusts, 2,500 cubic feet per* minute.

At the last four points the diversions, in times of flood, exceed the volumes set down considerably.

Explanation of apparent discrepancy in river gaugings.

5169. *Mr. Burchell.*] In reply to question No. 3744, on the 23rd July, you supplied a statement, showing the gaugings of the river Murray and contributing streams; I find that Mr. Checchi has supplied similar information; on comparing the two, the losses in the years 1894, 1896, and 1900 do not agree;—in most cases your figures are twice as much as Mr. Checchi's? I wish, at the present time, to confine my reply to the year 1894. The losses shown by me include the losses in the contributing streams from the points of gaugings, and agree with Mr. Checchi's figures except as regards the addition of 15,000,000,000 cubic feet for the portion of the catchment between Jingellic and Albury, on the New South Wales side, which was an estimated figure.

5170. Am I to understand that you have not allowed for any losses in the contributing streams? I do not give the gaugings at Albury. I give the discharges of all the streams at the points of gauging and at Echuca. That includes losses in the main stream from Jingellic to Echuca and in the contributing streams.

5171. *You have not made any* deductions for loss from the point of gauging in the contributing streams to the point of junction with the Murray? No; the losses are presumed to be balanced by the in-take.

5172. What do they represent? They represent the discharges of those rivers at the points where we take the gaugings. I was simply asked to give the Tooleybuc gaugings, and show the difference between the losses in those and the other gaugings.

5173. Take the gaugings for 1894 at Echuca;—your gaugings show 400,031,000,000 cubic feet as against Mr. Checchi's 406,105,000,000 cubic feet? I think you are taking the gaugings below the affluence of the Goulburn; that is not at Echuca exactly.

5174.

A. S. Kenyon. 15 Sept., 1902.

5174. The distance from the gauge to the junction of the Goulburn is 10 miles? About that by the river.

5175. Then the loss is 1½ per cent. of the whole volume? I do not know that I could answer that. My figures are taken from "River Gaugings" for 1900.

5176. How do you account for the difference in the gaugings at Tooleybuc for the year 1894;—your figures are 295,000 as against Mr. Checchi's 404,530? Of course, I cannot say anything about the figures given by Mr. Checchi, because I know very little about them, but my figures are the actual gaugings of the discharge of the Murray River itself at Tooleybuc. Those figures of Mr. Checchi's, as far as I can judge, would contain the discharge of the ana-branches flowing in New South Wales and rejoining the river below Tooleybuc.

5177. What ana-branches? I do not know the names of them all. They all run into the Wakool ana-branch.

5178. In your contributions from the Loddon to the Murray for the year 1894 you show 26,000,000,000 cubic feet as against Mr. Checchi's 11,000,000,000? The 26,000,000,000 is gauged higher up. Mr. Checchi allows for losses, and I have not.

5179. You are not sure that it does go into the river? I know a considerable volume did go into the river that year, but I have not worked it out exactly. Probably the whole 26,000,000,000 would have reached the river, as considerable volumes enter the river below the gauging point.

5180. In the year 1896 you show that the Loddon contributed 3,000,000,000 cubic feet, whereas Mr. Checchi shows that at the junction of the Loddon with the Murray it contributed nothing? My figures represent the discharge at the gauging point; the losses being assumed to be balanced by the intake, which is higher up.

5181. Will you prepare an explanation as to how these tables of yours and those put in by Mr. Checchi seem to disagree? Yes. *[Witness subsequently furnished the Commission with the following statement]:—*

Taking the year 1894, for example, the losses in the main channel, given by Mr. Checchi, from Jingellic to affluence of the Campaspe River (Echuca), total 86,570,000,000 cubic feet, while the losses from the points of gauging on the various tributary streams to their affluence with the Murray River amount to 46,032,000,000 cubic feet. Adding these, and allowing for 15,000,000,000 cubic feet for the catchment above Albury on the New South Wales side, not included in any of the gauging stations above Albury, it will be seen that the losses given by me agree very nearly with the total of those given by Mr. Checchi.

Mr. Checchi, although allowing for losses in the tributary channels from their gauging points to the affluence with the Murray, does not, apparently, estimate for intake below those points.

It may also be pointed out the gaugings at Echuca are those of the main channel of the Murray River at that point only, considerable volumes flowing in the anabranches of the Wakool country not being included. Similar remarks apply with even greater force to the Tooleybuc gaugings.

[Witness also forwarded a statement showing particulars regarding the Irrigation Trusts in Victoria. (Appendix 19)].

Pietro Baracchi, Government Astronomer, Melbourne, sworn and examined:—

P. Baracchi. 15 Sept., 1902.

5182. *President.*] What is your name? Pietro Baracchi.

5183. You are the Government Astronomer for Victoria? Yes.

5184. You were asked to prepare certain information for the Commission in regard to the rainfall? Yes. I hand in five tables—No. 1, showing the monthly and yearly amounts of rainfall, in inches, registered at stations within the basins of the Murray, Ovens, Campaspe, Goulburn, and Loddon Rivers for the period 1882–1901 inclusive [*Exhibit* 100]; No. 2, showing annual amounts of rainfall, in inches, registered at stations situated along the banks of the rivers Murray, Ovens, Campaspe, Goulburn, and Loddon, the records for which extend over ten years or longer [*Exhibit* 101]; No. 3, showing average, maximum and minimum, amount of annual rainfall, in inches, at stations situated along the banks of the rivers Murray, Ovens, Campaspe, Goulburn, and Loddon, based on records extending over ten years or longer [*Exhibit* 102]; No. 4, showing average, maximum and minimum, amount of annual rainfall, in inches, at stations situated along the banks of the rivers Murray, Ovens, Campaspe, Goulburn, and Loddon, based on records extending over twenty years or longer [*Exhibit* 103]; No. 5, showing amount of rainfall, in inches, over areas north of the Dividing ranges in the State of Victoria for each quarter of the year, and for each year from 1894 to 1901 inclusive, with corresponding annual average for each area, based on all available records [*Exhibit* 104].

Rainfall returns.

Ettore Checchi, Chief Assistant Engineer, Department of Mines and Water Supply, Melbourne, further examined:—

E. Checchi. 15 Sept., 1902.

5185. *President.*] You have prepared certain diagrams showing the annual discharges, so far as you can ascertain, of the Murray and contributing streams? Yes. [*Exhibit* 105.]

THURSDAY,

THURSDAY, 18 *SEPTEMBER*, 1902.

[*The Commission met in the Deputation Room, Public Works Department, Adelaide.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq., | FREDERICK N. BURCHELL, Esq.

Peter Wood, of the firm of G. Wood and Sons, merchants, of Adelaide, sworn and examined:—

P. Wood. 18 Sept., 1902.

5186. *President.*] What is your name? Peter Wood.
5187. You are a member of the firm of G. Wood and Sons? Yes.
5188. In your business capacity you have had a good deal to do with the products of Renmark? Yes.
5189. For how long? Seven or eight years.

Quality of Renmark products.

5190. Will you tell us how you regard the Renmark settlement from the point of view of the value of the products? Our firm handles from 50 per cent. to two-thirds of the dry fruits from Renmark. The quality is, in my opinion, all that could be desired, and certainly better than Mediterranean or American fruits. The currants are very much better, and bring from 4s. to 8s. per cwt. more than the Mediterranean fruit. The lexia raisins are of the best, and the sultanas also are very much superior to the imported fruit from Smyrna. The lexias, or dipped raisins, have supplanted the Smyrna, Spanish, and Valentia, and at the present time Renmark turns out more lexias than can be consumed in South Australia. Now that we have intercolonial free-trade, we sell the surplus into the markets of Victoria, New South Wales, Queensland, and Tasmania. We have also partly secured the West Australian market, but there we have to pay the same duty as other countries; later on, however, we shall have that market open free of duty. We also consign a fair quantity to New Zealand, where we have to compete against the Mediterranean fruit; but as the quantity of pudding raisins grown at Mildura, Renmark, and other settlements is now more than we can sell in Australia, we have, by a combination between Renmark and Mildura, agreed to export the surplus to outside the colonies, New Zealand, Africa, and elsewhere. Apricots and peaches form a large portion of the products of Renmark. Here, again, they turn out first-class goods, certainly superior to the American. We have been able to sell the major portion of our fruits in Australia, but last year there was a very heavy crop, and we had to export to London, where the market was weak and the prices consequently low. The quality of all these products shows that Renmark is well adapted to their growth, and that the men are sufficiently skilled to turn out an article equal to anything produced in any part of the world.

Markets.

Trade can be extended.

5191. Do you think the trade can be extended? Yes; in certain lines, currants for instance. In my opinion, there is a very big future for currants; I have not figures with me, but should say there would be 10 cwt. of currants required for every cwt. of raisins, while at the present time the production reverses those figures. I, therefore, estimate that it will be many years before the production of currants will meet Australian requirements.

Demand for sultanas.

5192. Raisins, you say, are produced in sufficient quantity to more than meet Australian requirements? Yes; as far as pudding raisins are concerned; but there is a larger demand for sultanas than can be supplied; so that I am of opinion it will be some years (say five or six) before sultanas will overtake the demand. In Mildura, however, they are planting sultanas very largely, and some are being planted at Renmark; but I think this is warranted, as I think that the demand will be considerably increased when prices recede, as they must. For the last two or three years sultanas have ranged from 7d. to 8d. per lb., and, notwithstanding that high price, there has been a large quantity imported. I believe that even 4d. would pay the grower, and when they can be retailed at lower prices probably twice as many will be used.

Demand for peaches and apricots will increase.

5193. It would appear, then, from what you say, that so far as peaches and apricots are concerned, the supply is more than equal to the demand in Australia? Well, there, again, I think that the demand would increase as the article becomes better known. Until the last two or three years, apricots and peaches were in the neighbourhood of 1s. per lb., and were, consequently, beyond the reach of many, but as they become better known, there will be a larger demand for both, especially should times improve, as they are bound to do.
5194. There appears to be a tendency to discontinue the growth of apricots and peaches? Yes; owing to the want of a market, particularly for peaches; as far as apricots are concerned, there is a better demand for them.

Export of lemons.

5195. *Mr. Burchell.*] Have you ever exported any green fruit? Yes; lemons to South Africa.
5196. Did it answer? The price was very satisfactory; 7s. 6d. per case. We have sold about 1,000 cases this year at from 6s. to 8s. per case.
5197. Is there a duty on our raisins in New Zealand? Yes; 1d., the same as all other countries have to pay. Australia is getting the bulk of the New Zealand trade.

Renmark olive oil.

5198. Have you done any business with olive oils from Renmark? Yes.
5199. How does it compare in quality with the imported? I think it is decidedly superior to any imported oil, as it is absolutely pure; most imported oils are more or less adulterated. We have practically knocked the imported article out of the market.

Effects of non-navigable rivers.

5200. *President.*] In what way does the non-navigability of the river affect the trade of Renmark? Taking this year as an illustration, we have only just got the raisins, currants, and peaches down. The peaches were boxed in March, and the currants in April. We had to go to the expense of carting many tons by road.
5201. What loss did the union sustain as the result of the delay? The very great cost of road carriage, increased insurance—which is very high at Renmark—and loss of market, beside which, when goods are stored in that very dry and trying climate, they deteriorate much more than they would do down here.
5202. What did you mean when you referred to a union between Renmark and Mildura? An association has been formed, or an arrangement come to between the two colonies, to market their fruits and export their surplus out of the Colonies.
5203. For the regulation and control of trade? Yes.

Richard

Richard William Mackie Waddy, Chief Clerk of the Post and Telegraph Department of Adelaide, sworn and examined:—

R. W. M. Waddy. 18 Sept., 1902.

5204. *President.*] What is your name? Richard William Mackie Waddy.
5205. What office do you hold? Chief Clerk in the Post and Telegraph Department; I appear here on behalf of Sir Charles Todd, Government Astronomer of South Australia.
5206. You have prepared certain information with regard to the rainfall along the course of the Murray? Yes. The averages for the various stations are as follows:—

Rainfall records.

Meningie	38 years,	18·70 inches.	Sandleton	15 years,	9·08 inches.
Milang	21 „	16·52 „	Blanchetown	34 „	11·30 „
Woodburn	39 „	16·37 „	Morgan	21 „	8·93 „
Langhornes Bridge	12 „	15·91 „	North West Bend	23 „	10·02 „
Wellington	19 „	14·88 „	Overland Corner	25 „	11·16 „
Cooke's Plains	11 „	14·00 „	Book-mark	7 „	10·33 „
Moorlands	9 „	14·76 „	Paringa	16 „	9·96 „
Murray Bridge	16 „	13·87 „	Renmark	12 „	10·92 „
Callington	18 „	15·28 „	Murthoo	11 „	8·74 „
Mannum	26 „	11·69 „	Tareena	16 „	10·26 „
Sedan	21 „	11·75 „	Wentworth	25 „	10·58 „

These figures are as accurate as possible, but cannot be guaranteed.
5207. You would say that they fairly represent the facts? Yes; so far as we know, it is the best information obtainable.

Alexander Bain Moncrieff, M.Inst.C.E., Engineer-in-Chief, South Australia, further examined:—

A. B. Moncrieff, M.Inst.C.E. 18 Sept., 1902.

5208. *President.*] You have prepared certain information for the Commission, and embodied it, so far as possible, in a statement? Yes.
5209. Will you please read it? I submit herewith a plan, showing the soundings and borings of cross-sections of Lakes Alexandrina and Albert. The boxes of samples referred to are available if required by the Commissioners. [*Exhibit* 106.] I submit also three cross-sections of the river Murray, viz., one near Parcoola Head Station, the second near Pyap Village Settlement, and the third at Renmark Irrigation Colony. The plans show borings at sections 1 and 3, and the said sections were taken at sites supposed to be typical, with a view of preparing estimates of locks and weirs. [*Exhibit* 107.] I have further prepared a plan for typical weir and lock which I think would be suitable, and which is based upon cross-sections of the river Murray, near the Parcoola Head Station. [*Exhibit* 108.] This design shows a lock in concrete with shutter weir across the main stream, and an earthen embankment across the flooded flat. I have also shown an alternative design for a lock, with entrance only of concrete, which could be more economically constructed in some situations. These plans of locks and weir I look upon as preliminary tentative sketches, the information at the disposal of the Department not being sufficient to work out the details, which might be considerably modified in preparing the working drawings. I beg to point out that cheaper designs of a more temporary character could be got out, but I did not deem it necessary to submit anything to this Commission of a temporary character. I estimate that the typical weir and lock shown on the tracing could be constructed for, approximately, £100,000. The chief difficulty in connection with the construction of the weir and lock at this typical place on the Murray is in the foundations, there being no bar of rock upon which they could be founded. It would, therefore, be necessary, at greater or less expenses, to use timber, and so far as I am aware there is none suitable obtainable in the locality; a considerable portion of sand would also have to be brought from long distances.

Cross-sections of Murray.

Typical lock and weir.

Cost.

5210. *Mr. Murray.*] Would the working of such a lock and weir be very costly? I do not think it would require to be worked often, owing to the conditions of the river; the removal of a few panels from the top would, in most years, be all that would be required; when notified that a big flood was coming down, they would have to be laid flat, in which case there would be some work in taking out the shutters and trollying them to the side. There would be no trouble in working the folding supports, I think.

Cost of working lock.

5211. Could a portion of the weir be open to allow of vessels passing through without opening the whole? No; vessels would have to use the lock.
5212. Suppose the water were 3 to 4 feet deep above the top of the shutters, would it be too low for a boat to pass over? There was no intention to allow water to pass over; if it were likely to do so, the shutters would be taken up in order to make way for it.
5213. Is the top of the shutters the same as high level in the river? A 10-feet rise is suitable for using the lock. As indicating the approximate position of the weirs which would be necessary to render the river permanently navigable from the mouth to the eastern boundary of the State, I submit a plan and longitudinal section showing the number of such weirs required, and their approximate positions and levels. [*Exhibit* 109.]

Cost of locking river.

Storage at Overland Corner.

5214. According to your estimate, the locking of the river from Blanchetown to the New South Wales border would cost, approximately, £600,000? Yes, with permanent structures. A plan has also been prepared, and is submitted herewith, showing a dam across the river near Overland Corner, which would form a storage reservoir capable of impounding 45,000,000,000 cubic feet above the level to which water might be drawn off without interfering with permanent navigation. [*Exhibits* 110 *and* 111.] If this dam were filled the water would flood back from near Overland Corner to Renmark, and fill Salt Creek at the latter place. This dam could be raised still higher, but would then flood out Renmark Town and part of the irrigation colony. The relative positions of the weirs, previously stated to be required for navigation, would be altered if such a reservoir were constructed. The variation is shown in the longitudinal section already submitted. The approximate preliminary estimate of such a dam and lock is £302,000.

Cost of locking, including reservoir.

5215. Supposing the weir were put in, what would be the total cost of locking the river between Blanchetown and the New South Wales border? Say £802,000, and for that sum there would be five permanent weirs, ensuring permanent navigation, and a storage reservoir capable of containing 45,000,000,000 cubic feet. I beg also to submit a plan, section, and cross-section, with estimate of a possible canal between Goolwa and Victor Harbour, the estimate being based upon a bottom width of 50

feet,

A. B. Moncrieff, M.Inst.C.E.
18 Sept., 1902.

feet, and water depth of 7 feet; the necessary road crossings, railway deviation, protection of sea outlet, lights, beacons, &c., having been allowed for. The total cost, including land, excavation, bridges, railway deviation, and making the usual allowance for engineering contingencies and interest on loan during the period of construction, would be, approximately, £473,000. [*Exhibit* 112.] On the supposition that weirs and locks are constructed upon the river Murray in South Australia, the acreage of low-lying land which would be submerged is, approximately, 133 square miles, while, with the storage reservoir referred to above, and the altered position of the weirs which would be necessary in consequence, the submerged area would be, approximately, 200 square miles. In this connection I beg to say that no considerable extent of country could be banked off from these flooded flats, and irrigated therefrom by gravitation. In connection with the navigation of the river Murray, the South Australian Government have spent in the building of training spurs, establishment of beacons, removing snags from the bed of the river and overhanging trees from its banks, about £21,000, exclusive of wharves and jetties. Including these, the amount spent has been £78,000. In order to provide for the loss of water by evaporation on the lakes and the river if navigation weirs were built, and upon the basis of evaporation in a dry year, I submit the following schedule, which shows that adding together the monthly requirements in cubic feet, the total for a year would be, say, 62,172 million cubic feet:—

Land submerged.

Gravitation.

Expenditure already incurred in connection with navigation.

Evaporation.

Month.	Quantity for Lakes and to No. 1 Weir.	Quantity for River with Weirs.	Total for Lakes and River.	Totals.
	cubic ft. per minute.	cubic ft. per minute.	cubic ft. per minute.	cubic ft.
December	27,832	58,706	86,538	3,863,000,000
January	27,832	74,148	101,980	4,552,000,000
February	27,832	64,891	92,723	3,739,000,000
March	27,832	40,166	67,998	3,035,000,000
April	27,832	24,711	52,543	2,270,000,000
May	27,832	15,455	43,287	1,932,000,000
June	27,832	9,270	37,102	1,603,000,000
July	27,832	12,356	40,188	1,794,000,000
August	195,696	18,540	214,236	9,563,000,000
September	195,696	21,626	217,322	9,388,000,000
October	195,696	30,896	226,596	10,115,000,000
November	195,696	43,252	238,848	10,318,000,000
			Total for year...	62,172,000,000

Basis of calculation of compensation water required.

I wish to state that the basis of this calculation is that on, say, 1st December, the lakes are supposed to be 2 feet 6 inches above summer level (that is, up to the level of the top of the weir suggested near the Murray mouth), and that, allowing for the lakes and the first reach of the river to Blanchetown to have fallen in the meantime to summer level, at the corresponding date of the following year (that is, the 1st December) the water in the reach and lakes would be restored to the same high-water position as it occupied on the preceding 1st December. The using of the lakes as a balancing reservoir has been suggested in order to require as little water as possible during the low river period. If the quantity of water required to maintain the evaporation in the lakes and lower reach of the river is supplied, it will be amply sufficient in its progress down the river for all purposes of navigation. In this calculation no allowance has been made for any loss by soakage, there being no available data for determining the amount. In connection with this matter I wish to point out that the whole area of the Coorong is supposed to be shut off from any connection with the lakes and open only to the sea. This arrangement would require modification of the original design for the barrage at the mouth of the river in P.P. 144/90, the whole of which scheme would, owing to lapse of time, probably require alteration of prices and other modification if the work were to be undertaken.

Soakage not allowed for.

Canalisation not reasonably practicable.

5216. Will you give an expression of opinion as to the canalisation of the river between Blanchetown and the South Australian border? I have given that matter some consideration, and come to the conclusion that it was not reasonably practicable, that any dredging carried out in the river would certainly be filled up again by the first heavy flood, and would necessitate constant dredging to keep such canal open. I think, however, that a good deal can still be done in the river by carrying out the same class of work that we have been doing heretofore, and by putting in spurs.

5217. Referring to the reservoir, which you estimate would have a capacity of 45,000,000,000 cubic feet when a dam is thrown across the river at near Overland Corner, have you taken into consideration what use is to be made of the water? The idea of the storage is to make up the loss due to evaporation, and to assist in supplying any water allotted to South Australia for irrigation purposes.

Goolwa Canal.

5218. In your opinion, is the canal between Goolwa and Victor Harbour a justifiable work, in view of the cost and the use to which it could be put? Not under present circumstances.

Retaining banks not desirable.

5219. As I understand it, you hold the opinion that it would not be advisable to bank off any of the country that would be affected by the locks and weirs proposed on the Murray, but that it would be better to allow it to be inundated? I think the area is so small and so narrow, and that the banking of it would be so costly, that it is better to use it as storage. There are one or two little billabongs which might be banked off by closing the lower end, but they are so small as to be hardly worth taking notice of.

5220. You realise that, supposing the large weir near Overland Corner were not put in, there would be very little storage available if the river were kept navigable the whole year round? Quite.

Submerged land Government property.

5221. *Mr. Murray.*] Is the cost of the land which would be submerged included in the estimate of the cost of the weirs, locks, and dam which you gave us? No.

5222. Could you give any idea of what that would add to the estimate? I take it that practically all the land is Government property, and would be available for the purpose.

5223. Would there be any material saving in bringing goods to the river mouth, instead of taking them by railway to Port Adelaide? There is a general feeling amongst business men along the river that it would be better to take the goods to Victor Harbour and ship them there.

Continuous navigation desirable.

5224. Would not there be a strong opposition to that view in Port Adelaide? I am not an authority on the matter, but my own opinion is that the river being closed so many months is a serious inconvenience to settlers along the river; and as irrigation extends and the number of settlers increases, it will be an increasing disadvantage, and that the best way to overcome the difficulty would be to provide continuous navigation.

5225.

A. B. Moncrieff, M.Inst.C.E.
18 Sept., 1902.

5225. Would not the traffic be as well provided for by navigation as low down as Morgan, with the railway from Morgan, as by keeping the river open to the mouth? The river below Morgan is seldom closed now; the difficulty is above Morgan.

5226. You would have one lock below Morgan? Yes.

5227. *Mr Burchell.*] Do I understand that you are in favour of the proposed works at the Murray mouth to prevent the sea from coming into the lakes? Certainly; that is part of the scheme necessary, if the lakes are to be kept fresh.

5228. Could you provide us with a plan and estimate of the present proposal for closing the Murray mouth? I could forward it to the Commission. [*Witness subsequently supplied plan* (*Exhibit* 112*a*), *and estimate, showing that the cost of the suggested works would be* £51,600.]

Murray gaugings at Morgan.

5229. *President.*] You have also prepared from records in your office a statement of gaugings of the river Murray at Morgan, from the year 1884 to 1902 inclusive, which you put in? Yes.

SOUTH AUSTRALIA, ENGINEER-IN-CHIEF'S DEPARTMENT.

GAUGINGS OF THE RIVER MURRAY, AT MORGAN, SHOWING DISCHARGES, 1884 TO 1902, INCLUSIVE.

Month and Year.	Mean Discharge, in cubic feet, per Minute.	Total Discharge, in cubic feet.	Month and Year.	Mean Discharge, in cubic feet, per Minute.	Total Discharge, in cubic feet.
1884.			1888.		
January	1,019,000	45,516,772,000	January	2,384,000	106,427,610,000
February	441,000	18,442,106,000	February	2,099,000	87,673,770,000
March	274,000	12,257,846,000	March	862,000	38,463,210,000
April	198,000	8,552,086,000	April	660,000	28,492,650,000
May	119,000	5,350,000,000	May	614,000	27,414,810,000
June	190,000	8,200,000,000	June	407,000	17,563,050,000
July	314,000	14,027,826,000	July	484,000	21,589,290,000
August	380,000	16,962,670,000	August	758,000	33,820,650,000
September	482,000	20,832,800,000	September	917,000	39,616,650,000
October	577,000	25,762,000,000	October	973,000	43,418,250,000
November	535,000	23,122,250,000	November	862,000	37,219,050,000
December	577,000	25,762,000,000	December	484,000	21,589,290,000
	Total for year ...	224,788,396,000		Total for year ...	503,288,280,000
1885.			1889.		
January	373,000	16,673,010,000	January	338,000	15,088,320,000
February	293,000	11,817,760,000	February	447,000	18,043,200,000
March	328,000	14,637,520,000	March	306,000	13,637,520,000
April	238,000	10,288,000,000	April	190,000	8,186,400,000
May	224,000	10,000,000,000	May	215,000	9,597,600,000
June	227,000	9,786,400,000	June	572,000	24,667,200,000
July	314,000	14,000,000,000	July	1,058,000	47,217,600,000
August	418,000	20,000,000,000	August	1,906,000	85,072,320,000
September	556,000	24,600,000,000	September	2,700,000	116,640,000,000
October	806,000	36,000,000,000	October	2,500,000	111,600,000,000
November	956,000	41,300,000,000	November	2,950,000	127,440,000,000
December	706,000	31,500,000,000	December	2,700,000	120,528,000,000
	Total for year ...	240,002,720,000		Total for year ...	697,718,160,000
1886.			1890.		
January	373,000	16,856,280,000	January	1,756,000	78,403,840,000
February	298,000	12,001,010,000	February	662,000	26,691,840,000
March	271,000	12,075,410,000	March	617,000	27,529,560,000
April	219,000	9,471,250,000	April	662,000	28,598,400,000
May	146,000	6,517,130,000	May	812,000	36,247,680,000
June	124,000	5,367,250,000	June	975,000	42,120,000,000
July	219,000	9,780,850,000	July	2,700,000	111,600,000,000
August	490,000	21,878,290,000	August	3,300,000	147,322,000,000
September	868,000	37,508,650,000	September	3,700,000	159,840,000,000
October	1,220,000	54,510,130,000	October	3,700,000	165,168,000,000
November	1,420,000	61,397,650,000	November	2,920,000	127,440,000,000
December	1,560,000	69,732,370,000	December	2,690,000	116,064,000,000
	Total for year ...	316,095,680,000		Total for year ...	1,067,006,320,000
1887.			1891.		
January	1,350,000	60,484,186,000	January	2,387,000	106,533,360,000
February	976,000	39,361,434,000	February	1,936,000	78,040,160,000
March	867,000	38,686,474,000	March	1,558,000	69,549,120,000
April	830,000	35,869,111,000	April	1,348,000	58,233,600,000
May	998,000	44,570,026,000	May	1,125,000	50,231,520,000
June	1,018,000	43,560,474,000	June	1,093,000	47,217,600,000
July	1,038,000	46,334,378,000	July	1,125,000	50,231,600,000
August	1,181,000	52,694,506,000	August	1,348,000	60,174,720,000
September	1,764,000	76,187,674,000	September	2,500,000	108,000,000,000
October	2,257,000	100,758,394,000	October	2,500,000	111,600,000,000
November	2,229,000	96,275,674,000	November	1,938,000	83,721,600,000
December	2,157,000	96,275,674,000	December	1,348,000	60,174,720,000
	Total for year ...	731,458,008,000		Total for year ...	883,708,000,000

A. B. Moncrieff, M.Inst.C.E. 18 Sept., 1902.

Month and Year.	Mean Discharge, in cubic feet, per Minute.	Total Discharge, in cubic feet.
1892.		
January	1,282,000	57,250,800,000
February	917,000	38,318,400,000
March	571,000	25,489,440,000
April	338,000	14,601,601,000
May	273,000	12,186,720,000
June	486 000	20,994,200,000
July	662,000	29,551,680,000
August	1,126,000	50,231,520,000
September	1,283,000	55,404,000,000
October	1,348,000	60,174,720,000
November	1,630,000	70,416,000,000
December	1,757,000	78,403,840,000
	Total for year...	513,022,920,000
1893.		
January	1,757,000	78,403,840,000
February	1,244,000	50,169,440,000
March	571,000	25,489,440,000
April	616,000	26,632,500,000
May	662,000	29,551,680,000
June	864,000	37,324,800,000
July	1,217,000	54,326 880,000
August	1,631,000	72,763,200,000
September	2,102,000	90,806,400,000
October	2,500,000	111,690,000,000
November	2,187,000	94,500,000,000
December	2,274,000	101,466,720,000
	Total for year...	773,034,960,000
1894.		
January	2,102,000	93,833,280,000
February	1,171,000	47,217,600,000
March	711,000	31,739,040,000
April	570,000	24,667,200,000
May	864,000	38,568,960,000
June	1,217,000	52,574,400,000
July	1,486,000	66,335 040 000
August	1,756,000	78,403,840,000
September	2,500,000	108,000,000,000
October	3,125,000	139,500,000,000
November	3,300,000	142,560,000,000
December	2,950,000	131,688,000,000
	Total for year...	955,087,360,000
1895.		
January	2,694,000	120,528,000,000
February	1,348,000	54,351,360,000
March	616,000	27,520,560,000
April	571,000	24,667,200,000
May	409,000	18,257,760,000
June	338,000	14,601,600,000
July	552,000	24,667,200,000
August	766,000	33,926,400,000
September	975,000	42,120,000,000
October	975,000	43,524,000,000
November	1,093,000	47,217,600,000
December	975,000	43,524,000,000
	Total for year...	494,905,680,000
1896.		
January	486,000	21,695,040,000
February	338,000	14,114,880,000
March	396,000	17,668,800,000
April	447,000	19,331,500,000
May	486,000	21,695,040,000
June	486,000	20,994,200,000
July	571,000	25,489,440,000
August	662,000	29,551,680,000
September	864,000	37,324,800,000
October	760,000	33,926,400,000
November	812,000	35,078,400,000
December	571,000	25,489,440,000
	Total for year ...	302,359,620,000

Month and Year.	Mean Discharge, in cubic feet, per Minute.	Total Discharge, in cubic feet.
1897.		
January	409,000	18,257,760,000
February	409,000	16,490,880,000
March	338,000	15,088,320,000
April	273,000	11,793,600,000
May	244,000	10,892,160,000
June	215,000	9,288,000,000
July	215,000	9,597,600,000
August	409,000	18,257,760,000
September	760,000	32,832 000,0 0
October	1,050,000	46,877,760,000
November	1,155,000	49,896,000,000
December	975,000	43,524,000,000
	Total for year ...	282,795,840,000
1898.		
January	338,000	15,088,320,000
February	293,000	11,817,760,000
March	409,000	18,257,760,000
April	447,000	19,331,500,000
May	305,000	13,637,520,000
June	215,000	9,288,000,000
July	409,000	18,257,760,000
August	528,000	23,592,240,000
September	760,000	32,832,000,000
October	975,000	43,524,000,000
November	919,000	39,722,400,000
December	812,000	36,247,680,000
	Total for year ...	281,596,940,000
1899.		
January	571,000	25,489,440,000
February	215,000	8,668,800,000
March	191,000	8,549,280,000
April	273,000	11,793,600,000
May	273,000	12,186,720,000
June	305,000	13,197,600,000
July	571,000	25,489,440,000
August	920,000	41,046,480,000
September	1,034,000	44,668,800,000
October	920,000	41,046,480,000
November	684,000	29,551,680,000
December	531,000	23,700,000,000
	Total for year ...	285,394,320,000
1900.		
January	273,000	12,186,720,000
February	120,000	4,838,000,000
March	90,000	4,000,000,000
April	142,000	6,134,000,000
May	409,000	18,257,760,000
June	528,000	22,830,700,000
July	662,000	29,551,680,000
August	1,125,000	50,231,520,000
September	1,610,000	69,549,120,000
October	1,756,000	78,403,840,000
November	1,781,000	76,939,200,000
December	1,348,000	60,174,720,000
	Total for year ...	433,097,660,000
1901.		
January	409,000	18,257,760,000
February	215,000	8,668,800,000
March	119,000	5,300,000,000
April	104,000	4,500,000,000
May	90,000	4,000,000,000
June	215,000	9,238,000,000
July	409,000	18,257,000,000
August	409,000	18,257,000,000
September	571,000	24,667,000,000
October	864,000	38,568,000,000
November	1,155,000	49,896,000,000
December	1,125,000	50,231,000,000
	Total for year ...	249,893,760,000
1902.		
January	662,000	29,551,680,000
February	262,000	10,967,040,000
March	119,000	5,300,000,000
April	69,000	3,000,000,000
May	78,000	3,500,000,000

26th June, 1902.

ALEX. B. MONCRIEFF,
Engineer-in-Chief.

Alexander

Alexander Miers, Manager for A. H. Landseer, shipping agent, Adelaide, sworn and examined:—

A. Miers. 18 Sept., 1902.

5230. *President.*] What is your name? Alexander Miers.
5231. What are you? Manager for Mr. A. H. Landseer, shipping agent.
5232. Have you held that position long? For many years.
5233. Where is the shipping done? On the Murray and Darling.
5234. You have prepared a statement which you desire to read? Yes. Our business has been conducted by Mr. A. H. Landseer for upwards of forty years, and at present Mr. Landseer has stores and offices at the several South Australian river ports, also at Victor Harbour, where there are all the necessary facilities for attending to the river trade. I have taken great interest in river matters since 1873, and for the first ten years was engaged in trading on the various streams. In 1877 I saw the river Darling a chain of water-holes, whilst two years later it was, at places, some 40 miles wide from back-water to back-water. In 1878 I saw 17,000 bales of wool lying at the Goolwa wharf waiting to be unloaded; and I have seen over twenty steamers and barges loading and unloading at Wilcannia at one time. For several years about this period this State paid New South Wales £40,000 per annum to be allowed to carry on free-trade with the latter. During this time the steamer "Queen of the South" traded weekly between Port Adelaide and Goolwa, *via* Murray mouth, and large quantities of freight were dealt with in addition, *via* Victor Harbour and the then existing tramway. It was in the year 1878 that the highest number of bales of wool was handled at Victor Harbour, when the total reached 28,388 bales. In 1887, 20,588 bales were shipped per thirteen vessels, whilst from 1887 to 1892 the tonnage of ships which left this port was 97,110, the exports being 75,596 bales of wool, 12,718 tons of wheat, 7,894 bags of chaff, and 200 tons of timber. From 1887 to 1891 Messrs. G. Ferguson and Company and A. H. Landseer shipped 35,620 tons of general merchandise for up-river, and received 203,141 bales of wool. The imports at Victor Harbour from January, 1897, to February, 1902, were 3,710 tons, in addition to which other agents handled goods, and hawking steamers cleared with large quantities. During 1893 some 16,000 bales of wool were shipped by seven vessels at Victor Harbour. In 1894 16,697 bales were lifted by eleven oversea crafts. Only in 1900 I contracted for the conveyance of Boorooma wool from above Brewarrina to this State. For full loads I consider steamers can carry freight from Wilcannia to Goolwa at the rate of 25s. per ton. Up-freights may be quoted at 15s. to 20s. to Wentworth, 30s. to Wilcannia, and 40s. to Bourke. Wool may be placed free on board at Victor Harbour from Bourke for 43s. 6d. per ton greasy and 49s. per ton scoured. From Wilcannia 38s. 6d. and 44s. respectively. The causes of the shrinkage in trade to this State of late are the drought, low condition of rivers, and the diversion caused by the keen competitive rates of the New South Wales and Victorian railways, *e.g.*, the rate for wool from Echuca to Melbourne, 156 miles, is fixed to compete with this State's rate from Murray Bridge to Port Adelaide, 69 miles. There is no doubt that Victor Harbour is the port, *via* which the major portion of river business should be transacted. It is undoubtedly the cheapest. Regarding river levels, I may state that during 1870 an unusual flood occurred. From 1873 to 1876 rivers were navigable at intervals sufficient for usual requirements. 1877 was a particularly dry year; in 1878–9 levels were high. During 1884 rivers were low, only a small rise occurred in the Darling in August. Early in 1885 this stream rose to 28 feet on 1st February, but rapidly fell to 2 feet 6 inches on the 24th. This gave a small fresh in the Murray to Wentworth, which river became thoroughly navigable in July, continuing so until the end of the year. In 1886 over 30 feet was reported at Wilcannia, in July this, with a little fresh in the Murray, gave 14 feet at Wentworth. Thence, until the end of 1888, rivers were fairly satisfactory. From May, 1889, until 1896, with the exception of some six weeks, the Murray was navigable to Wentworth. During this period substantial rises were frequently reported from the Darling. From 1896 to 1900, although rivers permitted navigation sufficient for requirements of trade, generally speaking, average flushes were not so large as previously. In 1901 the Darling was navigable from June to November, but no particularly high levels were registered. The Murray reached its maximum during October—21 feet 6 inches. In September, Echuca gauge read 20 feet, Wentworth 9 feet 9 inches. At the present time these places report 2 feet 3 inches and 9 inches respectively. Rain has not fallen in sufficient quantities to cause a fair rise this year, the maximum in August being 8 feet 7 inches at Echuca, and 4 feet at Wentworth. There is no doubt that diminished quantities of water lately reported are due to want of rain, and the diversion of water from the tributaries. Attached are the weekly records kept by the late Mr. J. P. Tripp, at Toorale, and the names of registered vessels now on the river (*Exhibit* 113). To ensure navigation, I consider heights of water should be: On the Murray—Albury, 6 feet; Wentworth, 6 feet; Renmark, 5 feet; Morgan, 4 feet. On the Darling—Bourke, 6 feet to 10 feet; Wilcannia, 6 feet. These are the lowest levels at which I think the large steamers can safely move. Should the water be interfered with below those heights, navigation would soon cease. The Murray may be locked to assure permanent navigation to Echuca, and the Darling to Wilcannia, providing storages be utilised, *e.g.*, Lake Victoria and other places on the former, Pomomora and Menindie Lakes on the latter; further, if the water be diverted the lakes at the mouth of the Murray would become salt. This would be most serious to this State, and the present valuable land adjacent to the lakes would be materially affected. Observations have driven one to the conclusion that to prevent salt water entering the lakes is absolutely necessary. Irrigation should not supersede navigation, the two should be managed together. Had it not been for the rivers, the back country would never have been opened up, and the interests of the pastoralists must certainly not be overlooked. A railway could never be constructed to follow the crooked course of the river, and growers of fruit, &c., must, to compete with other countries of the world, have certain, and the cheapest, communication with the cities and sea-board.

Darling a chain of water-holes. Trade. Record wool season. River freights. Victor Harbour. River levels. Depth required for navigation. Necessary to exclude salt water from lakes.

5235. *Mr. Burchell.*] How many steamers are laid up on account of the non-navigability of the river? The whole of those shown on the list (*Exhibit* 113), with the exception of four or five of the smaller ones.
5236. How long have they been laid up? Since last November, on the Darling.

Frederick

Frederick William Ringwood, Collector of Customs, Port Adelaide, sworn and examined:—

F. W. Ringwood. 18 Sept., 1902.

5237. *President.*] What is your name? Frederick William Ringwood.
5238. You are Collector of Customs at Port Adelaide? Yes.
5239. You have, in your official capacity, prepared certain returns asked for by the Commission? Yes.
5240. Will you please put them in, and name them as you do so?

South Australia.

Shipping returns.

RETURN showing Inward and Outward Shipping, and the values of the Imports and Exports, *via* River Murray, during the Years 1881 to 1901.

Year.	Inward Shipping.		Outward Shipping.		Imports—Value of.	Exports—Value of.
	No. of Steamers and Barges.	Registered Tonnage.	No. of Steamers and Barges.	Registered Tonnage.		
					£	£
1881	124	10,725	132	9,786	318,467	199,250
1882	185	22,872	180	17,798	861,259	346,717
1883	193	28,556	195	29,733	664,167	355,035
1884	172	22,091	161	19,450	794,054	185,215
1885	150	19,747	146	15,903	112,682	121,555
1886	121	18,094	123	18,025	571,584	122,351
1887	169	27,772	166	25,889	683,957	191,775
1888	118	15,722	126	18,039	123,029	131,457
1889	169	25,015	160	23,529	677,307	117,740
1890	147	23,937	148	24,854	467,741	126,521
1891	150	24,495	149	24,620	486,815	157,473
1892	144	23,504	145	23,345	425,706	131,293
1893	161	26,521	157	25,250	411,668	127,811
1894	168	30,307	167	29,605	460,547	90,936
1895	135	22,464	130	22,471	221,688	72,329
1896	177	31,739	165	28,107	471,568	95,808
1897	101	17,728	105	17,944	275,025	68,204
1898	94	14,560	96	14,899	145,407	50,346
1899	90	14,057	97	14,320	257,994	42,896
1900	88	14,332	86	13,689	181,850	45,216
1901	69	11,215	70	11,731	137,304	45,327
Total for 21 years	2,925	445,453	2,904	428,987	8,749,811	2,825,255

Remarks.—A Steamer with Barge in tow counts as one Ship in this return.

Custom House, Port Adelaide,
9th September, 1902.

Wool trade.

IMPORTS of Greasy and Scoured Wool, *via* River Murray, during the twenty years beginning 1882 and ending 1901.

Year.	Greasy.		Scoured.	
	Victoria.	New South Wales.	Victoria.	New South Wales.
	lb.	lb.	lb.	lb.
1882	391,600	10,586,975	103,000	6,196,682
1883	17,482	7,997,630	4,368	5,053,321
1884	211,600	10,567,900	15,800	5,783,600
1885	209,400	1,753,705	47,199	800,750
1886	16,000	8,233,220	1,200	2,899,846
1887	470,968	12,375,483	24,360	5,207,170
1888	604,052	1,518,974	29,840	645,212
1889	297,717	13,555,585	37,632	3,540,912
1890	593,024	9,773,904	67,620	1,784,500
1891	779,344	10,578,212	26,360	2,534,835
1892	503,296	8,751,060	17,820	2,327,250
1893	790,434	9,101,697	20,260	2,418,132
1894	760,671	10,236,496	41,728	2,556,913
1895	666,241	3,175,228	40,377	1,234,269
1896	313,637	11,902,574	31,314	2,556,579
1897	343,127	6,559,410	49,924	1,603,752
1898	345,799	2,366,853	9,984	688,104
1899	507,932	6,146,336	.....	915,371
1900	677,854	4,083,953	.....	840,318
1901	520,939	3,260,389	15,820	518,860

F. W. Ringwood. 18 Sept., 1902.

Imports and exports.

RETURN showing the total value of Imports and Exports, *via* the river Murray, from New South Wales and Victoria, during the twenty years ended 31st December, 1900, prepared in Customs Statistical Office, Port Adelaide.

Year.	IMPORTS. Imported from— New South Wales.	Victoria.	Totals.	Year.	EXPORTS. Exported to— New South Wales.	Victoria.	Totals.
	£	£	£		£	£	£
1881	276,016	42,451	318,467	1881	198,631	619	199,250
1882	837,704	23,555	861,259	1882	346,153	564	346,717
1883	663,362	805	664,167	1883	351,208	3,827	355,035
1884	785,097	8,957	794,054	1884	183,386	1,829	185,215
1885	101,376	11,306	112,682	1885	118,206	3,349	121,555
1886	571,016	568	571,584	1886	121,790	561	122,351
1887	665,975	17,982	683,957	1887	191,507	268	191,775
1888	101,947	21,082	123,029	1888	115,476	15,981	131,457
1889	663,001	14,306	677,307	1889	106,035	11,705	117,740
1890	435,071	32,670	467,741	1890	99,368	27,153	126,521
1891	461,026	25,789	486,815	1891	129,248	28,225	157,473
1892	405,342	20,364	425,706	1892	104,602	26,691	131,293
1893	383,585	28,083	411,668	1893	110,764	17,047	127,811
1894	422,709	37,838	460,548	1894	79,583	11,353	90,936
1895	172,604	49,084	221,688	1895	59,715	12,614	72,329
1896	446,043	25,525	471,568	1896	89,892	5,916	95,808
1897	258,548	16,477	275,025	1897	64,643	3,561	68,204
1898	131,194	14,213	145,407	1898	44,758	5,588	50,346
1899	234,798	23,196	257,994	1899	39,876	3,020	42,896
1900	159,188	22,662	181,850	1900	42,870	2,346	45,216
Totals	8,175,602	436,913	8,612,515	Totals	2,597,711	182,217	2,779,928
1901	112,536	24,768	137,304	1901	36,526	8,801	45,327

RETURN showing Value of Imports and Exports *via* River Murray, at Morgan, Mobilong, and Goolwa, for six years ended 31st December, 1901.

Year.	IMPORTS. Morgan.	Mobilong.	Goolwa.	EXPORTS. Morgan.	Mobilong.	Goolwa.
	£	£	£	£	£	£
1896	318,949	52,824	99,575	77,463	16,005	240
1897	201,463	21,102	64,551	51,223	15,383	367
1898	100,184	22,814	37,515	41,593	6,990	7
1899	233,635	10,002	7,442	36,427	6,235	.....
1900	175,839	4,882	.....	32,831	7,342	.....
1901	132,248	845	.....	38,201	3,875	.....
Total, 6 years	1,162,318	112,529	209,083	277,738	55,830	614

IMPORTS—PRINCIPAL ITEMS, RIVER MURRAY PORTS.

	Skins and Hides.	Tallow.	Dried Fruit.	Wool.	
	£	£	£	bales.	£
Morgan.					
1897	4,894	152	6,096	17,020	174,328
1898	3,233	380	345	8,658	86,952
1899	7,532	566	3,623	20,713	220,330
1900	7,580	591	374	15,819	163,628
1901	5,316	303	9,369	15,517	115,660
Mobilong.					
1897	5,578	1,665	1,786	946	8,200
1898	1,697	113	17,266	39	213
1899	654	31	2,808	404	4,387
1900	1,435	62	2,185	nil.	
1901	676	64	.....	7	38
Goolwa.					
1897	.....	.....	.....	6,835	64,543
1898	.....	.....	.....	4,015	37,376
1899	.....	.....	.....	619	7,429
1900	.....	.....	.....	nil.	
1901	.....	.....	.....	nil.	
Renmark.			Animals. £		
1897	.....	.....	1,856	.....	.....
1898	.....	.....	3,909	.....	.....
1899	.....	.....	6,707	.....	.....
1900	.....	.....	965	.....	.....
1901	.....	.....	3,998	.....	.....

FRIDAY, 19 SEPTEMBER, 1902.

The Commission met at the Deputation Room, Public Works Department, Adelaide, South Australia.

Present:—

JOSEPH DAVIS, Esq. (President).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Patrick M'Mahon Glynn, M.H.R., further examined:—

P. McM. Glynn, M.H.R. 19 Sept., 1902.

5241. *President.*] You have been supplied with certain legal questions which the Commission have asked in order to obtain your assistance in dealing with the constitutional aspect of the question remitted to them? Yes; but before answering them I would like to reply to Mr. Mills' criticism of my previous evidence. I have read the statement of Mr. Stephen Mills, put in (Question No. 3994) as a criticism of a position assumed by me in a pamphlet, published in 1891, called "A Review of the Murray Question." The opinion then expressed was as to the claim advanced by Sir Henry Parkes, when Premier of New South Wales, to the ownership of the waters of the Murray from the source of the river to the eastern boundary of South Australia. The ownership was claimed as absolute for all purposes, and as even including a right to prevent South Australia reducing the normal level of the river in breach of international obligations. The pamphlet was handed in more as a contribution to the general question than from a sense that the letter of Sir Henry Parkes, of 6th March, 1898, retained any significance now. Even then the terms of the letter were disapproved of by the *Sydney Morning Herald*, which said that "it would be a grave mistake to say the Murray is ours," and by the *Daily Telegraph*, which denied that "it was ever intended to give absolute ownership of the waters, and to deny all right and share in them to Victoria." As recently as February, 1898, the *Daily Telegraph* said that "the thing the Convention has to do is to provide a Constitution under which the navigable channels of federal rivers shall be federal property. What the Federation may do with them will then be for itself to determine." For the purposes, at least, of trade and commerce the channels of navigable rivers are now beyond doubt under Federal control, so that in respect of navigation the claim, while it has acquired no support, has lost its significance. But as Mr. Mills, at all events, still thinks "it seems perfectly clear that the waters of the Murray River, from the South Australian boundary to the right line boundary run from Cape Howe, pass wholly over New South Wales territory, and, consequently are the property of New South Wales," it may be well to examine his statement at a little length. It may have been noticed that the claim, when made with some particulars, kills itself. If, as the letter suggests, the ownership therein imputed to South Australia is conditioned by the international obligation to maintain, for the benefit of other riparian States, the normal level of the river, the ownership claimed for New South Wales is surely conditioned by a similar obligation. In either case ownership would be not absolute, but limited by the correlative riparian rights, the extent of which only must then remain open to question. When Mr. Mills quotes the maxim "*Cujus est solum, ejus est usque ad coelum*," and states, in the words of the American writer Angell, that it "inculcates that land in its legal significance has an indefinite extent upwards, and that a grant of it makes a stream of water as much the property of the owner of the soil over which it passes as the stones scattered over it," he assumes a position only to abandon it in the second next sentence; for he subsequently says: "No doubt the ownership of the bank of a stream carries with it the presumptive right to a certain limited use of the stream; but the original basis of this right is, perhaps, not the mere possession of the land along the bank, but the presumption of law (which was confirmed by the Privy Council in the appeal case of Lord *v.* Commissioners for the City of Sydney, and is generally applicable in England to non-tidal waters), that a grant of land bounded by a stream passes the ownership of the soil of the stream *ad medium filum aquæ*, the right to the use of the water then following as an incident to the ownership of the soil over which it passes, in accordance with the maxim above quoted." Now, here we have an admission that Angell's statement is not quite correct, and that "a stream of water is '*not*' as much the property of the owner of the soil over which it passes as the stones scattered over it." Ownership of the stones is absolute. But ownership of the soil over which the stream passes, which Mr. Mills thinks is the original basis of the right incident to the ownership of the bank, carries with it only "a presumptive right to a certain *limited use* of the stream." Whether New South Wales owns both banks and the bed (which Mr. Mills, by adopting for the purpose of the context Angell's definition of "watercourse," as consisting of "bed, banks, and water," seems to assert, and which involves the startling conclusion that Victoria is not bounded by the Murray), or one bank and the bed, makes no difference to States up or down stream. New South Wales would still only have a right to a certain limited use of the water, the maximum that could be taken without violation of the rights of other States being no greater than if Victoria owned, *ad medium filum aquæ*. To what does the right to a limited use amount? The answer is supplied by the case of Lord *v.* The Commissioners of the City of Sydney, for another purpose cited by Mr. Mills. In the judgment delivered by Lord Coleridge, the law is thus laid down:—"Mr. Chancellor Kent, in his Commentaries (Ed. 1840), Part 6, sect. 52, page 438, writes thus: 'Every proprietor of lands on the banks of a river has naturally an equal right to the use of the water which flows in the stream "adjacent to his lands"'; and a few lines further down, speaking of the same person, he adds, 'though he may use the water while it runs over his land, he cannot unreasonably detain it.'" That case, by the way, is by no means as clear an authority as Mr. Mills considers it as to the general principle (which, however, need not be disputed) of ownership *ad medium filum aquæ*. "It is a question of some nicety," said Lord Coleridge, "and it so constantly happens that the owner of the bank is also the owner of the land *ad medium filum aquæ*, that it is dangerous to attribute too much importance to the language either of judicial decisions or text books, which seem to define the right where the foundation of it is not in question." The headnote, which states that "a right to the use of flowing water does not necessarily depend upon the ownership of the soil covered by such water," scarcely strengthens Mr. Mills' position. The case of Miner *v.* Gilmour (12 Moore, P.C.R. 131) also indicates the extent of the right. "By the general law applicable to running streams, every proprietor has a right to what may be called the ordinary use of the water flowing past his land—for instance, to the reasonable use of the water for 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 down the stream. But, further, he has a right to the use of it for any purpose, on what may be termed the extraordinary use of it, provided that

Channels of navigable rivers under Federal control.

Ownership of soil over which stream passes gives only presumptive right to use of water.

Riparian proprietor cannot unreasonably detain water.

Right to reasonable use of water.

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." But it may be said again that, in this part of his argument, "Mr. Glynn is dealing purely with the riparian law as between an upper and a lower proprietor of a stream where both proprietors are under the same Government. His contention would only be true as applied to two States if there were an interstate riparian law exactly similar to the common law affecting individuals, but there is no such law." Now, in the pamphlet (written in 1891 before Federation) I simply, as Mr. Mills at the end of his statement admits, examined the grounds of the claim to the exclusive ownership of the waters of the Murray, according to the principles of a riparian law under which it was advanced. I assumed, for the purpose of the argument only, the asserted application of the law, and expressly stated that "the mutual rights of the Colonies, as deduced from the principles of private law, have, of course, no sanction outside the conscience of those to whom they relate. There exists neither a Court to declare nor an Executive to enforce them. The point need not be elaborated, as it is dealt with in my addendum to the second Progress Report of the South Australian Commission." That addendum is published in the evidence given by me, which Mr. Mills says he read. The question of the existence and scope of a riparian law between States forming part of an Empire may be a nice point for lawyers to discuss, but is of much less practical interest to politicians. If the States fail to amicably adjust their mutual claims, the High Court of Australia must determine the extent of their rights and obligations. The better opinion seems to be that, when States federate, they submit the validity of all acts that affect the rights of citizens of different States to the decision of the Federal tribunal (*see* 6 Wheaton, p. 380). Mr. Justice Clark, of Tasmania, puts the case clearly when he says (p. 286, Appendix, Federal Convention, Melbourne):—"The riparian rights of the owners of land abutting on the River Murray, in the Colony of South Australia, are rights of property in South Australia, and if these rights shall be infringed by any private person or any public body professing to act under colour of the authority of an Act of the Legislature of New South Wales, when both Colonies are constituent parts of the Commonwealth of Australia, the citizen of South Australia whose riparian right has been violated will have a remedy in the Federal Courts of the Commonwealth, either for damages or for a writ of injunction to restrain the continuance of the injury, or for both." As a direct authority upon this point, I may refer to the case of the Holyoke Water Power Company *versus* Connecticut River Company, which was decided in the United States in the year 1884. (*22 Blatchford, 131.*) *In that case the Legislature of Connecticut* had authorised the Connecticut River Company to raise their existing dam across the river in Connecticut to improve the navigation and also maintain the water power of the Company. The Connecticut River Company's dam was about 16 miles below the dam and factories belonging to the Holyoke Water Power Company in Massachusetts, and the Connecticut River Company proposed to raise its dam in Connecticut so high that it would cause a diminution in the fall of the river above the dam for six or seven months in the year, to the detriment of the Holyoke Company, and the Holyoke Company filed a bill in Equity in the Circuit Court of the United States for the District of Connecticut, praying for an injunction restraining the Connecticut River Company from raising their dam to the proposed height. The Court granted the injunction, and the concluding portion of the judgment of Shipman, J., runs as follows:—"The owner of land abutting upon a navigable river owns it subject to the right of the State to improve the navigation of the river because the land is within the governmental control of the State; but it seems to me that the State obtains, by virtue of its governmental powers, no control over, or right to injure, land without its jurisdiction. Jurisdiction confers the power and right to inflict consequential injury, but where no jurisdiction exists the right ceases to exist. It is a recognised principle that the statutes of one State in regard to real estate cannot act extra-territorially. As Connecticut has no direct jurisdiction or control over real estate situate in another State, it cannot indirectly, by virtue of its attempted improvement of its own navigable waters, control or subject to injury foreign real estate. If this resolution is a bar to an action for any consequential injury to land, or to rights connected with the land in Massachusetts, Connecticut is acting extra-territorially. Let there be a decree enjoining the defendant against any further raising of its present dams to a greater height than the height occupied by the respective portions of the present structure." In "Angell on Watercourses," one of Mr. Mills' authorities, the following propositions are laid down:—That even a private river may be subject to public use (692); that it resembles in respect of the right to public use a highway on land; that (693) riparian ownership confers no authority upon the proprietors of land to interfere with or obstruct the right of passage in the adjacent stream to the injury of another. The right of public use, and the power to indict for a nuisance, is not limited to the tidal portion. The Potomac, for instance, is part of the *jus publicum*, although it was originally not, and has by improvement only been made navigable above tide water. "The river Mississipi (691) is pre-eminently an open highway, and upon principles of international law the right of passage in it, by a citizen of one State within the jurisdiction of another, is classed among imperfect rights; but the right was made perfect by the Constitution of the United States, which provides that the citizens of each State shall be entitled to the privileges of the several States." (*See* the Commonwealth Constitution Act, section 117). The trade and commerce clauses, more obligatory in the Australian than in the American Constitution, also effect the same result. Mr. Mills examines, in the light of definitions, my contention as to the sense in which the word "watercourse" is used in the 5th section of the 18 and 19 Vic., c. 54, being the Imperial Act, enacting the Constitution Act of New South Wales, and states that I speak of the "watercourse or bed" as if the two words were synonymous. "Let us ask," he says, "what is the meaning of the word 'watercourse,' used in the Constitution Act above quoted," and he answers by giving definitions from Angell, Stephens (commentaries), and Wharton (law lexicon). As these definitions do not agree, they weaken, for the purpose quoted, the force of one another. Angell's is of a corporeal, Stephens' and Wharton's of an incorporeal hereditament. Angell says "a watercourse consists of bed, banks, and water"; while Stephens and Wharton say it is a "right which a man has to the benefit of the flow of water." In the latter sense it "involves the right to have the course of the water kept free from any interruption or disturbance to the prejudice of the claimant of the right by the acts of persons from without, and in parts not within his own territory." It does not require much thought to see that if the word "watercourse" is used in section 5 in the sense of Stephens' and Wharton's definition, the New South Wales Constitution Act, by necessary inference, declares the existence of reciprocal riparian rights and obligations between

P. McM. Glynn, M.H.R. 19 Sept., 1902.

No inter-State riparian law.

High Court of Australia must adjudicate.

Holyoke Water Power Co. *v.* Connecticut River Co.

River frontages held subject to right of State to improve navigation.

State statutes cannot act extra-territorially.

Private river may be subject to public use.

Public use of rivers not limited to tidal portion.

"Watercourse"—comparison of definitions.

P. McM. Glynn, M.H.R. 19 Sept., 1902.

the States. No extra-territorial riparian rights could have been given to New South Wales that did not impose corresponding obligations on that State in respect of the other riparian States. If the Commonwealth and the States agree to accept Stephens' and Wharton's definition, and all it involves, the river question can easily be settled. But while it is probable that in the acquisition of our laws and powers, riparian laws within States were conditioned by a similar law between States, section 5 of 18 and 19 Vic., c. 54, was not intended to confer or limit riparian rights. The object of the Act was to indicate a boundary which, under the 13th and 14th Vic., c. 59, was doubtful, and the word "watercourse" was used for that purpose only. "The course of the Rivers" is a historical method of division (Gibbon, "Decline and Fall of the Roman Empire, vol. I, p. 19, ed. 1900). Hardcastle, in his work on the interpretation of Statutes (2nd Ed., p. 172), says, "The best dictionary is but a guide to the true meaning of a word in a particular context, and can never be an absolute authority on so varied and fluctuating a subject as language. If a word, in its popular sense, and read in its ordinary way, is capable of two constructions, it is wise to adopt such a construction as is based upon the assumption that Parliament merely intended to give such a power as was necessary for carrying out the objects of the Act, and not to give unnecessary powers." (Wandsworth L. B., *v.* United Telephone Co., 1883, 13 Q.B.D., 920.) Applying these principles to the interpretation of the context, the sense in which the word "watercourse" is used becomes evident. The section (5 of 18 and 19 Vic., c. 54) says: "Whereas under the 13th and 14th Vic., c. 59, it is amongst other things enacted that the territories therein described as bounded on the north and the north-east by a straight line drawn from Cape Howe to the nearest source of the River Murray, and thence by the course of that river to the eastern boundary of the Colony of South Australia should be erected into a separate colony, to be known and designated as the Colony of Victoria. And whereas doubts have been entertained as to the true meaning of the said description of the boundary of the Colony: It is hereby declared and enacted that the whole of the watercourse of the said river Murray from its source therein described to the eastern boundary of the Colony of South Australia, is and shall be within the territory of New South Wales, &c." Here "course of the river" is used as interchangeable with "watercourse," and in the sense of path traversed by, or channel for the conveyance of the water. Applying the principle of construction laid down in Wandsworth L. B. *v.* United Telephone Company (supra), the word "watercourse" is used in the context in the popular sense of "bed." The declaration is that the whole of the watercourse or bed, not merely the bed *ad medium filum aquae* as incident to possession of one bank, is within the territory of New South Wales. That meaning is the only one perfectly consistent with the object of the Act, which is to clearly indicate a boundary and the State in which was vested incidental territorial jurisdiction, not to give to New South Wales the whole of the waters, both banks, and the bed of the Murray. Rights so comprehensive and exclusive would not belong to that State, even if the Murray, like the Darling, were between given points, altogether within the territory of that State. As I suggested, such absolute rights are no longer claimed by statesmen; and the assertion of them has been, from time to time, repudiated by the Australian Press. The *Sydney Daily Telegraph*, for instance, writing 27th January, 1898, during the sittings of the Federal Convention, said: "But what is the proposal? Simply that the great federal River Murray, with its navigable tributaries, should be kept free for the use of all Colonies alike." The *Sydney Morning Herald* asked, "Who is the owner, in law and fact, of the waters of these rivers, by which we mean, not only those flowing through or between different States, but also its tributaries, no matter where they flow?" It answers by applying to States the principle of the riparian law declared by a statute of New South Wales. "It is hardly to be supposed that the legislature or the people of New South Wales will, when the proper time comes to deal comprehensively with this question, refuse to accept for the regulation of its action as a State the principles which in this statute are laid down for determining the rights of private occupiers. If the State within which the rivers rise has its rights to the use of the water, other States across or lower down the stream must have their rights also. Those States have their rights now; all that is wanting to make them fully effective being, as was said in the Convention yesterday, the power of enforcing them." This is what the Melbourne *Age*, to quote its own words, says, "has been showing to be the only reasonable settlement of the river question between States coming into a federal compact."

Object of Act 18 and 19 Vic.

Sense in which "watercourse" used in Act 18 and 19 Vic., c. 54.

Daily Telegraph.

Sydney Morning Herald.

Age.

Effect of s. 5, 18 and 19 Vic., c. 54.

5242. [Question No. 1.]—Did section 5 of the Constitution Statute (18 and 19 Vic. c. 54), which enacts that "the whole watercourse of the said river Murray, from its source therein described to the eastern boundary of the Colony of South Australia, is and shall be within the territory of New South Wales," thereby make New South Wales the legal possessor of the waters passing along the bed of that river; if not (*a*) what was the right conveyed by that enactment; (*b*) how has that right been affected, if at all, by the passing of the Commonwealth Constitution Act? No. The section does not make New South Wales the legal possessor, in the sense of absolute owner, of the water passing along the bed of the river.

Act does not make N.S.W. absolute owner of water.

(*a*) No right was expressly conveyed, but as a consequence of the "watercourse" being declared to "be within the territory of New South Wales"—

Gives jurisdiction in respect of offences.

1. That State acquired, subject to certain express conditions, jurisdiction in respect of offences and trespasses committed between the banks against the laws of New South Wales.

A more accurate boundary line.

2. A more accurately-defined boundary line, the indefinite delimitation of which, under the 13 and 14 Vic. c. 59 rendered territorial jurisdiction doubtful.

(*b*) Jurisdiction in respect of matters arising under the Commonwealth Constitution, or laws passed thereunder, became vested in the Commonwealth.

Not the intention to deprive Victoria of use of waters.

It was evidently not the intention of the Imperial Parliament, by declaring that the whole of the bed was within New South Wales territory, to deprive Victoria, as a riparian State, whose territorial jurisdiction would otherwise have extended to half the bed, of the right to a reasonable use of the waters.

Matters which have passed under Federal control.

5243. Under heading (*b*) to Answer No. 1, you say that "jurisdiction in respect of matters arising under the Commonwealth Constitution, or laws passed thereunder, became vested in the Commonwealth";—what are those matters? The principal matters thus passing under Federal control refer to navigation and navigability. The power of the Federation to maintain and improve the navigability of rivers for the purpose of trade and commerce between the States. The application of Customs laws to the rivers—for

P. McM. Glynn, M.H.R. 19 Sept., 1902.

for instance, regulations for the future, instead of being made either by New South Wales or Victoria, each of which has hitherto passed regulations in respect of its own Customs, now have to be passed by the Federation, and of course the Commonwealth laws generally apply on the rivers as well as on land, while State laws would still be applicable only for purposes within State jurisdiction.

Scope of riparian law between States.

5244. [Question No. 2.]—Prior to Federation, what was the scope of the riparian law as between the Colonies; has federation modified, and if so, how, the tenor of this law as between states;—what tribunals are to be appealed to for the enforcement of interstate riparian law? Doubts have been expressed as to whether, prior to Federation, any riparian law existed between the Colonies. The better opinion seems to be that the principles of the common law of riparian rights applied between Colonies which in that respect were not in the position of independent States. Each Colony was entitled to reasonable use of the waters, and the maximum divisible under the law of riparian rights in force within its territory was limited to the quantity that could be used without interfering with the reasonable requirements of other riparian Colonies. Federation has rendered interstate rights enforceable, and injuries to riparian rights by the other States, or the citizens of another State, liable to be restrained by the High Court of Australia, or such Federal or State Courts as the Commonwealth Parliament invests with the necessary jurisdiction. Federal jurisdiction, for the purpose of navigation, also modifies the meaning of the word "reasonable" as applied to "use." In connection with that answer, I would like also to say there may be some slight doubt as to whether each State is to be regarded as entitled to a certain specific quantity of the water, or whether under federation all lines of demarcation are not wiped out, and the citizen of South Australia is in the same relation to the citizen of New South Wales as if there were no States in existence. Of course, under the latter construction, a citizen of one State could sue a citizen of another State whose diversion injured the first man, although the total diverted by the State was well within the total rights of that State. But the whole subject is a very difficult one. If, even before federation, a citizen of Victoria sued a citizen of New South Wales in a New South Wales Court, and proved that the unreasonable diversion of the New South Wales citizen had injured the citizen of Victoria, the Court in New South Wales would grant an injunction or damages, but Federation has made the power of enforcement absolutely certain.

Principles of common law riparian rights applied between States.

Federation renders inter-State rights enforceable.

Doubtful whether federation wipes out State lines of demarcation.

Commonwealth control of rivers.

5245. Do I understand you to be of opinion that the Commonwealth, as constituted, takes over the control, in a primary sense, of the whole of the rivers, both in regard to trade and commerce, and also the use of water for conservation and irrigation purposes, and that the Commonwealth, therefore, in the sense of having that control, has to say what is a reasonable use of the water to be given for water conservation and irrigation? No. It is necessary, as this is a technical subject, to keep very clearly in mind the distinction between the Parliamentary powers conferred by the Commonwealth Act and the judicial powers conferred. The Parliamentary powers in connection with this question are certainly limited to the control for purposes of navigation and navigability. Parliament cannot legislate in regard to irrigation or water conservation, except in so far as they may be necessary for federal purposes well within the scope of the Federation. The Federal Parliament, for instance, can only become a landowner so far as it is necessary to hold land incident to the powers conferred by section 51 of the Commonwealth Act, and cannot become a landowner in the general sense. But the judicial power does extend to the enforcement of Crown rights, and includes the enforcement of the federal laws which deal with navigation or navigability, and all inter-State riparian rights, whether they relate to irrigation, navigation, or water conservation, so that the judicial power can restrain diversions by States or individuals which violate riparian rights of other States or individuals in other States. I, therefore, say again that no legislative power in connection with water conservation or irrigation has been conferred, but the judicial power is sufficient to enforce the recognition of all proved rights.

Distinction between Parliamentary and judicial powers.

Extent of judicial powers.

Rights reserved to States binding.

5246. What rights do you consider have been reserved to the States in the clause which relates to water conservation and irrigation? I think, speaking generally, that the States have no rights conferred by the Federal Constitution that can restrict the federal power in respect of navigation and navigability, that, so far as they respect these powers, they can reasonably divert water within the law of riparian rights, and that what section 100 of the Federal Constitution declared, subject to the trade and commerce clauses, was merely the reservation of the existing rights for purposes of water conservation and irrigation. I would also say that if, in carrying out federal powers in relation to navigation and navigability, a clear case was put before the Courts under section 100, then the courts would declare that, inasmuch as more water has been taken than was necessary for the federal purpose, it was an unreasonable use by the Federation, and could be restrained at the instance of a State or individual whose riparian rights were infringed.

Federation could be restrained from unreasonable use of water.

"Reasonable use."

5247. What, as a matter of fact, would be a reasonable use of the water for conservation and irrigation? That is a very hard question, it is purely one of evidence. I think, giving merely a general opinion, that the Court would consider what ought to be a reasonable share as between State and State, as well as to what extent diversions by one citizen affect the rights of another citizen; but, though the law may be very clear, the application of it to each case is exceedingly difficult, and is a matter for decision by a jury, or a judge exercising the powers of a jury. That is why I would recommend the States, if they came to an agreement, to give some general principle to guide a commission, if appointed to supervise diversions, and which should look carefully into the whole matter. A Court would be guided entirely by what is a "reasonable use," and the difficulty, as regards the proof of that, would be great. My opinion, of course, is more that of a lawyer than an expert as to quantities capable as reasonable of being diverted. Each case must be examined separately, first, possibly, as to the total quantity to be diverted by the States, secondly, as regards the reasonable diversion by, say, A as against B. The only other way to settle it would be by means of an agreement. Though the law is always clear as to the enforcement by the citizen of one State against the citizen of another State, it is always exceedingly difficult to prove the damages by a particular person to another. Take, for instance, the case of a man at Goolwa complaining that the water had been rendered salt by diversion in the Riverina—the principle of the law is clear—that if that diversion has been made the man is entitled to damages, but it would be almost, if not absolutely, impossible to prove it.

Difficulty of proving damage.

Custom must be universal to be binding.

5248. *Mr. Murray.*] Would the accustomed use of the water in any way assist the Court in forming a judgment? It might, possibly, to some extent; but the custom must be universal and applicable to all parties. No Court could be guided by a custom exercised by only one party. Custom is not binding unless it is of very long duration, and applicable to all parties concerned. Custom by one party might merely amount to trespass.

5249.

P. McM. Glynn, M.H.R. 19 Sept., 1902.

5249. Supposing the other parties had concurred in the use of the water? No. If all the colonies were accustomed to use the water for one purpose in a particular way, it might be a slight guide as to what the words "reasonable use" meant; but it could not conflict with the principles of the Federal Constitution so as to give the use for irrigation supremacy over navigation, because the power to improve the river for purposes of navigation is impliedly affirmed by that Constitution. Custom cannot cancel existing riparian rights. On the Danube, for instance, a diversion beyond allowed quantities is not recognised unless it has been concurred in for at least thirty years. Under English laws, it must be equal to the period of the Statute of Limitations, and mean the non-enforcement of a right, from the breach of which it would date.

Effect of custom on riparian rights.

Statute of Limitations.

5250. Do you mean to imply that the diversion referred to would not apply, inasmuch as it would be diversion by the Crown? No rights can be given by prescription against the Crown without the Crown's consent, nor does the Statute of Limitations obtain against the Crown, nor would acquiescence begin to run at all if the right was not legally enforceable. Acquiescence means the non-enforcement of a legal right, and until the legal right exists there cannot be acquiescence. Some deny its existence before Federation.

"Acquiescence."

Remedy for riparian damage.

5251. *Mr. Burchell.*] If a person who is not a riparian owner diverts water to the damage of a riparian owner, what remedy has the latter? He can sue even if the diversion were under the authority of the States Act. Diversion of water to an unreasonable extent, which affects the riparian owner lower down, can be stopped. A State Act could never be set up as a defence to an action by one citizen of a State involving a question of unreasonable diversions of water to the detriment of a citizen of another State.

Section 5, 18 and 19 Vic., to be read with 13th and 14th Vic., c. 59.

5252. [Question 3.]—Must not 18 and 19 Vic. c 54, section 5, for the purpose of understanding its true purport and meaning, be read with the 13 and 14 Vic. c. 59, and being so read, does it not appear that section 5 of 18 and 19 Vic. c. 54 was passed to settle doubts as to the true meaning of descriptive words in 13 and 14 Vic. c. 59, and to get over difficulties caused by want of a clear delimitation of the boundaries of New South Wales and Victoria as to the imposition and collection of Customs duties, the punishment of offences, and the regulation of navigation? Yes. The section expressly declared that doubts had been entertained as to the true meaning of the description of the boundary of the Colony of Victoria as described by the earlier Act, and "enacted that the whole of the watercourse of the said River Murray, from its source therein described to the eastern boundary of the Colony of South Australia . . . is and shall be within the territory of New South Wales." The Legislatures of both Colonies were given power to make regulations and punish offences in respect of the Customs, and jointly to define in any different manner the boundary line of the said two Colonies along the course of the River Murray. The Act, therefore, was passed to define a boundary, and gave by consequence (subject to certain rights conferred on Victoria to pass regulations as to Customs and navigation by Victorian vessels) to New South Wales such rights as are incidental to the possession of the bed. Those rights are limited.

Object of Act.

5253. [Question No. 4.]—One witness has stated that "any scheme which so interfered with the natural flow of the River Murray as to render it less navigable than formerly, would be unconstitutional since Federation was established." (*a*) Do you concur in this opinion? (*b*) Is that statement supported by analogy of riparian relations as declared and administered between European States? (*c*) Do existing conventions or treaties between any European States regulate the right to divert water for irrigation purposes? Yes.

Right of Commonwealth to maintain navigation.

(*a*) Section 100 of the Commonwealth Constitution does not abridge the right of the Commonwealth, under the trade and commerce clauses, to see that a navigable depth is maintained.

Danube Commission jurisdiction.

(*b*) For instance, under the Treaty of Paris, 1856, the Danube has been placed under the control of a joint commission representative of the Signatory Powers, and freedom of navigation, with all that it involves, has been declared to be part of the public law of Europe. The stream belongs to the Commission, which has control over the tributaries passing through one State to the extent necessary to prevent diversions that would diminish the navigability of the main river. The Commission regulates the taking of water for industrial and irrigation purposes on the following principles:—

Measurement.

(*a*) The water diverted is measured by volume and hours of flow.

Residue.

(*b*) The drainage and residue must be given back to the river.

Drains.

(*c*) The drains used for diversion for industrial purposes must be constructed so as to carry off any chemical matters which pollute the water.

Navigation.

(*d*) No water can be taken to an extent that would affect navigability.

Regulation diversion of rights.

(*c*) Yes. In the sense that the Danubian Commission, appointed under the Treaty of Paris, regulates the right to divert for irrigation as well as industrial purposes. The water is chiefly used for industrial purposes, but Moldavia and Wallachia divert for irrigation. (*See* interview with Signor Corte, Italian Consul-General for Australia in 1898, President of the Danubian Commission in 1889, published in the Melbourne *Herald* about February, 1893).

Bed of navigable river.

5254. [Question 5.]—Is the alveus or bed of a public navigable river, *inter Regalia*, or in the Crown? Yes. (*See* MacQueen's Scotch App. Cases 46.) The bed of a navigable river "so far at least as the tide of the sea flows," *prima facie*, belongs to the Crown.—Stephens' Commentaries, 11 Ed., Vol. I, page631. Latterly there seems to be a growing inclination to regard the beds of non-tidal portions of navigable rivers as in the Crown. In Smith's Leading Cases, Vol. 11, page 140, it is stated, "up to a point reached by the flow of the tide the soil was presumably in the Crown; above that point, whether the soil at common law was in the Crown or in the owners of the adjacent land, was a point, perhaps, not free from doubt; there was at least a jurisdiction in the Crown to reform or punish nuisances thereon. It was, therefore, at common law, illegal to erect weirs so as to obstruct the channel." In Canada, the principle of ownership *ad medium filum aquæ* is not applicable to rivers *de facto* navigable. As Federal control exists for the purposes of navigation that point is not important.

Canadian law.

South Australian claim to Murray tributaries.

5255. [Question 6.]—One witness has stated that South Australia's claim to a share in the waters of the Murray extends to all the tributaries of that river.—(*a*) Has such a claim any legal or constitutional basis; (*b*) can the tributaries be diverted so as to interfere with the navigability of the main stream?

(*a*)

P. McM. Glynn, M.H.R. 19 Sept., 1902.

(*a*) Yes. A tributary, if part of an interstate system of navigable rivers, is subject to Federal control. Even if not navigable, it may be subject to riparian rights. (*b*) No. (*See* answer to Question 4.)

Miner *v.* Gilmour.

Riparian proprietor—rights of.

5256. [Question 7.]—(*a*) Was the difficulty prior to Federation of the application of the principles of riparian rights between colonies or the citizens of different colonies, that there was no tribunal having jurisdiction to determine or enforce such riparian rights or equities; (*b*) is the law as to riparian rights to the use of flowing water authoritatively laid down in the case of Miner *v.* Gilmour, XII Moore, P.C., 131, in which is declared:—"Every riparian proprietor has a right to the reasonable use of the water flowing past his land, namely, for his domestic purposes and for his cattle, and this without regard to the effect such use may have, in case of a deficiency, upon proprietors lower down the stream; he has also the right to the use of the water for any other purpose, provided he does not thereby interfere with the rights of the proprietor either above or below him. Subject to this condition, a riparian proprietor may dam up the stream for the purpose of a mill, or divert 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 waters by the other proprietors and inflicts upon them a sensible injury; (*c*) does this decision bind the Australian States in their interstate relations? (*a*) Yes. But I do not think it is certain that before Federation a citizen of one Colony could not have sued in the courts of another Colony for injury to his riparian rights by a citizen of the latter Colony. Any difficulty that existed has been removed by Federation. (*b* and *c*)—Yes.

State rights to rivers before Federation.

5257. [Question 8.]—(*a*) Before federation, what was the right of the Colony as to the waters of a river wholly within its own territory, but forming a tributary direct or indirect of the Murray; (*b*) were the rights of New South Wales the same as to control and use of the waters of the Murrumbidgee, which is a tributary of the Murray and say, to the Hawkesbury, which flows into the Pacific Ocean near Sydney; (*c*) have such rights, in either or both cases, been affected by the passing of the Commonwealth Constitution Act, and, if so, to what extent, and in what way? (*a*) It had a right to a use of the water as laid down in Miner *v.* Gilmour, quoted in Question 7. (*b*) No. Because the Hawkesbury could not have been subject to any riparian rights outside New South Wales. (*c*) The rivers, if navigable, have become subject to Federal control for the purposes of interstate and external commerce. (*See also* answer to 7)—(*a*).

Victorian obligations.

Inter-State agreement should deal with all inter-State riparian claims.

5258. [Question 9.]—Assuming the Government of Victoria to have entered into obligations with regard to the supply of water from the Murray and its tributaries, should any agreement between the three States especially interested in the Murray, regard these obligations as validly entered into, and deal only with such of the waters as remain unappropriated after they have been satisfied? Will you state your opinion separately as to the main river and as to the tributaries? The obligations entered into by Victoria were relative to Victorian powers to confer rights which were limited by the correlative rights of other States. Existing Victorian obligations relate to its own citizens, and not to those of other States, and cannot, so far as they derogate from rights of property outside Victoria, be regarded as validly entered into. Any agreement should, therefore, deal with all waters in respect of which interstate riparian claims exist. There has been no acquiescence in unreasonable diversions. Acquiescence, where it can be set up and is applicable, must extend over a period so long, and be under such circumstances, that authorisation can be inferred. In the case of the Danube unlawful diversions are not, as I said, recognised unless acquiesced in for thirty years. Victoria has no legal constitutional right to give authority for diversions from the Murray beyond her reasonable share of the waters as a riparian State. I do not think that the fact that the whole of the watercourse (in the sense of bed) has been declared to be within the territory of New South Wales deprives Victoria as possessor of one bank (from which possession of the bed *ad medium filum aquæ* would otherwise have been presumed) of a right to a reasonable share or use of the waters. Her right to trespass (at least for purposes not mentioned in 18 and 19 Vic. c. 54, section 5), on the bed may probably be questioned, by New South Wales for some purposes, by the Commonwealth for others.

Victorian rights.

Inter-State rights in tributaries.

5259. *President.*] Do I understand you to say that even in respect of the tributaries of the Murray that have their rise, and which run their whole course through Victorian territory, the rights which may exist in other States must be respected, and that in any diversions which Victoria makes she must have those rights in view? Yes; that is the stand I take.

Victoria's right to "reasonable use."

5260. In your last answer you state, "I do not think the fact that the whole of the watercourse has been declared to be within the territory of New South Wales deprived Victoria as possessor of one bank of a right to a reasonable share or use of the waters";—could you define a little more in detail what you mean by that part of your answer? Supposing 18 and 19 Vic., c. 54, had not been passed, if the law is clear, that the owner of a bank, subject to the Crown rights, is presumed to be the owner *ad medium filum aquæ*, I still do not think that it is quite as clear as some people believe, that Victoria would have a right to the reasonable use of the water as incident to ownership of half the bed, and not as incident to the ownership of the bank, as some think. I do not altogether agree that the right is incident to the bed, not the bank—but, in any case, Victoria would clearly be entitled to a reasonable use of the water as it passed down the river. Taking away the bed was not to deprive her of a right to water. But it is claimed by some—for instance, Mr. Mills, as an inference for his argument—that Victoria is not a riparian State at all, *i.e.*, that is the conclusion derived from his application of the definition given by Angell in respect to the word "watercourse," as including the bed and both banks. If that is so, Victoria would have no right at all; but what I think is the case is, that one bank and the whole of the bed are within New South Wales territory. Victoria, therefore, is not possessor or owner of half the bed; but I do not think the Imperial Parliament meant in taking half the bed from Victoria to cancel her right to a reasonable use of the water, which some think—though I do not share the opinion—is incident to ownership, not of the bank but of the bed. I think, as already stated, the Imperial intention was to define a boundary, not to cancel the previous rights of Victoria, which rights to whatever incident then clearly included a right to the reasonable use of the water of the Murray.

Inference from Angell definition.

Intention of Imperial Parliament.

Riparian right contingent on ownership of bank.

5261. Do I understand you to say that, assuming Victoria owns half the bed, she has rights in respect to the waters of the river, but assuming she has no rights in respect to the bed or banks on either side, she has no riparian rights? Well, probably, because she would not then be a riparian owner if she owned neither bank; but she would have the right of navigation, as that is not dependent upon riparian ownership, but is, under the Federal Constitution, the right of every citizen of the Commonwealth, as I showed. I deny that Angell's definition, which would deprive that State of a bank, is applicable.

5262.

P. McM. Glynn, M.H.R., 19 Sept., 1902.

5262. Assuming for a moment that the Victorian bank of the River Murray belongs to Victoria, and is not included in the term "watercourse," as used in the Act to which you have referred, would that, in your opinion, carry rights in respect to the waters, and, if so, will you give us your reasons for stating so? I think it would carry water rights, because my opinion is that the right to the use of the water depends on the ownership of the bank, and not on the ownership of the bed, but that, even if it depended on ownership of the bed that, for the purpose of rights to water, is presumed from ownership of the bank. I do not think you can say that the rights which existed at the time of the passing of Act 18 and 19 Vic. c. 54, sec. 5, has incidentally destroyed or taken away existing rights from Victoria. An Act of Parliament must be considered according to the evident intention in passing it. The object in this case being not to confirm or limit rights, but, as I have before said, to define a boundary. I do not think that the vesting of the whole of the Murray in New South Wales cut down the rights which Victoria previously exercised.

Act interpreted according to intention.

5263. If occasion arose, do you think you would be able to fortify your opinion by authorities? Yes, by reasoning certainly, and perhaps also by direct ruling. It appears that ownership of the banks affirms, apart from the Federal Constitution, rights not only of navigation, but also riparian rights, and I think I have already mentioned that Lord Coleridge has doubted the principle *ad medium filum aquæ*, and that it does not apply to navigable rivers in Canada. Lyon *v.* Fishmongers' Company, and other cases assign the right to a reasonable use to the bank and deny ownership of water to either bed or bank.

Lyon *v.* Fishmongers' Co.

5264. [Question 10.]—If the three States represented on this Commission desired to enter into an agreement with regard to the utilisation of the waters of the Murray and its tributaries, for the purposes of water conservation and irrigation, what would be the best method of making that agreement effective;—would it be competent for the Federal Parliament, at the request of the three States, to legalise such an agreement, or should the agreement be given effect to by the passing of identical statutes in the States Legislatures? It would, as far as their mutual rights are concerned. A Federal Act would be better than State Acts, as it would not be liable to repeal at the instance of any one State, I say, as far as the three States are concerned, because Queensland may be concerned in the matter, and reference by the three States represented here, and which do not include Queensland, might be held not to bind Queensland. If the States merely agreed to pass identical statutes, then that statute can be abrogated by any one of those States.

Best method of making inter-State agreement effective.

Federal Act.

5265. Do I understand you to say that so far as water conservation and irrigation are concerned, unless the Federal Government were intimately concerned, it would not, be competent for them to legislate, and as a consequence, it follows that the Federal Government would be unable, in your opinion, to pass such an Act as would legalise any agreement which might be entered into by the three States? What I said as to direct Federal powers did not apply to conservation and irrigation. There is a subsection to clause 5, which adds to the general powers of legislation, power to legislate on reference—subsection 37. What would be necessary in respect of not specially delegated matters would be for the State Parliaments to pass Acts authorising the Federal Government to pass a general Act, and that Act would not apply to any State which was not a party to the reference.

Federal Government power to legislate on reference.

5266. [Question 11.]—Should any such agreement or contract be subject to the maintenance and improvement, for purposes of interstate commerce, of the navigability of rivers under Federal jurisdiction? Yes. As well on grounds of expediency as of law. In connection with a question asked by Mr. Murray as regards the limitation of use of tributaries, I would like to say that my answer was subject to the condition that the Federal Government must not be unreasonable in using water for navigation beyond what is necessary, and to the general reasoning as to riparian rights.

Maintenance and improvement of navigability.

5267. [Question 12.]—The power of legislation on the subject of navigation being now vested in the Commonwealth Parliament—(*a*) seeing that *inland* navigation is closely connected with water conservation and irrigation, do you think that the control of all these matters should be under one centralised authority; (*b*) could the Commonwealth Parliament, at the request of the States, pass a statute governing not only *inland* navigation, but also water conservation and irrigation; (*c*) if so, is, it necessary or desirable that such a measure should be of general application, and extend to the whole Commonwealth; (*d*) do you consider the riparian law of England suitable to the physical conditions of Australia, or do you think the principles laid down in the New South Wales Water Rights Act, 60 Vic. No. 20 (now Consolidated Statute No. 51 of 1902), which declares the rights of the Crown to the use and flow and to the control of waters in rivers and lakes, should be extended throughout the Commonwealth; (*e*) do you think it desirable that the matters of water conservation and irrigation, together with inland navigation, should be controlled by a Department of the Commonwealth Government, administering such a statute as referred to in subsection *b* of this question? I have not, from want of time, considered the matter as carefully as I would like to have done; but speaking hurriedly and generally on the matter, I think it would be advisable, so that some authority should regulate and exercise supervision over diversion schemes carried out by the various States, and at least advise as to the extent to which such schemes were being carried out, subject to the rights of other States. It would help to prevent litigation. (*b*) I have answered that question—it could, so far as the law applied to the States which asked the Federal Government to pass such Act; but it could not bind other States. (*c*) I do not consider it desirable that Federal control should be exercised in regard to non-navigable rivers, but only to navigable rivers. The Federation should not take over conservation and irrigation for general purposes. (*d*) I have not read the Act referred to, but take it generally that the rivers are declared to be in the Crown, with certain limitations as to private ownership. I am in favour of that principle, and, so far as existing law does not declare it, it might be desirable to declare it. Of course, "Crown" here has two significations—one referring to the Federal authority, the other to the State. I do not think that the soil of the rivers, except for Federal purposes, should be vested in the Crown, as part of the Federation; but I would advocate, subject to riparian rights, Crown ownership as against absolute ownership by individuals.

Centralised authority desirable.

Federal control should be confined to navigable rivers.

New South Wales Water Rights Act.

5268. *Mr. Murray.*] Do I understand you to say that you incline to the opinion that the riparian common law of England might with advantage be abolished as it relates to these States? I did not say that. I only put the qualification with regard to vesting the control of rivers and lakes in the Crown, as is done in the New South Wales Act. I do not want to vary the law; but if it becomes a question of vesting the control of rivers in the private owner or in the Crown, I would prefer vesting it in the Crown; but I do not know that the Crown does not, in a sense, own the rivers at the present time. In any case, ownership is subject to riparian rights.

Vesting control of rivers.

5269. I think, when you were giving evidence previously, I referred to Mr. William Hammond Hall;—have you seen any of his works? No; I have heard of them.

W. H. Hall's works.

5270.

P. McM. Glynn, M.H.R., 19 Sept., 1902.

5270. There is a long report by him to the Government of Cape Colony in 1898, in which he states that "wherever (such) extreme physical conditions exist, the development of law soon leads to the recognition of fundamental principles, which are put forward as embodying elements of right and justice among men. And so they do for men within the physical environment where these principles have had birth; but, where the physical conditions governing life are absolutely the reverse, fundamental legal rulings born of necessities totally foreign, can be adopted only in violation of right and justice among men." Then, again, there is a very recent report by Mr. Willcocks, engineer to the Daira Sania Company of Egypt, to his Excellency Lord Milner, on "Irrigation in South Africa," in which he advises Lord Milner to at once abolish English riparian law in that place (and instances the case of Italy where Victor Emanuel abolished all existing rights in Italy which had grown up in violation of the old Roman law, that all streams and torrents are the property of the Crown and inalienable), to use his authority to abolish the law in respect to the Crown Colonies, feeling assured that what he calls the "Constitutional Colonies" would at once follow his example;—would you give us your view in regard to the ideas put forward there? Of course, alterations of the law are always considered in regard to the needs and peculiarities of each State. In America, for instance, they found that in certain parts the English law ought to be altered, as it interfered too much with the natural development of the country. In parts of California they found that the law in regard to riparian rights interfered with the diversion of water for mining purposes, and that the loss caused by the limitation of those rights in that state was infinitesimal as compared with the benefits to the great mining centres; they, therefore, I believe, in judicial decisions, gave an interpretation favourable to the diversion of water for mining purposes, and which runs somewhat counter to the English common law. I think the Californian Legislature also varied the law in regard to riparian ownership, but that question does not arise here. If it did, it would be for all the States to agree to alter the law. We are concerned with the law as it exists. Australia would never tolerate any Imperial law which altered riparian rights without the consent of all States concerned, though it might do for South Africa. I think the very principles I have been laying down are applied in Italy. I have various extracts from codes here, showing that in Italy the riparian rights of individuals must be respected as against one another. For the benefit of all, the rivers are vested in the Crown, and they may be leased, but cannot be absolutely alienated. I would say that Articles 558, 559, and 560 of the Italian law on the subject, and the principles embodied in English decisions, are generally applicable to the Colonies, and show that moderate rights must be respected, and that the Crown is in the position of a trustee. (*g*) I have said that I think there might be an objection to giving Federal control of or power to carry out works of water conservation or irrigation, though it might be advisable to give the power of supervision for the purpose of finding out to what extent the State and Federal rights are mutually respecting one another; but, if the States concerned and the Federal Parliament pass an Act to vest water conservation and irrigation, as well as inland navigation, in one body, I think it should be a federal body, and, of course, a Commonwealth Department would then, probably, be necessary, but, on the whole, I do not think we ought to allow the construction of waterworks for State purposes to be vested in the Commonwealth. I have here a decision in the case of W. Lyon *v.* Fishmongers' Company, which may be of interest to the Commission.

Alterations of English law in American States.

Italian law.

Waterworks for State purposes.

Lyon *v.* Fishmongers' Co.

5271. *President.*] Will you read it? By the Thames Conservancy Act (20 and 21 Vict., c. exlvii, s. liii), the conservators appointed under that Act have a power to grant a license to a riparian proprietor to make an embankment in front of his own land abutting on the river, but though such license might be the owner's justification, so far as the public right of navigation was concerned, it would not authorise a licensee, being a riparian owner, to embank in front of his own land so as injuriously to affect the land of another riparian owner. The right of navigating a tidal river is common to the subjects of the realm, but it may be connected with a right to the exclusive access to particular land on the bank of the river, and the latter is a private right to the enjoyment of the land, the invasion of which may form the ground for an action for damages, or for an injunction. It comes, therefore, within the operation of the saving clause (section clxxix) of the Thames Conservancy Act. The right of a riparian owner to the use of the stream does not depend on the ownership of the soil of the stream.

Navigation a common right.

Right to use of stream not dependent on ownership of soil of stream.

John William Salmond, Professor of Law, Adelaide University, sworn and examined:—

J. W. Salmond, 19 Sept., 1902.

5272. *President.*] What is your name? John William Salmond.

5273. You are Professor of Law at the Adelaide University? Yes.

5274. You have been supplied with a copy of the questions which have been submitted to legal gentlemen in the various States;—could you give us your opinion on those questions? In regard to Question No. 1, my answer is, No. The owner of land is not the owner of the water of streams which pass over the land. The waters of the Murray are common property; the intention of the statute in question was not to vest the ownership of waters, or alter rights in waters, but merely to determine a doubtful point as to the boundary of two Colonies. It was doubtful in an earlier Act whether the boundary was on the Victorian or New South Wales side of the river or in the middle of the stream. This Act determined it should be on the Victorian side. It does not, however, affect the water rights in any way, because it is perfectly well settled that water-rights depend, not upon the ownership of the bed of a river, but upon ownership of the bank—that was settled in the leading case of Lyon *v.* Fishmongers Company by the House of Lords. There can be no doubt that Victoria is the owner of the Victorian bank of the Murray. It is unquestionable that the territory of New South Wales only includes the water—no part whatever of the land on the other side of the water. The water rights of Victoria and New South Wales would be exactly the same as they now are, if the boundary were on the other side of the Murray, with this difference only, that at the present time New South Wales is the only State which would have the right to erect weirs or other obstructions in the bed. In regard to the latter part of the question. (*a*) The only right is ownership of the bed, as I have already stated. (*b*) It has not been affected in any way except that the Federal Parliament now possesses power to legislate with respect to the navigation of the river, although it is in New South Wales territory.

Intention of Statute.

Ownership of Victorian bank.

5275. *Mr. Murray.*] Do I understand you to say that New South Wales has a right to erect weirs in the Murray? Yes.

New South Wales can erect weirs in Murray.

5276. Would that be subject to the rights of Victoria as a riparian owner? I do not see how it could affect her rights as a riparian owner; but undoubtedly, in as far as it would do so, it would be subject to those rights.

5277.

J. W. Salmond. 19 Sept., 1902.

5277. *President.*] Do I understand, then, that it is your opinion that if ownership of the bank on the Victorian side is vested in Victoria it carries with it a right to the use of the water? Yes. If the bank is Victorian territory, Victoria is in exactly the same position as regards riparian rights as New South Wales.

5278. You are of opinion that the bank is Victorian? Yes. I should say that New South Wales territory would extend to low water-mark on the Victorian side. I think that is the law in America.

River boundary of New South Wales.

5279. Is it your opinion that the boundary of New South Wales is the summer level on the Victorian side of the Murray? I should say so.

Before Federation States had no right to divert water to injury of other States.

5280. In regard to Question No. 2? I believe that even before Federation there was an inter-State riparian law in force between the Colonies—that is to say, that even by legislation the different states had no power so to interfere with the rivers as to do material injury to other States. Any such legislation would, I believe, have been *ultra vires* and unconstitutional. That has been decided in America in more than one case on principles which would have been applicable to the Colonies even before Federation. There is the case of the Holyoke Water Power Company against the Connecticut River Company (22 Blatchford, 131). The facts are, briefly, that the Legislature of Connecticut authorised a dam to be erected in Connecticut. The effect of that dam would have been to injure a riparian owner in the adjoining State, and he brought an action for an *injunction* in a Circuit Court in Connecticut. It was held that the legislation was *ultra vires*, and an injunction was granted against the erection of the dam, the reason being that the legislative power of Connecticut was limited to Connecticut itself, and anything which affected the rights, property, or interests of owners of land outside that state could not be allowed. That argument was just as applicable before Federation as it was in the United States. A similar decision was given in the case of Rutz against the City of St. Louis (7 Federal Reports, 428), and also in the case of Stillman against the White Rock Manufacturing Company (3 Wood & M., 538). I believe these are perfectly good authorities, recognised in leading American books on the subject; and, therefore, on these grounds, I believe that even before Federation there was a law of riparian rights enforceable in State Courts. I cannot agree that any State had the right to legislate, irrespective of the rights of other States.

Law of riparian rights prior to Federation.

Federation declared existing rights.

5281. In regard to Question 3? Federation has not altered the matter in any way, except to declare that these rights exist, and to protect them against Federal legislation. Section 100 of the Commonwealth Act declares, in so many words, that each State has a right to the reasonable use of the water of the river for irrigation and conservation, and further provides that these rights shall not be interfered with by the legislation of the Commonwealth. That declaration excludes the contention that a State has a right to make any use it likes of the water, but it has a right to make a reasonable use of it. As to the question of what is meant by a "reasonable use," I believe that the law here is exactly what it is in England. The riparian law of England is that a riparian owner may make a "reasonable use" of water, but not an "unreasonable use." Unreasonable use in England means a use which inflicts substantial injury upon other owners, *i.e.*, no use is reasonable which materially diminishes the advantages which other riparian owners have been in the habit of deriving from the natural flow of the water. That rule and definition as to "reasonable use" is laid down in numerous English authorities, and exactly the same words are used in section 100 of the Commonwealth Act. I consider, therefore, the section in question is simply declaratory of the English riparian law, and confers or takes away no rights, but simply declares what they are.

"Reasonable use."

Sec. 100 of Commonwealth Act declaratory of English law.

"Unreasonable use."

5282. *President.*] Would you give us an example of the use of water by the States which would be a violation of reasonable use of it? No use would be reasonable which altered the natural course of the river or the volume of the water in such a way as to make a substantial difference to those lower down or on the other side of the river. It is impossible to be more definite than that. I know of no authority which makes it more definite.

5283. You mean that every case must stand on its own merits? Yes, that is so.

Actions between States impossible before Federation.

5284. *Mr. Murray.*] In respect to interference with the rights of others theretofore enjoyed? Yes; but it does not matter whether those rights have been actually exercised or not. So far as actions between private persons are concerned, the matter would be competent for any Court, and would have been so even before Federation. Actions between the States themselves were not possible before Federation, but will become so if the Federal Legislature makes due provision. Such actions would lie either in the High or any other Court the Federal authority gave jurisdiction to.

Object of Act 18 and 19 Vic.

5285. In regard to Question No. 3? As to the true meaning of the two statutes dealing with the boundary between New South Wales and Victoria, I think I have already answered that the object of the later Act was to clear up a doubt which already existed as to that boundary, and it has no other purpose whatever.

5286. As to Question 4? I believe the contention to be right. (*b*) I am not aware that there is any very definite international rule about it, but I am not prepared to say there is not; I rather think that it is simply a matter of treaty. I do not regard that as material, however, as this is a question of English law.

Treaties imply lack of law.

5287. *President.*] Would you not regard the fact of the Treaty as proving a want of law on the subject? Very probably. I should not be at all surprised to learn that there is no law whatever on the subject. (*c*) I presume they do to some extent in the case of the Danube, and, perhaps, some other rivers.

Bed of navigable river belongs to Crown.

5288. In regard to Question 5? The answer is that the bed of a public navigable river belongs to the Crown, unless it has been expressly granted to a subject; and I presume, therefore, that the whole of the bed of the Murray is in the Crown; it would, of course, depend upon the Crown grants, but, presumably, the boundaries of the riparian owners are expressed to be the river. If that is so, it means the bank, not the middle of the river. Unless an express grant of the bed of a navigable river is mentioned, it would not be implied; in the case of a river not navigable, it would be the other way. If land is expressed in a Crown grant to be bounded by an unnavigable river, it means the middle of the river. That was settled in the case of Lord *v.* The City of Sydney. [12 Moore, P.C. 473.]

No legal difference between main stream and tributaries.

5289. In regard to Question 6? (*a*) The tributaries are in the same position as the main stream. (*b*) There is no legal difference whatever between the tributaries and the main stream; the question was settled by the American case of The United States *v.* The Rio Grande Dam and Irrigation Company (174 U.S.A., 690).

Supreme Court's jurisdiction prior to Federation.

5290. In regard to Question 7? As against private persons, the Supreme Courts of the States had jurisdiction before Federation, but actions would not lie between States; the difficulty can, however, be overcome by Federal legislation. (*b*) The case referred to has been repeatedly recognised as a good authority. It was one of a series of cases which laid down that the test of the rights of riparian owners is a "reasonable use." (*c*) Yes, I believe it does.

J. W. Salmond. 19 Sept., 1902.

5291. In regard to Question 8? (*a*) The answer is that the State had the same rights to the tributary, and no more, that it had over the Murray itself. (*b*) The answer is, No. The right of New South Wales over the Hawkesbury was absolute, there being no riparian owners whatever except New South Wales. The rights of New South Wales over the Murrumbidgee were similar to the rights of Victoria and South Australia. (*c*) They have not been affected in any way except that the Commonwealth has been given power to legislate for and preserve navigation in those rivers. Before Federation New South Wales could have interfered as much as it liked with navigation in New South Wales, but now the Federal Parliament may maintain navigation of the river from its source to the mouth.

Restriction of State powers.

5292. *Mr. Murray.*] You heard Mr. Glynn's reply to that question? I think he gave the same reply.

5293. He said the law was unaffected as regards streams which are not tributaries of the Murray? I think he meant the same as I did. The right of New South Wales to deal with the Murray is the same as before Federation, except that the Federal Parliament may maintain navigation in the interests of all parties.

New South Wales right to deal with the Murray.

5294. *President.*] In reference to Question 9? Having regard to what I have said already, I do not recognise any difference between the main river and the tributaries. My answer is the same in regard to both.

Validity of Victorian obligations.

The validity of these agreements would depend upon whether they exceeded the reasonable use of the waters by Victoria, which, again, would depend upon whether the schemes would do material injury to the other States; if they were invalidated by that test, they should not be taken account of. No State can make such agreements to the prejudice of the citizens of other States.

Federal legislation.

5295. In regard to Question 10? The matter can be dealt with by an Act of the Federal Parliament passed at the request of the States concerned—that is to say, passed in consequence of a request from the Parliaments of the States concerned, not the Governments. It would require legislation in the States concerned referring the matter to the Federal Parliament and so conferring jurisdiction on it. I do not favour the passing of identical Acts in the various State legislatures, because such Acts could be repealed by the respective States immediately after they were passed.

Irrigation and navigation.

5296. In regard to Question 11? I do not think that I exactly understand the question unless it means—should the question of navigation and irrigation be taken together. If that is the meaning, I think the matters should be dealt with in one Act. The two matters are intimately connected, and it would be almost impossible to deal with them separately.

Control of navigation and irrigation.

5297. In regard to Question 12? I think that powers of supervision and control should be vested in Federal authority, but not powers of execution. I do not think it should be handed over to the Federal Government to conduct water conservation and irrigation in individual States, but that the acts of the States should be under the control of the Federal authority. (*b*) Yes. (*c*) No. I do not think it would be practicable to pass a general law. I should think any effective measure would have to take account of the special circumstances of the river, and the States concerned would have to be parties to it. (*d*) I have not seen that Act, but in answer to the first part of the question, I think, in the first place, that the riparian law of England is not definite enough. It wants to be defined by Federal legislation to make it precise. In the second place it requires central supervision and control, and thirdly, it is possible that, in view of the necessities of irrigation in Australia, the right to use the water for that purpose may reasonably be extended, but that is a question of public expediency which I do not think I can be expected to reply to. Any alteration of the law as it is in force here, must, I take it, be effected by Federal legislation with the consent of the States. It cannot be maintained that because the conditions are different the law has *ipso facto* been changed; whether it ought to be altered or not is a matter for the legislature, not the Law Courts.

Riparian law of England not definite.

Alteration of present law by Federal legislation.

5298. Do you consider that such a law should be passed by the Federal Legislature as would practically abolish the English law in respect to riparian rights, and substitute a law more applicable to the conditions of Australia? We cannot abolish riparian rights in the sense of allowing the upper proprietors to do what they like, but the law might be modified in some way; I am not, however, prepared to suggest the principle upon which it should be so altered.

Modification of riparian law.

Action under Water Rights Act.

5299. In regard to the New South Wales Water Rights Act, 60 Vic. No. 20 (now Consolidated Statute No. 51 of 1902), is it your opinion, that now we have the Federal Constitution, if action were taken it might be proved *ultra vires* because such Act did not take account of the States concerned? Quite possibly.

Modification of law would require consideration.

5300. *Mr. Murray.*] Referring to the matter of any proposed abolition of the English riparian law, Mr. Glynn's reply was that he was in favour of the abrogation of individual rights and vesting them in the Crown;—would that be an indication of the direction which any alteration should take? I am not prepared to go so far as that all rivers and streams should be vested in the Crown, but am not prepared to deny there might be an advantage in modifying the English riparian law in some way, but before committing myself to the approval of any particular scheme I should require to consider it very carefully. (*c*) I have expressed the opinion that there is a necessity for central control.

"Reasonable use."

5301. Bearing on the use of the words "reasonable use" I may refer to the following cases:—Earl of Sandwich *v.* the North-Eastern Railway Company, 10 Chancery Division 707. This was an action brought against the railway for taking too much water for the use of their engines. It was said that: "Every riparian proprietor has a right to all the enjoyment he can derive from his interest in the stream, provided he exercises that enjoyment in a reasonable manner. He may take all that is required for purposes of his business, providing only that he does not take so much as injures the other persons whose rights are equal to his own." Then there is the case of Embrey *v.* Owen, 6 Exc. 369, in which it is said: "This right to the benefit and advantage of the water flowing past his land is not an absolute and exclusive right to the flow of all the water in its natural state, but only to the flow of the water and the enjoyment of it, subject to the similar natural right of all the proprietors of the banks on each side to the reasonable enjoyment of the same stream." Then there is the case of Rameshur *v.* Pattock, 4, Appeal Cases 121, which states that "each proprietor is entitled to the unimpeded flow of the water in its natural course and to its reasonable use as it passes through his land." In the Swindon Waterworks Company *v.* the Wilts Canal Company, L.R. 7, H.L. 697, Lord Cairns says: "The exhaustion of the water, which may take place, may be so inconsiderable as not to form a subject of complaint by the lower owner. Again, it may well be that there may be a use of the water by the upper owner for, I will say, manufacturing purposes, so reasonable that no just complaint can be made upon the subject by the lower owner. Whether such a use in any particular case could be made would, I apprehend, depend upon whether the use was a reasonable one." After stating the facts, Lord Cairns continues: "My Lords,—That is not a

Embrey *v.* Owen.

Rameshur *v.* Pattock.

Swindon Waterworks Co. *v.* Wilts Canal Co.

use

J. W. Salmond. 19 Sept., 1902.

use of the stream which could be called a reasonable use by the upper owner; it is a confiscation of the rights of the lower owner." Lastly, there is the case of *Miner v. Gilmour*, 12 Moore, P.C. 156. "Subject to this condition he may dam up the stream for the purpose of a mill, or divert 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." That is the English law, and it is applicable here until altered by the Federal Parliament.

James William Jones, Secretary to the Commissioner of Public Works, Adelaide, sworn and examined:—

J. W. Jones. 19 Sept., 1902.

5302. *President.*] What is your name? James William Jones.

5303. You were Conservator of Water and are now Secretary to the Commissioner of Public Works? Yes.

5304. I understand that you are prepared to submit details respecting Lakes Alexandrina and Albert? Yes. Fully 1,000 square miles of land, equal to 640,000 acres, are comprised in the area dependent upon the lake waters, and these lands, under normal conditions, carry fully 7,000 to 10,000 great cattle and 150,000 sheep. The sizes of the lakes are very considerable. Lake Alexandrina covers an area of 220 square miles, and Lake Albert 64 square miles. These areas, together with the Goolwa, Finniss, and Currency Creek channels, make up an aggregate of 192,000 acres of water surface, the shore frontages of which total 250 miles in length. The present depth of Lake Alexandrina is 7 to 10 feet, and Lake Albert 3 to 6 feet. I refer to the present depth because the level is now, and has been since January of this year, down to about the zero of the Milang gauge, R.L. 106·52, as compared with 110·75 of ordinary spring tides, and, therefore, from 2 to 3 feet below a proper navigable level; and instead of the water being fresh, as it should be naturally, it has been either very brackish or as salt as the sea. The disastrous results of the present state of the lakes can hardly be exaggerated. Navigation between Milang and Meningie has been rendered most difficult and at times impossible. All irrigation schemes—including those costly ones of Mr. McFarlane and Mr. Jervois—the one just below and the other just above Wellington, have been stopped, and, to a large extent, stock have had to be removed to other waters. As an instance, in view of the present difficulty and the unfavourable outlook in the future, Mr. T. R. Bowman is spending a large sum of money in boring to a great depth in search of deep-seated underwater at Campbell Park, on the eastern shores of Lake Albert. Even so far up as the Murray bridge the river water is seriously affected to such an extent as to render it unsuitable for the Melbourne express locomotives. Some tests of the river water, made at Murray Bridge a few days ago, show that for 3 or 4 feet on the surface of the river the water is but slightly affected so long as there is a flow towards the lakes, but that from about 4 feet to the bottom of the river—a depth of 50 feet—the water is salt. Never before in the historical records of South Australia has the volume of flow of the river Murray into this State been so small as it has been during the last few years. It is not so much the aggregate year's discharge that we are concerned with as the quantity flowing down to the lakes at times of low river. With the greatly reduced flow of the river in summer and autumn, which we have now had for several years in succession, the quantity of water passing Wellington into Lake Alexandrina has, during the first six months of this year, been insufficient to make up for evaporation from the lake; that is to say, not a drop of the river water has reached the sea-mouth of the Murray during the past six or seven months. In fact, the sea-water has been constantly flowing into the lakes to keep the water-level up to the low-water level of the sea; therefore, as a direct consequence of the reduced flow of the river, we have these splendid lakes not only salt but abnormally low. It is known that your Commission has a suggestion under consideration which contemplates the reclamation of a large part of the lake areas and the leaving of comparatively narrow strips of water for navigation, &c. This is suggested, no doubt, chiefly to save the necessity of sending down a sufficient flow to make up the loss by evaporation—in other words, to give a greater quantity of water for diversion in the upper river. Of course, such reclamation works have been carried out and proved successful where the land was of good quality, but the conditions are, I think, in no way favourable in these lakes, where, for a considerable part, the bottom is a limestone crust, and the remainder not by any means rich soil, and where there is every prospect of the reclaimed areas only proving to be salt swamps, for it is a known fact that the ground water is as salt as the sea. The cost would be enormous, and I am personally opposed to any such scheme. I have shown that with the entire present flow of the river in summer and autumn there is not sufficient water coming down to meet even the requirements of the lakes. It is, therefore, easy to imagine what the result will be if the projects for further diversion in the other States are carried out without some compensating consideration being given to meet South Australia's just rights. It would not even be sufficient to construct the proposed weir and lock on the Goolwa and Coorong Channels, near the Murray mouth, because in the present state of the river, the lakes, although cut off from the bad effects of the sea-water, would become, in such a year as this, lower than they have ever been. It is essential, therefore, even after the lower weirs are built, to have a constant and considerable flow always passing down below Wellington to keep the lakes up to their effective level. I therefore place as the first necessity very large storage reservoirs in South Australia, in the locality of Overland Corner or Renmark, which will store up the winter flood waters, so that they can be drawn off at times of low river to augment the flow coming over the border, and thus maintain a satisfactory and sufficient volume of water to serve the South Australian part of the Murray River for navigation and irrigation, and for Lakes Alexandrina and Albert. It should be clearly borne in mind that these storages are now required for the purposes of the river navigation, chiefly because of the present and contemplated further diversions of the river Murray and tributaries by the other States, and that, therefore, we have an undoubted right to look to the Federal Government to carry out such works, seeing that navigation is now under Commonwealth control and jurisdiction. The next requirement is the shutting out of the sea-water by weirs and locks near the Murray mouth. This also should be a Federal work. There is a report by the Engineer-in-Chief, Mr. A. B. Monerieff, M. Inst. C.E., with plans and estimates of a scheme for locks and weirs on the channels near the Murray mouth; but a modification of that scheme has since been found necessary, and I understand the Engineer-in-Chief proposes to make some alterations, so as to exclude the Coorong from its connection with the lakes. In this I concur, if it can be done at a reasonable cost. The proposal is to carry an embankment or barrage from Mundoo Island to Pelican Point. I have mentioned the level of

Area of land dependent on lake waters. Stock. Area of lakes. Depth of lakes. Present condition of lakes. Water brackish as far as Murray Bridge. Lowest river flow. Insufficient to make up for evaporation. Sea water flowing into lakes. Lakes unsuitable for reclamation. Cost enormous. Storages of primary importance. Storages necessary for navigation. Weirs near Murray mouth.

J. W. Jones. 19 Sept., 1902.

of the lake as being R.L. 106·52, the level at the zero of the Milang gauge. The natural effect of the sea inflow can be easily realised when it is known that the spring tide sea-level at the mouth of the Murray is R.L 110·75, and extreme high water (sea) R.L. 112·00, low spring being 106·00. To give a satisfactory depth of water at Milang and in Lakes Albert and Meningie, the lake levels should be kept up to 2 ft. 6 in. above zero of Milang gauge. During the last five years the lakes have been very saline, through the inflow of sea-water, due to low rivers, as follows:—

1898, January to September; 1899, middle of February to end of September; 1900, January to September; 1901, 1st March to middle of December; 1902, 1st March to date (September, 1902).

Analyses of lake water.

For the purpose of showing salinity, I put in analyses of Lake Alexandrina water, taken at the outer end of Milang Jetty, as follows:—May, 1896, 0·90 oz. per gallon; June, 1900, 1·09 oz. per gallon; April, 1901, 1·59 oz. per gallon; also, for the purpose of analogy, analysis of Murray water when the river was in fair flood, 21·00 grains per gallon. [*Exhibit* 114.] The water in the Murray, at Murray Bridge, is now, and has been for seven or eight months, very saline, equal to the Lake analysis for April, 1901, at a few feet below the surface. Owing to the lesser specific gravity of the fresh water, when it is flowing, which it is not now always doing, because of the wind and the small flow, it is carried over the salt water. This obtains below Blanchetown to Wellington, where there is a depression 50 or 60 feet deep in places, which has been scoured out. As the salt water is driven up, this basin becomes practically filled with the salt water, and the fresh water, as it comes down, passes over the top of it. We have a very satisfactory determination of evaporation at the Adelaide Observatory and at a recording station at Hope Valley Reservoir. I put in a copy of the maximum, minimum, and mean monthly records during the years 1881 to 1901 at Hope Valley, showing evaporation for these years of 71·54, 42·95, and 57·17 inches respectively [*Exhibit* 115].

Depression in river bed.

Evaporation records.

5305. *Mr. Murray.*] Is that clear of the rainfall? The rainfall has been deducted—that is the net loss, and may, I think, be taken as an index for Lake Alexandrina. (The Government Meteorologist, Mr. Griffiths, agrees with me in this opinion.) I also put in schedule showing the rainfall at Milang, Lake Alexandrina, which shows the mean rainfall per annum for seventeen years to be 16·80 inches, the maximum 23·41 inches, and the minimum 11·71 inches. [*Exhibit* 116]. The mean rainfall at Hope Valley would be about 21 or 22 inches per annum. Taking the area of the lake's surface at 700 square miles, and the evaporation at 60 inches per annum, we have an evaporation of 42,000 million cubic feet per annum. Taking the months when the river has been low of late years—January to June—and computing on the basis of the Hope Valley records, we have for the lakes:—

	Mean evaporation per month.		Per minute.
January	6,700,000,000	cubic feet ...	150,089 cubic feet.
February	5,750,000,000	„ ...	142,609 „
March	4,600,000,000	„ ...	103,016 „
April	2,600,000,000	„ ...	60,185 „
May	1,500,000,000	„ ...	33,602 „
June	950,000,000	„ ...	21,991 „

Rainfall to be deducted.

5306. I will read from my brief extracts of evidence:—Frank Nicholls, manager for J. H. Angas, Point Sturt Station: "Found the lakes had become more salt of late years; attributed increase to low river owing to drought"? In my opinion it is due partly to the drought and partly to the diversion works in Victoria and New South Wales, causing a low river and thus allowing an inflow of sea-water.

Causes of salinity.

5307. Charles Oliver, master of the river steamer, says: "The river has been low of late years, and there has been a corresponding increase of saltness; the river has been as low and as salt at other times"; Hurtle Willoughby Morphett, of Wood's Point, says: "The volume of the river has been lower of late years; attributes it chiefly to the drought; May of last year (1901) the river was salter than witness had ever known it before or since"? Under ordinary circumstances one would not expect Wood's Point to be affected at all; it is due to the small flow coming down the river, allowing the salt water to get into the deep part of the river.

5308. Frank Nicholls says that the water is sometimes too salt to use for irrigation; that they do not use it when it contains more than one-eighth of an ounce of salt to the gallon;—do you consider water containing one-eighth of an ounce to the gallon suitable for irrigation? Yes; we have proved it to be so. I have shown the importance of these lakes to this State, and now recommend to the Commission, and ask on behalf of South Australia, that Lakes Alexandrina and Albert, and the channels connected therewith, shall be kept fresh and of a satisfactory depth for navigation—say, 2 feet 6 inches above zero of the Milang gauge—by the construction of the necessary weirs, locks, and barrage in the Goolwa channel, and from Mundoo Island to Pelican Point, near the Murray mouth. This, I respectfully submit, should be a Commonwealth work.

Maintenance of navigation and freshness of lakes should be a Federal work.

5309. *President.*] You have prepared certain information with regard to storage sites for reservoirs in South Australia, have you not? Yes; I put in a plan of the river Murray, between Morgan and the boundary of the Province [*Exhibit* 117], showing two sites suitable for storage reservoirs. I understand you have already had from the Engineer-in-Chief full details, with estimate, for reservoir at Site No. 1, near Overland Corner, which would impound, at a height of 32 feet above zero of the Overland Corner gauge, approximately 30,000,000,000 cubic feet of water, the upper 10 feet of which, representing 20,000,000,000 cubic feet, or two-thirds of the entire volume, would be available for purposes of navigation, irrigation, &c.

Overland Corner reservoir.

5310. The Engineer-in-Chief yesterday, in evidence, referred to a dam 40 feet high at the site you refer to;—what, in your opinion, would be the effect of such a dam in regard to storage and as to the land submerged? I cannot say absolutely, as it is a question which must be settled by a survey; but I am afraid it would seriously affect the Lyrup village settlement where the houses are situated, also the low-lying land around the town of Renmark. Before such a dam is decided on, a detailed survey should be made round the water-spread, in order to ascertain if it would injuriously affect the settlements. Another site, marked No. 2, on *Exhibit* No. 117, has been suggested, just above Renmark, the water-spread of which, so far as South Australia is concerned, is shown margined in blue. The levels show that the water would be forced back into Lake Victoria in New South Wales. The exact quantity which would be impounded by such a reservoir has not therefore been determined; but I estimate the capacity, so far as South

Reservoir, Site No. 2, above Renmark.

J. W. Jones. 19 Sept., 1902.

South Australia is concerned, to be approximately 35,000,000,000 cubic feet—practically the same quantity as would be impounded at No. 1 site. The height of the embankment contemplated is 30 feet above zero of the Renmark gauge, and it would require to be about 20,000 feet, or 4 miles long, with a weir and lock of about 900 feet. The work would, of course, be a very large one, and the cost considerable, but I am not prepared to give an estimate as there has been no complete survey made. I am, however, of opinion that the cost would not be prohibitive. It would be more expensive than the No. 1 site. One disadvantage is that the foundation is somewhat defective. After the first 15 feet there is a sand bed which would allow the water to percolate below the surface soil to a small extent. Personally, I do not regard that as a very serious matter, however, as the water would find its way to the river and thus supplement the flow. I merely put the matter before the Commission for consideration, particularly in view of a possible storage contemplated at Lake Victoria.

5311. Would the upper storage be more expensive per gallon than the lower? I could not say definitely, as I do not know the capacity of the New South Wales portion, but it is more favourably situated.

5312. In what way? For purposes of irrigation in South Australia.

5313. *Mr. Murray.*] By gravitation? Yes, to a small extent, but principally for pumping to the higher lands.

5314. *President.*] Is not the main reason for such a reservoir as you suggest for the purpose of maintaining the level and freshness of the lakes? Not the only reason; I am not sure that it is the main reason. It would be one of the main reasons if the river were locked below, but I anticipate that you will have to consider the question of storages, both in connection with and apart from locks. In this connection I might mention that a reservoir at either of the suggested sites would save one lock, and allow us to look much more favourably upon any proposed further diversions from the upper river.

Reservoir would save one lock.

5315. *Mr. Murray.*] We had evidence from Mr. Sharman, manager of Lake Victoria Station, to the effect that Lake Victoria contains 17,000,000,000 cubic feet of water at the point where communication between the lake and the river is closed, and that it could be increased to 25,000,000,000 cubic feet by the construction of regulators;—do you know anything of the site? I realised that it was considerable, and that helps me to appreciate the desirableness of considering the upper storage, but you should have your levels carried down to the South Australian border, where there is a bench-mark.

Lake Victoria.

5316. Where is that bench-mark? I will obtain that information and supply it, with the whole series of levels along the river. From Morgan to Renmark the river rises at the rate of about 2·88 inches per mile; from Renmark to the boundary of the province, it rises to about 3·5 inches per mile; the fall in the upper parts of the river is greater. As an engineer, I make a strong recommendation that such a storage as mentioned should be constructed, and a strong claim on behalf of South Australia that such a work should be carried out by the Commonwealth. I think a wrong would be done to South Australia if she were saddled with the cost, because the necessity for the work is largely due to what has been, and particularly to what is proposed to be done by the neighbouring States.

River grade.

Storages should be carried out by Commonwealth.

5317. *President.*] Have you prepared details as to the locking of the river between Blanchetown and the South Australian border? Yes [*Exhibit* 117]; and I ask, on behalf of South Australia, that the rivers Murray and Darling be locked for navigation purposes, the first lock to be near Blanchetown, where the Murray begins to shallow, at about 170 miles from the mouth of the river, and other necessary locks and weirs throughout the 231 miles of river to the boundary of this State, 401 miles from the mouth; also that the locks be continued in the Murray and up the Darling as far as, after careful consideration, the Commission deems advisable in the interests of the three States concerned. I desire to press upon the Commission the importance of the Darling trade to South Australia, and understand that you have already had from the Collector of Customs information in relation thereto. It would be easy to prove that the bulk of the Darling trade has always been with this State, and I might add that some of it has only been won from South Australia by the extraordinary preferential railway rates of Victoria. As an example, I will cite the following:—Greasy wool, from Wilcannia to Melbourne—Steamer, Wilcannia to Echuca, 1,054 miles, 25s.; rail, Echuca to Melbourne, 125 miles, 18s.; agency, wharfage, &c., 7s.=f.o.b. Melbourne, £2 10s. 6d., or £1 3s. 6d. less than normal rates. Wilcannia to Port Adelaide:—Steamer, Wilcannia to Morgan, 900 miles, or Murray Bridge, 1,060 miles, £1 5s.; rail to Port Adelaide from Morgan, 105 miles, or Murray Bridge, 69 miles, 15s.; agency, wharfage, &c., 13s. 6d.=£2 7s. Wilcannia to Victor Harbour, *via* Goolwa—Wilcannia to Goolwa, 1,120 miles, 25s.; rail, Goolwa to Victor Harbour, about 7 miles, including wharfage and agency, 7s. = f.o.b. Victor Harbour, £1 18s. 6d., a difference of £1 14s. per ton in favour of Victor Harbour if normal rates obtained throughout. I understand that the Engineer-in-Chief has submitted estimates and plan showing positions of locks, with design. In order to show the necessity for doing something to improve navigation, I would like to say that in 1889 navigation was stopped two and a half months, in 1892 one month, in 1896 two months, in 1897 six months, in 1898 three months, in 1899 five months, in 1900 four months, in 1901 seven months for the principal steamers, and most of the time for all vessels. Navigation was absolutely stopped at the end of January this year; but on the 17th and 25th July, one or two small steamers, drawing 2 feet 6 inches of water, managed to make a trip. In this connection, I would like to say that the steamers generally draw 5 feet to 5 feet 6 inches, barges 6 feet to 6 feet 6 inches; and therefore there ought to be a depth of 6 feet 6 inches at least maintained. During the past seven years, there has been a succession of low rivers, as follows:—1896, 302,000,000,000 cubic feet; 1897, 283,000,000,000; 1898, 281,000,000,000; 1899, 285,000,000,000; 1900, 433,000,000,000; 1901, 250,000,000,000; 1902, 80,000,000,000. A good river year would be about 800,000,000,000 cubic feet. We should therefore require a depth of 4 feet on the Overland Corner gauge, representing a volume of 450,000 cubic feet per minute, for the larger vessels. To sum up the whole, I would make a request that locks should be constructed over that part of the river Murray between Blanchetown and the boundary of this State, also to a considerable extent up the Murray and Darling.

Details of locking between Blanchetown and the S. A. border. Locking the Darling.

Rail and steamer freights.

Periods navigation stopped.

Low rivers.

Navigable depth.

5318. How far do you consider locking should extend in the Murray above the South Australian border? To, say, Echuca.

5319. How far up the Darling? To, say, Wilcannia.

5320. What about the Murrumbidgee? I am not sure about the policy of locking that river; but in the interests of south Australia, I would like it locked too, but how far up I am not prepared to say, probably to Balranald. *In connection with this, I would like to add that if locking is carried out I maintain* strongly that it must be on a basis which would not require the steamers or trade to be saddled with the expense of

Locking Murrumbidgee.

J. W. Jones. 19 Sept., 1902.

of interest and maintenance. I do not say there should be no charge, but that it should be a comparatively small one. The effect of saddling the trade with interest and working expenses would be to largely prevent trade going on the river at all.

5321. Do I understand that, in your opinion, it would not pay as a commercial enterprise? I think it would, because, in my opinion, there would be other indirect benefits; but revenue must be sought for in some other way.

Revenue, how produced.

5322. What would you sugest? I do not know that I am prepared to make a suggestion. I realise it is a great difficulty, and trust that the Commission will investigate the matter, but am sure it would never do to saddle the trade with the expense.

5323. *Mr. Burchell.*] Would producers in other States benefit as much as those in South Australia? Undoubtedly.

5324. We have it in evidence that if the river is unnavigable, many of the stations on the river would absolutely close? I fully agree with that opinion.

Stations would close if river unnavigable.

5325. *President.*] On what ground do you claim that these works should be carried out, and yet should not be self-supporting? On the ground that permanent navigation would have the effect of so largely increasing settlement and trade on the river that whilst it would not be self-supporting at first, it would, in a series of years, be so largely developed as to probably be able to bear the burden; and, further, that the locking of the river would serve other interests besides the ordinary trade of the river itself. It would allow of a very much greater proportion of the water of the Murray and its tributaries being used for irrigation and other purposes, instead of running into the sea as at present.

Grounds of claim that navigation should not be self-supporting.

5326. *Mr. Murray.*] You may have read a good deal of what has appeared in the public press, especially in Victoria on the question of locking the Murray, and have probably noticed therein statements to the effect that locking would conserve water both for navigation and irrigation; I think a suggestion has been made by at least one writer that the locks might be so situated as to promote the diversion of water by gravitation on to the land on the banks, for irrigation;—keeping that in mind, I would like to ask you if the system of locks mentioned by the Engineer-in-Chief and yourself would contribute in any way to diversion by gravitation? To a very small extent indeed, in South Australia; but I am of opinion that it would do so in the portion of the river in the other States, where the banks are much lower.

Locking would contribute very little to diversion by gravitation.

5327. Can you instance a case? Not from absolute personal knowledge of the places; but all I have read about the levels, both in the public press and in reports by experts, leads me to think that would be the effect.

5328. Would it contribute very materially to the reduction of cost in pumping? Yes; in the case of Renmark, it would do away with one pumping-station altogether, and would considerably reduce the cost in other places.

Would reduce cost of pumping.

5329. *President.*] You have, I understand, prepared information for the Commission relative to the river-flats in South Australia? Yes. In the plan put in [*Exhibit* 117], Sheet No. 1, the river-flats below the cliff from Wellington to the boundary are shown.

5330. What is the area of those flats? 450 square miles.

Area of river flats.

5331. What would be the approximate level? Thirty feet above low water in the river.

5332. What is the nature of the soil? It is a heavy clay, unsuitable, as a rule, for fruit culture, but more or less adapted for the growth, under irrigation, of grass, cereals, and, to a smaller extent, onions, potatoes, and crops of that sort; I say to a small extent, because it is to a large extent composed of river mud, which is too cold and poor to be of any great use.

Character of soil.

5333. What proportion would be suitable for irrigation? The whole of it to some extent; but how far it would prove to be well suited is a matter for experience to decide. So far as the experience of Renmark and one or two other settlements goes, it will not grow fruit; they have abandoned the flats for fruit culture, and are using them for other crops, of which they in some cases get very good ones, and in others very poor ones. It would be difficult to determine the proportions, as a considerable area of the lower flats would be flooded by the locked water. For the most part these flats are now only submerged by a moderately high river, and we do not look upon them as rich arable land: they are not at all like the richer flats about Wellington, which derived their soil from the decomposition of reeds, flags, and other vegetable matter. The soil of the upper flats is largely of a mineral character, incidentally, I might say, something like the soil of the Wentworth Irrigation Settlement in New South Wales. I put in plan [*Exhibit* 118] showing $2\frac{1}{2}$ million acres coloured pink, representing a width on the south and east side of about 10 miles and on the north and west side of about 12 miles. The levels of the latter are up to 160 feet above low water of the river, and those of the former up to 120 feet, a good deal of both being of very much less height, Of that area fully 1,000,000 acres, ranging up to 110 feet above low-water of the river, is excellent soil, well adapted for the cultivation of fruit and all other products which are so successfully grown at Mildura and Renmark, and compares most favourably with the best soil in those settlements; it is a good sandy loam, of great depth, with a varying subsoil, moderate clay in some places and calcareous in others. That this lift of up to 110 feet is in no way prohibitive, the evidence of Mr. Stuart Murray with regard to Mildura shows, in which he states that the lift at that place is up to 90 feet, and that the cost, including pumping and management, is less than 1d. per thousand gallons. At Renmark the lifts vary from 30 to 65 feet, and the entire cost of pumping (three lifts), including management and maintenance, is 1d. per 2,000 to 3,000 gallons; under these conditions irrigation operations in connection with fruit culture are eminently successful. The people of Renmark are well able to pay 20s. per acre per annum, and get a substantial profit, as is proved more clearly every year. It has been my professional duty to obtain fully the facts with regard to Renmark from its inception, and I say, without fear of contradiction, that the settlement is now a pronounced success, particularly on the higher and sandy land, and that the charge of 20s. per acre per annum is not felt to be too heavy a burden by any means.

Not very suitable for irrigation.

Irrigable area in South Australia.

5334. What would you say would be the cost of raising water to an average level of 110 feet under the same conditions and for the same purposes as at Renmark? It depends on the volume raised; on the basis of the volume raised at Renmark I estimate it would cost, without including interest on capital, say, $\frac{3}{4}$d. per thousand gallons.

Cost of raising water.

5335. *Mr. Murray.*] That would mean 1s. 6d. per inch acre? But 110 feet is the maximum height, and the cost is estimated on the small amount raised at Renmark. If the volume were increased the cost would be greatly reduced. The cost of irrigating the million acres referred to would not be more than $\frac{1}{2}$d. per thousand gallons, without taking into account capital cost.

5336.

J. W. Jones. 19 Sept., 1902.

5336. *President.*] What would it be including interest on capital cost? Say, 12½ to 25 per cent. (according to the nature of the works) increase over part of the area, but for at least a quarter to a half of the total area the cost would not be more than one-third of a penny per 1,000 gallons.

Intense culture necessary.

5337. Would land, unless intensely cultivated, as at Renmark, stand such a charge as you have indicated, for irrigation purposes? I do not think so. By intense culture I understand something more than merely flooding grass, or even wheat.

Estimate of irrigable area.

5338. Taking all the conditions of trade into consideration, what quantity of the area you have indicated, comprising 1,000,000 acres of land, do you anticipate could be used in the way land is being used at Renmark? I cannot forecast what may be done in the future, but I think, under present conditions, 250,000 acres would be a reasonable estimate.

Water requirements of South Australia.

5339. *Mr. Burchell.*] Would a weir near the Murray month, the locking of the river, and the construction of the large storage reservoir referred to in South Australia, enable South Australia to do with less of the river flow, for purposes of navigation and irrigation, than would be possible without such improvements? Dealing first with the river as at present, I maintain that the policy of South Australia must be to oppose all diversions by gravitation from any part of the Murray or its tributaries when the flow is reduced to, say, 600,000 cubic feet per minute—26,000,000,000 per cubic feet month—at the boundary of South Australia. Navigation wants 450,000 cubic feet per minute, *i.e.*, 4 feet on the Overland Corner gauge, allowing something for irrigation and all other purposes on the upper part of the river, I arrive at 600,000 cubic feet per minute as being necessary for purposes of navigation, irrigation, and evaporation in the lakes.

Annual discharge at Morgan.

The aggregate annual discharge of the river, as recorded at Morgan in 1899, was 285,394,000,000 cubic feet. On the basis of 600,000 cubic feet per minute for all purposes, when we could get it, and the reduced flow when below that figure, we should have taken from that volume 238,112,000,000 cubic feet, leaving for additional diversion in the upper States 47,282,000,000 cubic feet. In 1891 we had 250,000,000,000 cubic feet; on the same basis we should have taken 190,000,000,000 cubic feet, leaving a balance for diversion in the neighbouring States of 60,000,000,000 cubic feet. I put in diagram showing river flow [*Exhibit* 119], and call attention to the fact that, as shown thereon, in 1901 the highest flow—October to December—only had the effect of making the lakes fresh for three months, the remainder of the year they were either salt or brackish. I, therefore, say that I am extremely reasonable in claiming 600,000 cubic feet per minute as necessary to meet present requirements. I would also call attention to the fact that the present year is the lowest on record, being only 80,000,000,000 cubic feet, but must leave it to the Commission to decide how far this is due to the drought, and how far to the diversions in the upper States. I realise that the drought has a great deal to do with it, and am sure the Commission will come to a just decision in regard to the matter. It is not necessary to dwell upon the immense disadvantage to South Australia of having a low river. You have it in evidence how it retards traffic, and injuriously affects South Australian settlements on the river. These are very grave matters to South Australia. South Australia considers that in deciding the aggregate bulk of water to be apportioned between the three States concerned, everything that has been done in the way of diversion from the Murray and its tributaries in each State should be taken into consideration. I have put before you the present aspect of the matter, and our absolutely reasonable claims under existing conditions: I now wish to put before you our view of the altered circumstances which would obtain if the salt water were shut out from the lakes, the river locked in South Australia—and to a reasonable extent in the other States—and, at least, one reservoir constructed in South Australia. Under such circumstances, we should require for Lakes Alexandrina and Albert, on account of evaporation, about 42,000,000,000 cubic feet per annum; 20,000,000,000 cubic feet for the irrigation of, say, 250,000 acres of land, allowing 24 inches per annum, and 25 per cent. for loss; 31,000,000,000 cubic feet, and, say, 7,000,000,000 for evaporation, for storages, locks, &c., or a total of 100,000,000,000 cubic feet per annum, approximately one-third of a low-river year. Looking at the question from the aspect of cubic feet per minute, and taking the average evaporation from the lakes at 250,000 cubic feet per minute, evaporation from reservoirs, locks, &c., at 75,000 cubic feet per minute, and for irrigation 100,000 cubic feet per minute—which is an allowance of 4 inches every thirty days—we have a total of 300,000 cubic feet per minute; and I say it is reasonable to ask that when the flow of the river at the boundary of the State falls to 300,000 cubic feet per minute, all diversion by gravitation shall cease. I have said that 100,000,000,000 would serve for the year. I now wish to show how that works out in comparison with the actual diagram for 1901 [*Exhibit* 119]. In 1901 the total flow was 250,000,000,000 cubic feet. Taking all above 300,000 cubic feet per minute on the diagram, we have 150,000,000,000 cubic feet, leaving a balance of 100,000,000,000 cubic feet—*i.e.*, instead of taking two-thirds, as in the case of an unimproved river, we should be satisfied with approximately one-third of the flow, showing that the answer I gave, to the effect that the locking of the river would allow of the utilisation of a greater volume of water for other purposes than navigation, is correct.

Requirements for evaporation.

Diversions by gravitation should cease when river falls below 300,000 feet per minute.

Diversions should not take place when river at minimum flow.

5340. *President.*] Taking the year 1899, you gave us the discharge at Morgan, 285,394,000,000 cubic feet, and the balance, after South Australia has had what you consider her reasonable share, as 47,000,000,000 cubic feet, about 16 per cent. of the volume;—do you consider that a reasonable proportion to allow for New South Wales and Victoria? Yes, because, from my point of view, Victoria and New South Wales have no right to divert from the river or its tributaries, by any means, a large quantity of water when the river is at anything like its minimum flow.

5341. You also stated that out of the 84 per cent. which you claim of the water which reaches South Australia, you propose to appropriate a large proportion, presumably about 31,000,000,000 cubic feet, for irrigation purposes? Yes.

Victorian and New South Wales diversions.

5342. In view of that, do you consider the 47,000,000,000 cubic feet you propose should be the proportion for Victoria and New South Wales, is fair and reasonable? Yes, when you take into consideration the quantity already being diverted by existing works on the River Murray and tributaries in addition. Adding the two amounts together, you arrive at a quantity which, in my opinion, is in every way a reasonable proportion. The Engineer-in-Chief has desired me to put in a plan showing the annual rainfall at various stations on the Murray; also an abstract of readings on tide-gauges at Wentworth, Overland Corner, Morgan, and Milang respectively.

WEDNESDAY,

WEDNESDAY, 24 SEPTEMBER, 1902.

[*The Commission met at Modern Chambers, Collins-street, Melbourne.*]

Present:—

JOSEPH DAVIS, Esq. (President.)

FREDERICK N. BURCHELL, Esq.

Frederick Freeman, master of dredger, in the Public Works Department, Melbourne, sworn and examined:—

F. Freeman 24 Sept., 1902.

5343. *President.*] What is your name? Frederick Freeman.

5344. What position do you occupy in the Public Works Department? Master of steam dredger.

5345. A return has been prepared in the Public Works Department, showing the expenditure to date on the river Murray, so far as Victoria is concerned, which you hand in? Yes. [*Exhibit* 121.]

Victorian expenditure in connection with the Murray.

5346. What is the total amount to date? £98,865, and about £1,500 per annum is expended.

5347. What does that include? The removal of snags from the river bed, the "throwing back" of overhanging and dangerous trees, the reduction of bars and dangerous reefs, and occasional dredging at the Echuca wharves and dock.

5348. *Mr. Burchell.*] At what part of the river is your Department engaged in snagging? Up and down the river, principally between Euston and Echuca at present.

5349. Is Euston the lowest part of the river at which your Department has done snagging? No; a party has recently been engaged near Mildura, on the McFarlane Reef.

5350. Is Mildura the lowest point at which your Department has done snagging? No; we have been down to the junction of the Darling, and up to as far as 20 miles from Yarrawonga.

THURSDAY, 25 SEPTEMBER, 1902.

[*The Commission met at the Offices, Modern Chambers, Collins-street, Melbourne.*]

Present:—

JOSEPH DAVIS, Esq. (President.)

STUART MURRAY, Esq., | FREDERICK N. BURCHELL, Esq.

John Creuzé Hingeston Ogier, Barrister-at-law, sworn and examined:—

J. C. H. Ogier. 25 Sept., 1902.

5351. *President.*] What is your name? John Creuzé Hingeston Ogier.

5352. What are you? A barrister.

5353. Where are your chambers? Selbourne Chambers, Little Collins street, Melbourne.

5354. You are practising in the Melbourne Courts? Yes; I was called to the Bar in England, and was admitted here in October, or November, 1853.

9 Geo. IV, c. 83. 3 & 4 Vic., c. 62.

5355. You desire to make a statement as to the legal aspect, as between the States, in regard to the division of the waters of the Murray River Basin? The waters of Riverina. In 1770, Cape Howe was designated by Captain Cook. In 1828, the laws of England were established over the territory of New South Wales, by the 9 George IV, Chap. 83. By the 3 and 4 Victoria, chap. 62, 1840, after reciting that the Colony of New South Wales was of great extent, statutory authority was given to found separate Colonies, and these words were introduced:—"And it shall be lawful for Her Majesty to authorise a Legislative Council to make laws for the Government thereof, subject to confirmation." And by the Act, No. 21, of New South Wales, in 1842, a separate registry for lands was established for Port Phillip and New South Wales respectively. By the 5 and 6 Victoria, chap. 76, in 1842, the Legislature was empowered to make all necessary provisions for dividing the parts of the said Colony within the boundaries of location into convenient electoral districts, and for the appointment of returning officers: "Provided always that the district of Port Phillip and the towns of Sydney and Melbourne shall be electoral districts, and that the district of Port Phillip shall return at least five members, the town of Sydney shall return two members, and the town of Melbourne shall return one member: Provided also, that for the purposes of this Act the boundary of the district of Port Phillip, on the north and north-east, shall be a straight line drawn from Cape Howe to the nearest source of the river Murray, and thence the course of that river to the eastern boundary of the province of South Australia." 6 Victoria No. 16, of New South Wales, 1843, an Act to provide for the division of the Colony of Victoria, recites the 5 and 6 Victoria, chap. 76, as to the boundary of Port Phillip, and the Separation Act, 13 and 14 Victoria, chap. 59, reiterates the boundary of Port Phillip and uses the following words:—"The territories now comprised within the said district of Port Phillip, including the town of Melbourne, and bounded on the north and north-east by a straight line drawn from Cape Howe to the nearest source of the river Murray, and thence by the course of that river to the eastern boundary of the Colony of South Australia, shall be separated from the Colony of New South Wales, and shall cease to return Members to the Legislative Council of such Colony, and shall be erected into and thenceforth form a separate Colony, to be known and designated the Colony of Victoria." (5th August, 1850.) On the 10th September, 1850, the New South Wales Parliament passed an Act, 14 Victoria No. 10, which, after reciting 5 Victoria No. 21 and 6 George IV No. 28, made it lawful for the resident Judge to appoint a Commissioner or Commissioners in any part of the district of Port Phillip capable of performing the duties of Deputy-Registrar. Then comes the legislation by New South Wales as to the redistribution of electoral districts after the separation of Victoria from New South Wales, viz., Nos. 47 and 48, dated 2nd May, 1851. The Colonial Act, No. 47, is an "Act to provide for the division of the Colony of Victoria into electoral districts." The 2nd section divides the Colony into sixteen electoral districts (whether Riverina was not within the districts of location does not appear), without naming Riverina, although it recites 5 and 6 Victoria, chap. 76, and also 13 Victoria, chap. 59. The Schedule "A" also omits the district of Riverina. The Act of New South Wales, No. 48, Schedule "A," 16, gives the electoral district of the pastoral district of the Murrumbidgee, bounded on the north by the Murrumbidgee River from

5 & 6 Vic., c. 76, boundaries of Colony.

6 Vic. No. 16.

14 Vic. No 10.

J. C. H. Ogier. 25 Sept., 1902.

from its confluence with the Murray to its confluence with the Yass River, on the east by the Murrumbidgee River, &c., to the boundary between this Colony and Port Phillip at the nearest source of the River Murray to Cape Howe, &c. Then comes the Constitution Act of New South Wales, 18 and 19 Victoria, chap. 54, 16th July, 1855. That Act says, after reiterating the boundaries I have read:—"Whereas doubts have been entertained as to the true meaning of the said description of the boundary of the said Colony, it is hereby declared and enacted that the whole watercourse of the said river *Murray*, from its source therein described to the eastern boundary of the Colony of South Australia, is and shall be within the territory of New South Wales: Provided that it shall be competent for the Legislatures of the said two Colonies, by laws passed in concurrence with each other, to define in any different manner the boundary line of the said two Colonies along the course of the river Murray, and to alter the other provisions of this section." Then comes the Victorian Constitution Act of equal date, chap. 55, section 40 of which enacts that "All laws or statutes at the time of the passing of the Act shall be in force within Victoria, and shall remain and continue to be of the same force, authority, and effect as if this Act had not been made, except in so far as the same shall or may hereafter, by virtue and under the authority of this Act, be repealed or varied by any Act or Acts of the Legislature of Victoria." The Victorian Constitution Act is silent as to the boundary, except as far as Riverina is omitted from the Schedule. The New South Wales Constitution Act took away all the waters of the River Murray and gave them to New South Wales, although both Acts are of even date. Under 13 and 14 Victoria, chap. 59, section 30, the Legislatures of one or other of the said Colonies may petition Her Majesty to alter the boundaries of the said Colonies of New South Wales and Victoria, so as to transfer to one of such Colonies a portion of the territory which, after separation, shall be comprised in the other of them; and it shall be lawful for Her Majesty, if she should think fit, by an order to be made with the advice of Her Privy Council, to alter such boundaries in pursuance of the prayer of such petition or petitions in any such varied manner as Her Majesty with such advice will think fit, provided that such petition for alteration shall not be taken into consideration by Her Privy Council until six months' notice shall have been given to the Legislative Council which shall not have petitioned. The Colonial Boundaries Act, 58 and 59 Victoria, chap. 34, 1895-1896, enacted, in connection with altering the boundaries of a Colony either before or after the passing of that Act by Order-in-Council, that such boundary so altered shall be deemed to have been from the date of such alteration the boundary of the Colony. Intervening between these two Imperial Acts there was the decision of the Privy Council in the case of Pental Island in the Murray River, such case arising out of a dispute between New South Wales and Victoria as to which of the two Colonies the Island belonged. The case was decided on the 9th August, 1872, and the decision of the Order-in-Council at Osborne House was:—"The Lords of the Committee, in obedience of your Majesty's special orders of reference, have taken the said petitions into consideration, and having heard counsel on behalf of the Colony of Victoria and also on behalf of the Colony of New South Wales, and having inquired into the whole matter, their Lordships do this day agree humbly to report to your Majesty as their opinion that it ought to be awarded and declared by your Majesty in Council that the tract of land called Pental Island is part of the territory of the Colony of Victoria." Now, if in 1872 all the waters of the river Murray belonged to the territory of New South Wales, how is it that an island situated within those waters belonged to the territory of the Colony of Victoria? Then there is the recent judgment of the Privy Council, delivered by Lord Hobhouse in the matter of Callender, Sykes, & Co. *v.* the Colonial Secretary of Lagos and Davies, reported in the House of Lords and Privy Council Appeal Cases, 1891, page 465:—"The Supreme Court laid down the principle that an Imperial Act does not apply to a Colony unless it be expressly so stated or necessarily implied; they point out that there is no case deciding that land in a Colony passes under section 17 (English Bankruptcy Act, 1869), and they dwell on the inconvenience which would arise from conflicts of law if an English Statute were to transfer land beyond the limits of the United Kingdom. Therefore, the Constitution Act of New South Wales could not transfer a territory containing some 30,000 square miles by implication, while the Victorian Constitution Act of even date by section 41, declares that all laws in force at the time of separation are to retain their effect. On the 31st December, 1900, I contend the territory of Riverina was part of the State of Victoria, according to Imperial legislation and Orders-in-Council; and I say this, that the law, not only with respect to freeholds, but copyhold and leaseholds, not only between parishes and owners, but between counties and kingdoms, is always that where a river divides two properties or States, the mid-channel is the boundary line.

N.S.W. Constitution Statute.

Victorian Constitution Act.

Pental Island case.

Riverina, part of Victoria.

5356. *Mr. Murray.*] Your contention is, that originally the boundary was the nearest source of the river Murray, and that it was one of the tributaries of the Murrumbidgee? Yes; I think it was the Yarrawonga Creek.*

5357. And that since Pental Island was adjudged to be part of the territory of Victoria, it cannot be held that the whole of the river belongs to New South Wales? Yes, that is my opinion.

FRIDAY, 26 SEPTEMBER, 1902.

[*The Commission met at the Court-house, Corowa, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY Esq., | FREDERICK N. BURCHELL, Esq.

Peter Kirkland Ritchie, tailor, Corowa, sworn and examined:—

P. K. Ritchie. 26 Sept., 1902.

5358. *President.*] What is your name? Peter Kirkland Ritchie.

5359. What are you? A tailor.

5360. Where do you reside? At Corowa.

5361. Have you known the Murray at Corowa for many years? Yes; twenty-five years.

Pollution of river.

5362. Have you noticed any difference in the quality of the water of late years? Yes, a considerable difference. When I first came here, twenty-five years ago, the water was perfectly pure; you could see the bottom of the river anywhere in summer time, but now it is simply a sludge channel. 5363.

* Witness subsequently informed the Commission that it was the Umaralla Creek, running north into the Umaralla River, which also runs north into the Murrumbidgee River.

P. K. Ritchie. 26 Sept., 1902.

5363. What do you mean by that? Owing to the sluicing operations.

5364. Do you mean that the water is discoloured now in summer? Yes.

5365. Whereas formerly it was quite clear? Yes.

5366. When did the change take place? During the last three or four years it has been more marked than formerly.

Effect of sluicing.

5367. To what do you attribute that? To the sluicing operations on the Upper Murray. I have only seen one of the sluicing plants myself—that at Staghorn Flat, Yackandandah, on the Victorian side. All the sludge from that runs into the Murray ultimately.

5368. *Mr. Murray.*] Is any record kept of the amount of pollution by sludge? I think not.

5369. You merely trust to your own memory? Yes; that is only one plant that I have referred to.

5370. Do they take any steps to dispose of their sludge locally? No; they could not possibly do that—there is such a quantity. They could not make a sludge dam to carry all the sludge from (say) an acre of land 50 feet deep, which they can take out in a month; it would not pay a mining claim to do it.

5371. It is a question whether it would pay in that case? Yes:

5372. What would you propose to remedy the difficulty? The only remedy is to prohibit sluicing altogether.

5373. Do you think that would be possible? I think it would be hardly possible. There is a large amount of capital sunk in these claims, and it would appear to be an injustice to shut down their claims, but it is a question whether they should suffer an injustice or the people on the banks of the Murray.

5374. Have you been concerned yourself in mining in any way? Not practically. I am a shareholder in many claims, but I have never held shares in a sluicing claim.

5375. *Mr. Burchell.*] How does the polluted water affect you? Not at all personally; I am independent of it.

Water supply.

5376. How is the town of Corowa supplied? We have no supply. If we want water we have to cart it.

5377. Where from? It is pumped from the river to the railway station, and carted from the railway station.

Proportion of sediment in water.

5378. Have you experienced anything unpleasant in regard to the water for drinking purposes? Not personally. I have heard that 200 gallons of water will leave a deposit of half an inch of mud in the tank.

5379. Has there been any sickness reported on account of the condition of the water? There has been a good deal of sickness, but it cannot be directly traced to the condition of the water.

5380. Supposing Corowa had a complete system of water supply, where would it be taken from? I should be in favour of taking it from the Corowa Deep Lead Mine.

5381. What depth do they pump there? Ninety feet.

5382. How far is it from Corowa? One and a half miles. I think it would be much preferable to the Murray water in its present state.

Frederick Charles Piggin, President of the Corowa Progress Association, Corowa, sworn and examined:—

F. C. Piggin. 26 Sept, 1902.

5383. *President.*] What is your name? Frederick Charles Piggin.

5384. You are President of the Corowa Progress Association? Yes.

5385. How many years have you been resident in the district? About thirty-eight years.

5386. During that time I suppose you have been acquainted with the condition of the Murray—that is to say, the quality of the water coming down? Yes, having bathed in it pretty well every morning.

Quality of water deteriorating.

5387. Comparing its present condition with that of former years, what would you say? During the last four or five years it has been gradually getting worse. The last twelve months it has been exceedingly bad.

5388. Does that apply the whole year round? Pretty well; there are very few days with any alteration. I have noticed it most at the commencement of the week, which I attribute to the fact that the sluicing was done during the latter end of the week, and the pollution was at its worst about Tuesday or Wednesday.

5389. Do you think that the discharge of the river being low this year has intensified the appearance of the muddy condition? Not at all, because when we get a fresh we get it even worse. I fancy that it is much the same all the time.

5390. How does it affect the town of Corowa? It affects those materially who have to drink the water. At times it is not fit to bathe in; I have returned from it and used the water from a tank which I have at home. My bathhouse is on a back water, and the sediment collects where my bathhouse is situated.

Pollution caused by sluicing.

5391. To what do you attribute the cause of the pollution? I can give you no practical opinion; but the general opinion is that it comes from the sluicing operations on the Upper Murray. Two or three years ago I communicated with the Albury Council in regard to the matter, but they gave me a very cold reception; they said they did not notice any pollution there. That fact I attributed to the works coming in below Albury. Since then sluicing has been in operation above Albury, and they are now writing to us to assist them.

5392. Would you propose any remedy? The only remedy I can see is to make some provision for the settlement of the silt, or stop the sluicing altogether. I take it that the public health and the growth of stock, and the interest taken in stock-producing, apart from the vital interests of human consumption, should certainly be considered before the interests of half a dozen sluicing claims.

Bungowannah scheme.

5393. You know that it is proposed to erect a weir at Bungowannah for the purpose of diverting water on to the New South Wales and possibly on to the Victorian sides of the river;—how is the scheme regarded in Corowa, so far as the New South Wales side is concerned? I might say that I was a delegate at the Berrigan Conference, and I was instructed to advocate the starting of the scheme. The general opinion is that the head works should be started, leaving the flood-waters to run in their natural channels. This opinion was expressed by me at the Conference, and, as I pointed out there, we being at the head works, it might be thought that we were regardless of the interests of those down below. I explained that the water would be diverted into the Twelve-mile Creek, and when it would reach those lower down would be a matter of opinion. My colleague, the Rev. Hose, took the same view as I did.

5394. For the construction of the weir? Yes.

5395. And the leaving out of the channels for the time being? That is, if the Government did not feel inclined to go on with the work in its entirety. Until water is found for the people out back, settlement will never be permanent; there will always be a disposition to sell and go to some other locality.

F. C. Piggin. 26 Sept., 1902.

5396. Are you acquainted with the locality lying between here and Berrigan? Yes, every inch of it.
5397. Have you had any experience in irrigation? None at all.
5398. You do not know whether it is suitable country for irrigation purposes? No.
5399. *Mr. Murray.*] Your friends advocate the construction of the weir in the first place? Yes.
5400. In what way will that serve? Simply by diverting water into the natural channels.
5401. What natural channels would be served by the construction of the weir? Eight miles from Howlong it goes into the Twelve-mile Creek.
5402. That is below? I am not acquainted with those above.
5403. *Mr. Burchell.*] Do you recognise that, with seasons like the last two or three we have had, and what we are experiencing at present, the area that could be guaranteed for irrigation, when everyone is supplied on the banks of the river, must be very small? I could not give any opinion as to that.
5404. You understand that when the Bungowannah weir and the two channels are constructed, you will only get one-third of the water past Corowa? I could not say anything about that.

Alexander Augustus Piggin, stock and station agent, Corowa, sworn and examined:—

A. A. Piggin. 26 Sept., 1902.

5405. *President.*] What is your name? Alexander Augustus Piggin.
5406. You have been a resident of Corowa for how long? Twenty-six years.
5407. Are you familiar with the proposal for diverting water from Bungowannah across the Riverina country in the direction of Berrigan and Deniliquin? Yes.

Bungowannah scheme.

5408. What is your idea as to the proposal? I think the proposal a very good one, and that it would be of immense benefit to all the settlers along the course of the proposed channel—that is, if the cost of taking the water will not be too great, and it can be shown that it will be of commercial value.

Order in which works should be carried out.

5409. Do you advocate the construction of the whole of the channels? I do, but, as a first instalment, seeing that the scheme is to be a very costly one, I advocate the construction of the weir at Bungowannah and the cutting of a channel 8 to 10 miles long, leading the water into the Twelve-mile Creek, which has a natural fall as far as Jerilderie, and then flows into the Billabong. When it gets to Narrow Plains there is another creek which would lead it to Clear Hills, called the Back Creek. This would give a domestic and stock supply along a distance of 70 miles. The channel, of course, is practically formed, and when it branches off to the Back Creek it would then, perhaps, go another distance of 8 or 10 miles. So that practically, with the construction of the weir at Bungowannah, and the cutting of 8 or 10 miles of channel, you could give a supply of water for domestic purposes and stock for 70 or 80 miles. I take it that the construction of the weir at Bungowannah would simply be the beginning or part of the proposed scheme. This part of the work could be done at comparatively small expense, and would give immediate relief to the people in the locality I have indicated without waiting for such a costly scheme as you are considering now. It will probably take a long time to complete this scheme, and I cannot see why the people should be kept waiting in the meantime.

Benefits to Corowa.

5410. *Mr. Burchell.*] Would Corowa benefit by the construction of the Bungowannah works? If the water is to come down on an elevated channel, Corowa would; but if it is to follow the course of the Twelve-mile Creek, I do not see how irrigation could be carried out unless water were pumped from the Twelve-mile. Practically, for 18 miles from Corowa, unless the water is raised in some way or other, I do not see how you could irrigate at all until you get on to the Billabong Forest.

Rainfall.

5411. What is the rainfall of the country you have been describing? About 20 inches.
5412. About 70 or 80 miles would be served? Yes. Along this line I refer to, they are practically out of water.
5413. That is on account of the exceptionally dry seasons? Yes.
5414. If the diversion works were constructed on the Murray, below Corowa, instead of at Bungowannah, would it materially affect Corowa? I do not think so.
5415. Do I understand you to say that the Bungowannah weir should be constructed before head-works or storage are carried out? If it would give water along this Twelve-mile Creek, yes; if not, no.
5416. Take the present season, how much water could be afforded at the present time if the Bungowannah weir and the two channels were constructed, and only one-third of the water came down here? I think there would be quite sufficient to run a good stream down the Twelve-mile.
5417. How do you think the people down below would get on? I do not know how the river is down below. I take it that if water could be spared, it would be allowed to flow down the Twelve-mile Creek; if it could not be spared, the water would be blocked from going down there.
5418. Without storage, do you not see the risk of having works constructed, when by such means all the water could be taken;—you are taking water out of the river, from persons who have been depending upon it, to persons away from the river? The people out-back have just as much right to the water as those on the Murray.
5419. You see the risk of there not being sufficient unless storage is provided? I think it is got over simply by the question of supplies. Of course, if the water cannot be spared, it will have to be blocked.

Charles Thomas Brewer, Manager of the Bank of Australasia, Corowa, sworn and examined:—

C. T. Brewer. 26 Sept., 1902.

5420. *President.*] What is your name? Charles Thomas Brewer.
5421. You are manager of the Bank of Australasia, Corowa? Yes.
5422. How long have you been here? Twelve years.
5423. Have you had the condition of the river under observation during the whole of that time? Yes.

Extent of pollution.

5424. Have you noticed any change of late years as compared with what the condition was in former years? Yes; twelve years ago it certainly was not polluted to the same extent as it is now. Every year the pollution seems to be getting more and more pronounced, so much so that now, during these seasons of drought, when we have to depend on the river for our water supply, it is questionable whether it is of any benefit for washing purposes, seeing that it is so polluted by the mining works on the Victorian side. It seems to me that in the course of years, if this pollution is not prevented, and mining companies are not compelled to settle their sludge before they let it out into the river, it will become a very serious question indeed to those who are compelled to live on the banks of, and draw their water supply from, the river. It appears to any reflective mind that if you erect any dams or weirs in the bed of the river you

C. T. Brewer. 26 Sept., 1902.

you will probably find that this slum nuisance will become more accentuated, because the probability is that such works will act as accumulators for it. Taking this year, we practically have not had a clear river since the beginning of the year. It has been customary in the past for the river to become cloudy and very filthy for two or three days at a time—just after the mining companies had let out their slum—and then it would become clear again. For the last six or eight months it has never cleared at all.
5425. I suppose you would say that the pollution is inorganic, not organic? We have never had it subjected to analysis.
5426. Has there been any sickness which could be attributed to the condition of the water? It is impossible to say, but it is scarcely probable in such a volume of water. The Albury people have settling tanks in connection with their water supply, and some day we will want to have a water supply here, and will have to go to a large expense in getting settling tanks also. And even with the settling tanks the Albury people are crying out about the condition of the water. I think the mining companies should be compelled to filter or settle their sludge or slum.

Mining companies should precipitate sewage.

5427. In your opinion, that is the remedy? Yes.
5428. *Mr. Burchell.*] Has the water been used for garden purposes? Not in Corowa.
5429. Do you know if it affects vegetation at all? No; I could not say.

Albert Horace Thompson, Secretary to the Rutherglen Waterworks Trust, Rutherglen, Victoria, sworn and examined:—

A. H. Thompson. 26 Sept., 1902.

5430. *President.*] What is your name? Albert Horace Thompson.
5431. You are secretary to the Rutherglen Waterworks Trust? Yes.
5432. How long have you been a resident of Rutherglen? Fifteen years. The Rutherglen Waterworks Trust completed its works about two and a half years ago. It is a pumping scheme, the water being pumped direct from the Murray into a system of underground pipes a distance of 5 miles, and then carried into an elevated tank within the township. Just before the works were completed the Trust saw the difficulty in regard to the sludging business, and had a rose placed 9 inches from the bottom of the tank, so as to allow the sediment to settle in the bottom of the tank. For the last two years the water has been getting worse every day—in fact, now it is almost useless for domestic purposes. People cannot wash with it. When the water was first laid on, the majority of the people got rid of their tanks, and they have now had to reinstate them. Most of the people do not use the water at all, not even for washing purposes, and certainly not for drinking. There are no filter-beds provided, but the day is not far distant when they will have to be provided, or something done to prevent the settlement that takes place. Officers have had to be employed to go round the various scour-valves every fortnight or so. Every morning, before you can get a bucket of water, you must waste two buckets in taking off the sediment. With regard to the remedy, while we consider it would be a hardship to stop the mining operations, the only real system of prevention is to make them provide storage-paddocks for this slum water, let it settle, and then let it back into the river. The private mining claims at Rutherglen caused paddocks to be constructed. They allow the water to remain in these paddocks sufficiently long for it to settle, and then let it off. If they can do that on private land, I do not see why these other claims should be allowed to pollute the water as at present.

Water almost useless for domestic purposes.

Method of preventing pollution.

5433. *Mr. Murray.*] Have you had any experience of town waterworks outside Rutherglen? No.
5434. You complained of having to send officers round for the purpose of scouring your pipes? Yes, once a fortnight or once a month. The inspector has to report at each meeting of the Trust that every scour valve has been used. That is in consequence of the numerous complaints we have received as to the quality of the water.

Scouring mains.

5435. Are you aware that it is usual, in connection with water supplies, for an instruction to be issued to turncocks to scour all mains once a week? I was not aware of that.
5436. You complained also that it is necessary of a morning to run off a bucket or two before you can draw a bucket of water;—are you not aware that that is almost always the case, even where the supply is from clear mountain streams? If you run off 100 buckets the water will still be unfit to drink. If the water were put into a glass jug, and allowed to stand all night, the incrustation that would take place round that vessel would be very great.
5437. Have the people themselves ever tried any means of precipitation? I could not speak on that point.
5438. Do the people take the rain-water off the roof without precipitation also? They have done so for the last twenty years.
5439. *Mr. Burchell.*] Has the Trust taken any action to prevent this pollution? The Trust instructed its Parliamentary representatives on several occasions to make representations to the Government and other authorities, with a view to preventing the pollution of the river by dredging and sluicing operations. The Wangaratta Council took the matter actively in hand, and communicated with several Trusts, including Rutherglen. The Rutherglen Trust voted a sum of money towards a fund, with a view to having a test case taken to Court for the purpose of preventing mining operations polluting natural streams. The Wangaratta Council have not, up to the present, taken that action, but the offer of the Rutherglen Trust is still standing good.

Trust action to prevent pollution.

5440. Can you speak of the water as applied to irrigation? Only as an amateur gardener.
5441. Have you noticed the taste of the water? Yes; it has a limy, unpleasant taste—a foreign taste.
5442. How does it affect the fish? The scarcity of fish clearly shows the effect the water has on them.
5443. Have you noticed any dead fish? No.

Royston Ready, Chairman of the Rutherglen Waterworks Trust, Rutherglen, Victoria, sworn and examined:—

R. Ready 26 Sept., 1902.

5444. *President.*] What is your name? Royston Ready.
5445. You are chairman of the Rutherglen Waterworks Trust? Yes.
5446. For how many years have you been resident in the district? Twenty-one.
5447. Have you been acquainted with the Murray all that time? Yes.
5448. Have you heard the evidence given by your secretary? Yes; I can simply corroborate all he said.
5449. Is there anything you wish to add? No.

SATURDAY,

SATURDAY, 27 SEPTEMBER, 1902.

[*The Commission met at the Court-house, Albury, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

George Arthur Thompson, Managing Director for Messrs. T. H. Mate and Company, Limited, merchants, Albury, sworn and examined:—

G. A. Thompson. 27 Sept., 1902.

5450. *President.*] What is your name? George Arthur Thompson.
5451. You are managing director for Messrs. T. H. Mate and Company, Limited, merchants, of Albury? Yes.
5452. You have been a resident of Albury for how many years? Sixteen.
5453. And you, I suppose, are acquainted with the Murray? Yes, very well acquainted.
5454. And have been here throughout the whole of that time? Yes.
5455. We would like you to compare the condition of the Murray to-day with what you knew it years ago? Even comparatively few years back it was clear. I was in the habit of bathing in the river, and the water was so clear that you could see your body as you walked through it. Now, you could not see the slightest trace of your form in the water. With regard to the use of it, a few years ago it was clear and good for domestic use; but latterly it has been so bad that it has been practically useless even for washing purposes. Had it not been for the fact that at my own house I have tanks of rain-water, by which the clothes can be rinsed out after washing, we could not have used the river water at all. The sediment in the water gets right into the clothes, and ruins them. — Effects of pollution.
5456. What do you regard as the cause of the pollution of which you speak? The sluicing works on both sides of the Murray. I had occasion, about April last, to be in Tumbarumba, and I saw there the sluicing operations just above the town and also on Burra Creek. I saw the water as it passes down near Tooma, and it was just like liquid mud rolling down—quite red. On the other side, in company with the Mayor and others, I visited the channel that runs into the Mitta River, above Huon's Lane. There is a channel cut there to take the water from the mine—that is, the overflow from these mining operations—back to the Mitta, and they have cut a channel so as to save the sludge going over people's paddocks. This channel was just rolling mud. As we drew up in our trap the men working on the road cried out, "Do not drink it; it is not fit to drink." The Mayor took a fair sample (*produced*) from the running stream that goes straight into the Mitta River. After getting that specimen we went round to Bethanga Creek, which also runs into the Mitta, and the water there was almost the colour of blood and full of minerals (*specimen produced*). — Pollution caused by sluicing.
5557. You know, as a commercial man, that the mining operations are of some considerable importance to the two States? Yes.
5458. And that, whilst one way would be to stop the mining and get over the pollution difficulty in that way, it would not be a desirable thing to do;—now, what remedy do you propose? I am not a mining engineer, but, looking at it from a business man's point of view, I should say there is no desire to stop the mining operations; but I think they ought to be controlled. If they were compelled to make dams for the settlement of the water used in their operations, and allow it to settle for some little time, the water that ran over afterwards would not seriously pollute the river. It seems to me that that would stop the trouble. — Methods of preventing pollution.
5459. *Mr. Murray.*] Do you know if any records have been kept of the amount of pollution;—have samples been taken and recorded? I believe that has been done.
5460. Have they been taken regularly by any authority, and proper records kept? I could not say.
5461. So far as you are concerned, the extent of the pollution depends on memory alone;—you have no record? No.
5462. How long is it since sluicing was commenced on those flats? Eight or nine years ago.
5463. Was there not sluicing in 1885? I do not think so; at any rate, the river was not polluted then. I came here in 1886, and the river was clear then. In my own business I have an engine working, and my man tells me that the water is of such a gritty nature that it is damaging the machinery.
5464. Have you any idea as to the cost of precipitation? No.
5465. Have you seen it practised at Bendigo? Yes.
5466. *Mr. Burchell.*] How many companies are there up the river? I could not say; there are two sides, one coming into the Mitta River, and the other into the Little River.
5467. What is the distance between the nearest one and Albury? Twelve or 13 miles.
5468. Have you used the water for irrigating anything in your garden? Merely through a hose and sprinkler.
5469. Have you used it for drinking purposes as well as washing? Yes; but we always have to filter every drop before using it for drinking purposes.
5470. Have you heard of it having an injurious effect on any one? No.

Frederick William Hayes, proprietor of the Albury Flour-mills, Albury, sworn and examined:—

F. W. Hayes. 27 Sept., 1902.

5471. *President.*] What is your name? Frederick William Hayes.
5472. You are the proprietor of the Albury Flour Mills? Yes.
5473. How long have you resided in Albury? Thirty-two years.
5474. Do you use the water from the river for your mills? Yes, directly from the water pipes into the boiler.
5475. How long have you owned the mills? The firm have used the water now for thirty-two years.
5476. Will you compare the use of the water for your purposes, so far as the past is concerned, with the present? Before the river was so polluted, we could run the boiler for three or four months at a time without having occasion to blow it off, whereas now it is necessary to blow her off twice, and sometimes three or four times a day. If we were to run the boiler for a day, and then cool her down, and then clean her out, there would be about 4 inches of mud on the bottom of the boiler, and an accumulation on the tubes. — Effects of pollution.

tubes. We are using now about 25 per cent. more wood in getting up steam than we did fifteen or sixteen years ago. Then there is the effect it has on the blow-off cock; the grit gets into that, and in a week it starts to drop and leak. It has the same effect upon the injector. There are two or three cones in the injector, and the water going through it cuts the cones right away, and we have had to bush them. The bottom glass of the gauge cannot be kept tight. If it was required to be kept tight, it would be necessary to grind it in twice a week. It is one of the latest asbestos packed gauge glasses, and the grit seems to get into the asbestos and cuts the plug right away. Besides, we are paying for water by meter at so much per 1,000 gallons, and, instead of what we pay for, we are getting a large percentage of mud. — F. W. Hayes. 27 Sept., 1902.
5477. Do you not think that three months is rather a long time to leave a boiler without blowing it off, even under the present conditions? No, not when using pure water.
5478. You know at the time the waterworks were constructed that provision was made for settling the water before it was consumed by the people of Albury? Yes.
5479. There must have been a necessity for the expenditure, or it would not have been incurred? Yes.
5480. That being so, there must have been something wrong with the river water when the waterworks were constructed, as they were, nearly twenty years ago;—what have you to say in regard to that? Those settling tanks were only there for use in flood time. In flood-time any river—even a snow river—is dirty. It is necessary now to do double pumping to take the water out of the settling tanks. — Albury settling tanks.
5481. Those tanks were constructed at the inception;—have you got anything to say in regard to that, because it is clear that the river at that time must have been in such a condition as to make it necessary for the water to be treated before it could be used? At that time it was known that whenever a flood occurred the river always would be muddy, and that is what the settling tanks were put there for. They were not put there to get over the pollution difficulty.
5482. *Mr. Murray.*] Do you know how long it is since mining, and especially sluice mining, began on the Upper Murray and its tributaries? The Pioneer Mining Company, up at the junction of the Mitta and the Snowy River, about 45 miles from here, was established a good while; but at the time it was established they did not have the same face to work upon. It never had nearly the same effect, although I have noticed the effect of the Mitta upon the river for the last eighteen or nineteen years. They have a face there about 100 feet deep. The amount of stuff that comes down that is simply appalling. Fences that I have known to stand 3 feet 6 inches and 4 feet high are only standing about 2 feet out of the ground now, and lagoons that I knew on the Mitta flats are now filled up. — Date of commencement of mining.
5483. How long is it since mining began about Tumbarumba and Tooma? Heinecke's mine—which I think is now called the Union Jack—was established about five years ago.
5184. Was there not mining back in the fifty's? Only to a small extent.
5485. Did not the mines, both in New South Wales and Victoria, in the early days use the rivers and creeks as common drains for discharging their sludge into? Yes; I believe so.
5486. How do you propose to get over the difficulty in regard to the right that has grown up in consequence? I think they ought to dam back the sludge.
5487. Upon whom is it incumbent to do so? I thought there was a law in force whereby the miners could be made to do it.
5488. *Mr. Burchell.*] What action has been taken in regard to the pollution? Meetings have been held in Albury in regard to the matter, and I think this inquiry is the continuation of the action we have taken. — Action taken in regard to pollution.
5489. Have you received any communication from anyone else on the river? Yes; both Corowa and Howlong have asked us to join them in protesting against it.
5490. Were any steps taken? No; I believe we were then preparing ourselves for this inquiry.

Patrick Kennedy, medical practitioner, Albury, sworn and examined:—

P. Kennedy. 27 Sept., 1902.

5491. *President.*] What is your name? Patrick Kennedy.
5492. Have you been practising your profession very long in Albury? Over twenty years.
5493. You are therefore well acquainted with the river, so far as its condition is concerned? Yes.
5494. Will you give us the benefit of your opinion as to the effect the water in its present condition has on the health of the inhabitants? The water recently has been very muddy, and I should say decidedly injurious to health. When tea is made with it, it gives the tea a peculiar muddy flavour that is certainly not desirable any way. Over and above that, the condition of the water interferes with the house service in many places. In my own garden the taps are never in order, and cannot be kept in order, on account of the accumulation of mud. — Effects of pollution.
5495. Have you had any cases of sickness that you could attribute directly to the effects of the water? Not directly, but I can quite understand that it would cause more or less gastric trouble and trouble in the bowels.
5496. Is the pollution inorganic or organic? Largely organic, I should judge. — Pollution largely organic.
5497. Has there been any analysis of the water recently? I think so, but I have not seen it.
5498. Have you anything further you wish to add? Of course, the present season has been an exceedingly dry one, and probably the water being lessened in quantity the mud has been worse. For twenty years past the mud has been coming down the Yackandandah Creek from the Yackandandah neighbourhood, and I know that, so far down as Corowa, there have been protests against this matter of the pollution of the Murray. I should judge that it will destroy the fish in the river. As a citizen of the Commonwealth, I protest against the pollution of our main river. We are a town and district of 6,000, and the general principle of the greatest good for the greatest number should apply, instead of which a few Victorian miners are allowed to pollute the river to the detriment of those lower down. — Fish probably destroyed.
5499. Do you know of any injurious effect on the health of the people on the Bethanga Creek? Yes. I have seen cases there of neuritis and some stomach disturbance—symptoms of arsenical poisoning—similar to the cases of arsenical poisoning from beer which occurred recently in England. — Injurious to health. Arsenic present.
5500. To what do you attribute the cases of sickness that you have referred to? To the presence of arsenic. It would get into the house water; but I think it would be so diluted in the Murray that it would be hardly appreciable.

Joseph

Joseph Matthews, contractor, Albury, sworn and examined :—

J. Matthews. 27 Sept., 1902.

5501. *President.*] What is your name? Joseph Matthews.
5502. You are a contractor? Yes.
5503. Resident in Albury? Yes, for over thirty years.
5504. You have been in the habit of indulging in the harmless sport of fishing? Yes.

Reproduction of fish destroyed.

5505. Will you give us your opinion as to the effect of the alleged pollution on the fish? In my opinion it is destroying the reproduction of fish entirely.
5506. Why do you say that the reproductiveness of the fish is destroyed by the pollution? During the last three or four years I have never caught any perch or other small fish, and I attribute that to the effect of the sediment in the river on the spawn. Years ago you could catch hundreds of them. I consider the shortage in fish at the present time is due to the fact that there is no reproduction.

Frank Henry Williams, Engineer, Albury Town Waterworks, sworn and examined :—

F. H. Williams. 27 Sept., 1902.

5507. *President.*] What is your name? Frank Henry Williams.
5508. You are Engineer to the Albury Town Waterworks? Yes.
5509. How many years have you been in charge? Three and a half.
5510. Were you acquainted with the works before that? No.
5511. Is the water pumped direct from the river? Yes.

Settlement not always practicable

5512. What do you do with it after it passes through the pumps? In some cases we settle it, at other times the consumption is so large that we have not the time to settle it—it takes too long.
5513. You pump direct to the reservoir? Yes; and they have to take it just as it is.
5514. What proportion do you settle? The consumption averages 500,000 gallons a day, and it would take a fortnight to settle that properly; it would require continuous pumping in and out, so that really there is no gain in settling it.
5515. *Have you tried the settling yourself?* Yes; when I came here three years ago we could settle it.
5516. How long did it take then? About four days.
5517. When was the last time you tried to settle it? Some eighteen months ago.
5518. How long did it take? Over a fortnight, and there was still that murky appearance in it.
5519. Have you tried any precipitant? No.
5520. Have there been any complaints about the condition of the water pumped direct from the river? Nothing else but complaints.

Effect on machinery.

5521. How does the water that you use affect your machinery? It cuts it away. I had new brass liners put in a feed pump twelve months ago, and they are now cut through. [*Witness then produced a sample of the water taken fifteen months ago.*]
5522. The water then was perfectly transparent? Yes, but only for a short time. There must have been some cessation in the mining operations for some time.
5523. *Mr. Burchell.*] How does the water affect your reticulation-pipes? That I could not say, but the turncock tells me that the pipes are cutting very badly.

Walter Joseph Billson, Mayor of Albury, sworn and examined :—

W. J. Billson. 27 Sept., 1902.

5524. *President.*] What is your name? Walter Joseph Billson.
5525. You are Mayor of Albury, and proprietor of the New Brewery, Albury? Yes.
5526. How long have you resided in Albury? Twenty years, with the exception of a break of a few years, when I was away.
5527. Can you speak as to the condition of the river twenty years ago compared to what it is to-day? The transformation that has taken place in the last twenty years is practically shown by the difference in the two samples produced. Twenty years ago the water was comparatively clear; it was pure and wholesome for all purposes, whereas now it is not.
5528. Have any cases of sickness come under the notice of your Council as the result of the pollution? *None that could be directly attributed to the water.*
5529. The pollution is, we understand from the evidence given, due to the mining operations on the Upper Murray? Yes.

Source of pollution.

5530. Where is the principal pollution? On the Victorian side from the source of the Mitta (and the tributaries leading into the Mitta in the shape of creeks) and the Kiewa River, each of which empty into the Murray.
5531. Have you inspected the river above the junction of the Mitta with the Murray? Yes.
5532. Was the water objectionable above the junction? Not at the time I inspected it.
5533. Was it apparent that the pollution was at the point where the junction of the Mitta occurs? Yes; the point of junction of the Mitta and Murray. I might say that some six months ago we communicated with the Department in Sydney, and they instructed the local road superintendent to take samples of the water and send them down. This was done, and we naturally expected to receive an analytical return showing the condition of the water; but from that time up to the present we have had no reply as to the character of the water, or what the Department's intentions were in the way of abating the evil. Following on that we found it necessary to call public meetings, of which this inquiry is the outcome. I was born on the Ovens; but the mining operations to-day are vastly different to what they were then. Under the new process of dredging, this water is used over and over again, until it becomes of the consistency of pea-soup. I might say, further, that the river-bed is being destroyed; in many cases, the course of the river has been completely altered through the silting up. The Mitta, years ago, took its course half a mile from where it crosses the Bethanga-road now, and the difference is due to the silting up from the mining operations. The Little or Kiewa River was a beautiful, clear stream; whereas now it is nothing but rolling mud. As far as the domestic supply is concerned, the water is undrinkable. In my own business as a brewer, I have to treat all my water now; whereas, in the past, there was no necessity for it.

River course altered.

Kiewa River.

5534. *Mr. Burchell.*] Could you name any particular places where the river has silted up so badly? At a point about 3 miles from here.

5535.

W. J. Billson. 27 Sept., 1902.

5535. Are there any other places that show visible signs of change? In the summer time, when the river is shallow, the deep holes, where we always caught fish—"good spots for fish"—are things of the past.
5536. Is there anything else you wish to add? In regard to the corrosion, I might say that the friction due to the grit causes the ball-valves in the fire-plugs to cut, and as a result they are continually leaking.

MONDAY, 29 SEPTEMBER, 1902.

[*The Commission met in the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).

STUART MURRAY, ESQ. | FREDERICK N. BURCHELL, ESQ.

Alexander Oliver, M.A., President of the Land Appeal Court, Sydney, sworn and examined :—

A Oliver, M.A. 29 Sept., 1902.

5537. *President.*] What is your name? Alexander Oliver.
5538. You are President of the Land Appeal Court? Yes.
5539. You were formerly Parliamentary Draughtsman? Yes.
5540. You have been supplied with a list of questions relating to the constitutional and legal aspect of the matter that has been remitted to us for consideration? Yes.
5541. And you are prepared to answer them? Yes, so far as they are capable, in my opinion, of being answered, I shall be very happy to give the Commission my opinions. They are but opinions, for there is practically no body of riparian law in this or any other Australian State—that is to say, law that has been the result of interpretations by the Judges. In our State I think we have only had one solitary case, Lord *v.* The City of Sydney. That was decided by our Supreme Court; it went to the Privy Council, and was there overruled. I have had one or two riparian cases before my own Court, but in Courts of highest authority we have, as a matter of fact, a very small body of law; whereas in England and America there is a volume of law on the subject of riparian rights. Here it is practically a blank.

No body of riparian law in Australian States.

5542. I suppose you will be able to tell us, so far as your judgment goes, whether the conditions obtaining in Australia are such that they could be reasonably compared with the conditions in England and America, so that an analogy might be drawn? There is no doubt that the conditions are very different indeed—so much so, that if cases had come before our State Courts they would probably have been more guided by the conditions of the drier parts of America than by anything European; at all events more *than by the conditions obtaining in Great Britain.* We, of course, inherit the common law of England; we bring that with us, so far as it is applicable. We also bring the statute law, with the same vinculum; and that vinculum, *so far as it is applicable, I think, is the key to the situation here—that is to say,* that the authority that expounds the law of riparian rights has practically a very wide field. I do not think they would be bound down by English common law, and practically there is very little statute law in reference to riparian rights in England. On the other hand, I think they would have absolute liberty to adopt so much of the American law as they think would suit the circumstances.

Conditions in England and Australia very different.

English common law binding only so far as applicable.

5543. [Question No. 1.] Did section 5 of the Constitution Statute (18 and 19 Victoria, c. 54), which enacts that "the whole watercourse of the said river Murray from its source therein described to the eastern boundary of the Colony of South Australia, is and shall be within the territory of New South Wales," thereby make New South Wales the legal possessor of the waters passing along the bed of that river; if not, (*a*) what was the right conveyed by that enactment; (*b*) how has that right been affected, if at all, by the passing of the Commonwealth Constitution Act? Of course, this is an Imperial Act—I am speaking of 18 and 19 Vic., chap. 54—so far as its source is concerned. It has all the force of Imperial legislation. It is not a State Act. When this 5th section was enacted, it is quite clear that there were doubts that required settlement, and those doubts obviously originated in the Act of 1850, in which the boundary of Victoria was declared to be "a straight line drawn from Cape Howe to the nearest source of the river Murray, and thence by the course of that river to the eastern boundary of the Colony of South Australia." We have to remember that all the Colonies or States were chopped out of New South Wales. The first chopping out took place, I think, with South Australia. I forget what date—probably 1837. Later on there was a more accurate definition of boundaries. Then, in 1850, Victoria was chopped out of New South Wales. Well, why that has some bearing upon this question I think is not a very difficult matter to answer, although I can quite understand Judges of the highest eminence differing upon this point. Referring to the Statute, one sees a declaratory enactment. One must not forget that the whole of the Murray was once in New South Wales; because the first Commission that was issued to our Governor authorised him to govern from Cape York to the south cape of Tasmania and the 135th meridian of east longitude. Well, there was no doubt then that the Murray belonged to New South Wales; it was part of it. It was not as if two colonies had been established at the same time, and then the boundary delimited. This river was always in New South Wales, until something took it out of the territory. Now, it is claimed that the joint operations of these two enactments has had that effect. When you go to the Act of 1850, there are no doubt very ambiguous words used—"by the course of that river." If there had been nothing more than these, I apprehend that that would have taken the boundaries of each State to the mid-thread—*medium filum*—of the river. That would probably have had such an effect, inasmuch as it would be fairly argued that the district of Port Phillip, afterwards called Victoria, was meant to be a riparian State. I daresay that, on the footing of that Act of 1850, the State of Victoria and the private proprietors considered that they had riparian rights to the river. Now I, know nothing about the history of the doubts; all that I know is this: When the opportunity came to declare what the meaning of that enactment was, that opportunity was seized (*in 1855*), and the words used are very momentous, though rather difficult of interpretation; because the British Legislature meant to declare, not what the law is, but what it was and always had been. The words are, "it is declared . . . is and shall be." That is declaratory. Where? "Within the territory of New South Wales." Therefore, although it is very strongly urged that those are mere words of boundary, without any intention of adding to our territory or taking away from the riparian rights of Victoria, you

Act 18 and 19 Vic. an Imperial Act.

Object of section 5 to settle doubts.

Whole of Murray once in N.S.W.

Riparian rights.

The law declared.

are

A. Oliver, M.A. 29 Sept., 1902.

are still confronted with those words, which put the whole watercourse—whatever that means—within the territory of New South Wales, by the use of words which have a technical meaning, inasmuch as they are technical words. And the important words are, "the whole watercourse," together with the words, "is and shall be"; and, as I have already said, this is declaratory of what the law was, and not an amendment of it. That brings me to the interpretation of a very difficult enactment—an enactment stating that a certain watercourse is in the territory of New South Wales. Then comes another trouble. What is a watercourse? Now, I was examined in 1896 before the Standing Committee on Public Works on the locking of the Darling. I was asked to furnish a paper, which I did, and which, up to that date, expresses the opinions I held—of course, before Federation—on subjects of this character; and, among others, I considered the meaning of the word "watercourse." Of course, the text-books are very well known. The one by the American writer, Angell, describes what he considers, on the authority of the old publicists—no doubt on very good authority—a watercourse to be; and he comes to the conclusion that it consists of Bed, Banks, and Water. Now, with the very greatest respect for Angell, I venture to differ from him. I think he is right with regard to the bed and the banks; I do not think he is right with regard to the water. I think he should have said the stream. Now, it may appear to be trifling with words to say that stream is not the same as water. But the *cursus fluminis*, or course of the water, is a very different thing from the fluid particles of the river—the liquid that is passing along, and which is supposed to go on for ever, a vehicle for carrying things, and so forth, as flowing in a given direction and of a certain height. All that, I think, is fairly comprehended in the word "stream." But I do not think it was ever meant to vest in New South Wales territory the flowing water any more than you can convey air or fire. Therefore, I think that Angell has either misunderstood his authority, or has come to a conclusion on that point which would not be supported. I think it would be found from other authorities that the watercourse would mean bed, bank, and stream, but stream in the sense in which I have tried to describe it. I should prefer to revise Angell's definition, and say it meant those three things.

Meaning of "watercourse."

Angell's definition differed from.

Not intended to vest flowing water in N.S.W.

Definition of "bank."

5544. Will you define for us what you mean by bank? I do not think there is much difficulty with the authorities in regard to that. The bank, I should say, is that part of the *alveus* or channel which delimits the stream vertically, or as near vertically as possible, as distinguishable from the channel; but I do not think it is possible to draw the line from where the banks end and the bottom or *alveus* begins.

"Bed."

5545. Would you estimate that the river at its minimum flow should be taken into consideration in deciding what the banks would be, or the river at its maximum flow? I do not think they have had that difficulty in England; they seem to have a much easier way of settling what is bed there than we have here. My notion of bed is the bottom of the channel—that part of the channel which would about define where the silt or mud of the river began. I should hardly like to take the bed up to (say) the average level of the river, and say the bank begins from that average level and goes on to the flood level. But I feel that this is an exceedingly difficult thing to define.

5546. What is the bank? There would be no difficulty in ascertaining where it begins, as a rule; you would find that fairly well defined. Now, according to the view that I should be inclined to take at present, the bed would be far lower than any of us have ever seen the Murray, and that is where I should be inclined to look for the bed.

Line between bank and bed.

5547. Does the bank begin where the bed finishes, and terminate at the ordinary surface of the ground? I should say so; that is quite consistent with the view I take.

5548. There would be no difficulty, according to your interpretation of what is meant by the term "watercourse," if, as you say, watercourse means the bed, banks, and stream; if, as you say, the bank begins where the bed finishes and continues up to the surface? I ought to say that, although it is my strong impression that those who would show that the Victorian bank is vested in Victoria would have the labouring oar, my opinion is: that both by prescription and by natural law they have a public easement—that is to say, a right, over the water; whether it belongs to New South Wales or not, is immaterial. The left bank of the river is subject to a public servitude in favour of Victoria and her riparian proprietors, and they have an easement to obtain the water, and, I am afraid, to pollute it if they have a prescriptive right to do it; at all events, they have an easement of getting water. That is the conclusion I have come to, and in your endeavour to harmonise the two views I think that it is probably one that might be seriously considered. The easement is very nearly as good as the property. Those who have access have also a right to the water as an usufruct. It is quite a mistake to suppose it is only those who have property in land adjoining that have a right to the water. That has been settled many years ago. So that if that is in any direction a solution of the difficulty, as such I would submit it. It may be technically within the territory of New South Wales, yet Victoria is, to all intents and purposes, a quasi-riparian State with this easement—(an easement is a right to go over another man's land to exercise a right). There is also an easement of polluting water, which I have just mentioned.

Victoria has a public easement.

Easement nearly as good as property.

5549. *Mr. Murray.*] Respecting the difficulty you pointed out in strictly defining the limitation of the bed and banks between the greater difficulty here and the less difficulty in England, would that not be due to the fact that such things as droughts of months'—and sometimes of years'—duration are practically unknown in England? Those upon whom the duty is cast of interpreting this law will have, in my opinion, plenty of room to give effect to the different conditions that operate here as compared to those which we know exist in England, where we get our common law, because I maintain that the words "so far as applicable," which is the condition under which we accept the common law, and the condition under which we accept the statute law, give ample room and verge for judicial interpretation.

Judicial interpretation of law.

5550. You think the physical facts might be held to modify the application of the common law? Precisely.

Distinction between "stream" and "water."

5551. *Mr. Burchell.*] Referring to Angell's definition, was the distinction drawn between stream and water, so as to involve a modification;—would an alteration of Angell's definition alter the position? Most undoubtedly, for those who maintain that the very water itself—the particles of water—belong to New South Wales. Such a claim, I believe, has been made on the part of New South Wales. In Angell's definition, the use of the word "water" means actually what it says—the particles of water flowing down; and any diversion of that water would be an illegal diversion, because that definition says that watercourse includes water.

5552. Referring to the statute 18 and 19 Victoria, chap. 57, section 5, do you not think it was recognised that ownership of the whole river and both banks would be challenged when the words were used: "Provided also that it shall be competent for the Legislatures of the said two Colonies, by laws passed in concurrence

A. Oliver, M.A. 29 Sept., 1902.

concurrence with each other, to define in any different manner the boundary line of the said two Colonies along the course of the river Murray, and to alter the other provisions of section 4"? I think it is very likely indeed that this was an *interim arrangement, but they have not done the other thing.* Victoria and New South Wales have never attempted to pass legislation of the same kind, though they have the power. I should like to refer to one fact in fairness here. You know all about Pental Island. The dispute went on to the Privy Council—not in its judicial capacity exactly. Although it was not argued, I put a great deal of value on the award, for it is a very strong award if you come to consider it. Pental Island is separated by a narrow ana branch from the left-hand bank of the Murray. It was leased by the Victorian Government for years as a cattle station. Nevertheless, although separated by an ana branch from the Murray, the Privy Council awarded Pental Island to Victoria. Now, what is the conclusion to be drawn from that? They considered the boundary of Victoria to include—to jump over—an ana branch and take in Pental Island and annex it to the State of Victoria. If that had been argued in the ordinary way, so as to be capable of being quoted in Courts, that would be a very strong case, because it shows that, at all events, the Judicial Committee considered that Victoria had a riparian frontier.

Pental Island.

Privy Council decision.

5553. *President.*] [Question No. 2.] Prior to Federation, what was the scope of the riparian law, as between the Colonies; has Federation modified, and if so how, the tenor of this law as between States;—what tribunals are to be appealed to for the enforcement of inter-State riparian law? After all, the State is the Crown. When you come to consider the thing, we all hold under the Crown, so that it would be the Crown in one State against the Crown in another, and very peculiar results might follow from this. There is no doubt whatever that the Crown has never abandoned the property in its possessions. Although we call it the State, as a matter of law the Attorney-General of this State might be proceeding against the Attorney-General of another State. With regard to the riparian law, of course, the State has riparian laws just as its people have, but these would be territorial rather than incident to property, when you view it from the State point of view. The State law would not vary much from the laws laid down with regard to the claims of individuals to the use of the water; the only difference would be that a State would claim it as a territorial right, whereas the individual would claim it as an incident of property or right of access. But that the State would have riparian rights, I have no doubt whatever, and, I think, they would be largely governed by the private law. With regard to the second part of the question, as to whether Federation has modified the tenor of the riparian law as between the States, I say, undoubtedly, it has. I would begin with section 98. That invests Parliament with the power, among other things, of legislating for navigation; and I presume that that word has to have a liberal interpretation, including inland navigation. Therefore, as regards the Murray, the power there given would enable the Federal Parliament to legislate for navigation of the Murray; but what the scope of that legislation should be, in what interest, and for what purpose, would, of course, be another matter. Then comes section 100, which must be read in connection with section 98, because there is a limitation on the power conferred on the Federal Parliament in respect of trade and commerce. It says: "The Commonwealth shall not . . . abridge the right of a State or of the residents therein to the reasonable use of the waters of rivers for conservation or irrigation." That comes as a sort of break on the general power given to legislate for navigation. Now, that is not all. In sections 106 and 107 we have two very important savings. The first declares that our Constitution shall continue as at the establishment of the Commonwealth. Now, the clauses from the Acts of 1850 and 1855, which we have already commented upon, are part of our Constitution, so that 106th section would be in the nature of a declaration that that Constitution was to continue as at the establishment of the Commonwealth, until, of course, altered in accordance with the Constitution of the State. Section 107 reads: "Every power of the Parliament of a Colony which has become, or becomes a State, shall, unless it is by this Constitution exclusively vested in the Parliament of the Commonwealth or withdrawn from the Parliament of the State, continue as at the establishment of the Commonwealth, or as at the admission or establishment of the State, as the case may be." So that you have, first of all, to consider whether any exclusive power has been granted by the Constitution before you can see exactly what the scope of the Federal Legislature may be; but there is no doubt that that legislative power of the State is intended to be concurrent with the legislative powers of the Commonwealth with those limitations, unless it is a case for exclusive legislation, or unless the powers have been withdrawn. Now, the power has not been withdrawn, because the power given to the Commonwealth Parliament to legislate for navigation is not given as an exclusive power; it is not among those powers that are exclusive in their exercise. So that there you get another difficulty introduced, that of concurrent legislation, State and Federal—perhaps, on the same subject matter. Of course, when the two are in existence there is no doubt which is to prevail, provided the Federal Legislature has not exceeded its functions in legislating. I suppose, also, there are some powers that would be considered to be incidental to the granted powers. As to the third part of Question No. 2, we generally suppose and hope that it will be the High Court, or such State Court as will be invested with Federal jurisdiction. Say somebody in South Australia thinks there has been a diminution in the water supply that he claims a right to have in undiminished volume; suppose he went for an injunction in the Supreme Court at Adelaide, I am very much inclined to think he would be met straight away with a defence of "no jurisdiction." Section 75, subsection 4, of the Commonwealth Constitution Act, states that the High Court shall have Federal jurisdiction "between States, or between residents of different States, or between a State and a resident of another State."

State and individual riparian laws compared.

Effect of federation on riparian law between States.

Sections 100, 98, 106, 107.

Saving of State Constitutions.

Saving of State legislative powers.

Commonwealth power to legislate for navigation not exclusive.

Authority for enforcing inter-State riparian law.

5554. [Question No. 3.] Must not the 18 and 19 Vic., c. 54, section 5, for the purposes of understanding its true purport and meaning, be read with the 13 and 14 Vic. c. 59; and, being so read, does it not appear that section 5 of 18 and 19 Vic., c. 54, was passed to settle doubts as to the true meaning of descriptive words in 13 and 14 Vic. c. 59, and to get over any difficulties caused by want of a clear delimitation of the boundaries of New South Wales and Victoria, as to the imposition and collection of Customs duties, the punishment of offences, and the regulation of navigation? I have anticipated that.

5555. [Question No. 4.] One witness has stated that "Any scheme which so interfered with the natural flow of the river (Murray) as to render it less navigable than formerly would be unconstitutional since Federation was established";—(*a*) do you concur in this; (*b*) is this statement supported by analogy of riparian relations as declared and administered between European states; (*c*) do existing conventions or treaties between any European States regulate the right to divert water for irrigation purposes? (*a*) The words "less navigable" would, of course, be very difficult of interpretation. Suppose you take the Murray, and suppose works from the Victorian side and from the New South Wales side, at a very low river,

"Less navigable."

A. Oliver, M.A. 29 Sept., 1902.

river, prevented the steamers from going up to Swan Hill, and supposing those works were executed conjointly by both States under a State law, that would be one of the hardest things to prove that you could imagine in any Court. With regard to the tributaries, it would be utterly impossible to prove that the diversion of the Warrego—a tributary of the Darling—would be otherwise than an *injuria sine damno* of the diversion of such a stream as would affect the river by (say) the millionth part of a millimetre, the law will not take any notice. But suppose, by enormous works close to the province of South Australia, the water was so diverted as to stop the navigability of that stream, then that is another question, because there you could shoot home the non-navigability straight away. In that case, I should say that those works would be absolutely *ultra vires*. (*b*) I do not pretend to know very much about European States, with the exception of Great Britain, and here and there a little of the Continental. I know there have been treaties. That fact shows that there has been an absence of law. This has been a matter of convention, not of public law. It was not the interpretation of any law; but the people arranged matters by a treaty. (*c*) I am not aware of them.

Infinitesimal diversions.

Treaties imply absence of law.

Bed of navigable river vested in Crown.

5556. [Question No. 5.] Is the alveus or bed of a public navigable river *inter Regalia*, or in the Crown? Yes, certainly; it always being understood that the British law has one definition of a navigable river, and the American law another. I do not think there was any doubt about a navigable river; it was a river, in which the bed was vested in the Crown; it was a river subject to the influx and flux of the tide. But that is not the American law as enunciated in the larger States, although it is in regard to some of the States, as they adhere to the English law. In America, actual navigability obtains, as a rule, I think, and not navigability by law; navigability, in fact, as distinguished from navigability in law.

Navigability in fact the American test.

5557. [Question No. 6] One witness has stated that South Australia's claim to a share in the waters of the Murray extends to all the tributaries of that river;—(*a*) has such a claim any legal or constitutional basis; (*b*) can the tributaries be diverted so as to interfere with the navigability of the main stream? I would like to know what you mean by the words "claim to a share"?

5558. *President.*] They claim that they have enjoyed certain rights in respect to navigation from the time their State was started; they say that those rights should not be taken from them; they claim, furthermore, that they have rights in respect to the lakes at the mouth of the Murray, and that those rights should not be nullified by any action taken by a State further up the river; they, furthermore, claim that they have rights in common with the other States to use the water for irrigation purposes?

U.S. *v.* Rio Grande Co.

I think they are applying the decision of the Federal Court in the case of the United States *v.* Rio Grande Dam and Irrigation Company, 174 U.S. Report, 690: "It was admitted that every State has the power, within the Dominion, to alter the common law rule as to the appropriation of flowing waters, and to permit their appropriation, for such purposes as the State deems desirable. Also that (by Acts cited) Congress had recognised and assented to such appropriation; but it was not to be inferred that Congress thereby meant to confer on any State the right to appropriate all the waters of the tributary streams which unite into a navigable watercourse, and so destroy the navigability of that watercourse, in derogation of the interests of the people of the United States." How far you can apply that to this particular claim is not too easy. Supposing that the case is a valuable authority, I should gather from it that each State was perfectly well entitled to erect works for irrigation or anything else from the tributaries, but that they were not entitled to divert the whole of the water out of the watercourse so as to render the stream where it was navigable less navigable—a stream which was navigable heretofore unnavigable hereafter. As regards the words "share in the waters," supposing the claim to extend to a share in the water up to its extremest source, I think the case of Kensit *v.* Great Eastern Railway (27 c.h D. C.A., 122, 1884) has some bearing: "Owner of land not abutting on a river, with the license of a riparian owner, took water from the river, and after using it for cooling certain apparatus returned it to the river unpolluted and undiminished, and it was held that a lower riparian owner could not obtain an injunction against the landowner so taking the water, or against the riparian owner through whose land it was taken. *Lindley*, L.J., said that an argument had been put that a man who was not a riparian proprietor had no right to take water from a stream at all, and that if a riparian proprietor found any one who was not a riparian proprietor taking water from the stream, although he was not damnified, he might maintain an action. This, he said, would lead to the absurd consequence that if there were a riparian proprietor near the mouth of the Mississippi, and somebody 1,000 miles up diverted the water, an action might be maintained, although there was no damage." You see the connecting link there. That means you have got to prove damage that the law can get hold of, not mere *injuria*. "Finally the Court declined to agree to the proposition that riparian proprietors in a stream were a class of persons in the nature of a close borough, and that any one of them had a right to object to the introduction into that class of persons who had got no property bordering on a stream." In that case a man, some distance away, who gets a license from a riparian proprietor, is entitled to the water, thus getting rid of the idea that it is only the frontager who has right. Unless the words have some other meaning than that, I should not be inclined to think that South Australia could claim a share in the waters of the Murray away up in the tributaries. I could not accede to that proposition. At the same time, if it could be proved that a navigable channel had been made non-navigable by certain diversions, that is another thing. 'I think the mere fact that the volume of the Murray is considerably benefited by Victorian streams ought to be considered in this matter. All the water in the Murray does not come from New South Wales. On the Upper Murray, the Mitta Mitta, Goulburn, &c., are affluents of value to the Murray.

State not entitled to make navigable streams unnavigable.

Kensit *v.* Great Eastern Railway Co.

Legal proof of damage necessary.

S.A. claim to waters of tributaries.

5559. *Mr. Burchell.*] Can a person who is a riparian owner sue a person in another State, who is not a riparian resident, who diverts water from the river, even under the authority of a State Act. to the injury of a riparian resident? If there is injury with real damnification, if there is perceptible injury, such as you could get damages for, or an injunction, I should be very much inclined to think that he could. His remedy would be before the High Court.

Perceptible injury ground for action.

5560. *President*] [Question No. 7.] (*a*) Was the difficulty prior to Federation of the application of the principles of riparian rights between colonies, or the citizens of different colonies, that there was no tribunal having jurisdiction to determine or enforce such riparian rights or equities; (*b*) is the law as to riparian rights to the use of flowing water authoritatively laid down in the case of Miner *v.* Gilmour XII, Moore, P.C. 131, in which it is declared:—"Every riparian proprietor has a right to the reasonable use of the water flowing past his land, namely, for his domestic purpose and for his cattle, and this without regard to the effect such use may have, in case of a deficiency, upon proprietors lower down the stream, he has also the right to use the water for any other purpose, provided he does not thereby interfere with the rights of the proprietor either above or below him. Subject to this condition, a riparian proprietor may

A. Oliver, M.A. 29 Sept., 1902.

may dam up the stream for the purpose of a mill, or divert 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 waters of the other proprietors, and inflicts upon them a sensible injury. (*c*) Does this decision bind the Australian States in their inter-state relations? (*a*) Yes, a very great difficulty undoubtedly. (*b*) Yes, that is a leading case, and although a good deal of the judgment in that case has been developed, yet still it remains standard authority. (*c*) It would, if those States are relatively to one another in the position of similar riparian proprietors. You would have to bring them to the same level before that judgment would be absolutely applicable, and then the question would arise, "Is that applicable to our circumstances"? This judgment is common law, and that common law would not be taken here by the High Court as a matter of course. They would ask, "How far is it applicable to our circumstances?" The tendency would be to prove that the two States were exactly in the same position as the riparian proprietors in the case of Miner *v.* Gilmour, and then the tendency of Australian Courts would perhaps be to follow English decisions.

No jurisdiction prior to Federation.

Miner *v.* Gilmour.

Riparian relations of States.

Applicability of Common law.

5561. [Question No. 8.] (*a*) Before Federation, what was the right of the Colony as to the waters of a river wholly within its own territory, but forming a tributary direct or indirect of the Murray? (*b*) Were the rights of New South Wales the same as to control and use of the waters of the Murrumbidgee, which is a tributary of the Murray and, say, to the Hawkesbury, which flows into the Pacific Ocean, near Sydney? (*c*) Have such rights in either, or both cases, been affected by the passing of the Commonwealth Constitution Act; and, if so, to what extent, and in what way? (*a*) I should think the right of Victoria with regard to the waters of the Goulburn would be practically absolute. I am applying now what I read in the Kensit case. So far as English law would determine this matter, I should say the proprietary right of the State of Victoria to the waters of the Goulburn was absolute; and if anybody took exception to the way in which that right was exercised, he would have to prove an actual, perceptible damage to some other State. (*b*) Well, those rivers are wholly within our territory. The Murrumbidgee is a very different stream from the Murray. The Murrumbidgee pours much more water into the Murray to the benefit of South Australia than does the Goulburn as between Victoria and New South Wales. Many people think the Murrumbidgee is as big as the Murray.

Right of State to waters of river within its own territory.

5562. *President.*] But the same principle would apply? I presume it would. Of course, I wish it to be understood that the injury, the subject of the claim, would have to be a perceptible, and not an imaginary, injury; it must be one running, so to speak, in damages. There is a difficulty in these things. The law makes a distinction between *injuria sine damno* and *injuria cum damno*. You would have to prove actual damage, not imaginary damage. I think the difficulty would pivot on that. No person in his senses would go to the High Court with an imaginary grievance, and say, "Some water has been taken which belongs to me as a riparian right; I cannot say the Murray has gone down one inch in consequence; I am only suing for an injury."

Actual damage must be proved.

5563. *Mr. Burchell.*] Once the river is affected by diversion or utilisation of a tributary, so that the level of the stream below is altered to the injury of the lower riparian proprietor, they would have a remedy? I think they would before the High Court. It seems to me that by necessary inference you have to give reasonable meaning to the words "reasonable use." You would have to prove unreasonable use; and besides unreasonable use, there must be damage.

5564. *Mr. Murray.*] I want to clear up one point which appears in need of elucidation; you spoke of it being necessary to prove *injuria cum damno*;—I am under the impression that it is not necessary for the Crown to prove *a damnum* in order to sustain an action? You are quite right.

Not necessary for Crown to prove a "damnum."

5565. In this case the Crown, from what you have said, would be the party in the case for both Colonies;—would that in any way affect the matter? It would be a very difficult thing—the Crown by its domiciliary representative in one State proceeding against its domiciliary representative in another State. This shows the necessity of dealing with the matter by a convention or commission.

Necessity of a commission.

(*c*) Anticipated.

5566. *President.*] [Question No. 9.] Assuming the Government of Victoria to have entered into obligations with regard to the supply of water from the Murray and its tributaries, should any agreement between the three States especially interested in the Murray regard these obligations as validly entered into, and deal only with such of the waters as remain unappropriated after they have been satisfied;—will you state your opinion separately as to the main river and as to the tributaries? Assuming those obligations were entered into before Federation, to begin with, it would seem premature before their operations had disclosed something in the way of damage, some real injury to riparian States or riparian proprietors, to say that they should not be recognised; in other words, the mere entering into an obligation is not of itself sufficient; one would have to wait for its result. There are obligations now entered into, not only in existence but in operation. After the establishment of the Commonwealth, and with such side-lights as we have from the Commonwealth Act, ought they to be considered as having been validly entered into? It is a case of "What is to become of the cake after you have had a bite out of it"? I suppose the difficulty is to go back to the original condition of things, and as Victoria has entered into obligation, presumably that could be enforceable against her, the question is: How could this trouble be equitably arranged, so that other States should not be in any way injured, because Victoria has been, so to speak, a little premature? I still think that the right of Victoria to the waters of the Goulburn would be absolute. Well, now, it is said that the Murray itself from a long way up to a long way down is mainly the result of Victorian waters. One would think that Victoria, in taking these waters, considered that, seeing that it was her territory that contributed so large a volume to the Murray, she was entitled to take its equivalent out of the Murray. Anyway, she has done that. The difficulty confronts you that you cannot put the State back into the original condition before she entered into these obligations. This rather comes into the engineering part of the business, I think. Like the case of devisees under a will who have had advances made to them, I think that fact ought to be put in abatement against their share. If it can be shown that she has taken more than she has a right to take—because there is no doubt if she is in any sense a riparian proprietor, the territory of Victoria has a right to a share of the water, both a prescriptive right and by virtue of the fact that she herself is a large contributor—if she has taken more than her right to take, I am assuming that she had a right to take a certain quantity, say, x, if she has taken $2x$, she ought to account for that excess. Surely she has had a right to take some water. If in the exercise of that right it is shown that she has taken more water than she had a fair right to take, I think she ought to be debited

Existing Victorian obligations.

Right of Victoria to waters of Goulburn.

How excess of diversion to be treated.

A. Oliver, M.A. 29 Sept., 1902.

debited with the difference in any division that you may make hereafter. I wish to repeat it again that, although under strict interpretation the watercourse is in New South Wales, the public easement which Victoria enjoys as a riparian State entitles her to take water as if she owned the bank.

5567. *Mr. Murray.*] How is it to be debited? I understand there is to be a subsequent division of water. You see this is a continuous operation. If that continuous operation does not take more water from the river than she is entitled to, then she should not be asked to account for it.

5568. Where, as in this case, one State has diverted a portion of the water to which she might be held to be entitled as a riparian State, I understand your evidence to be that she would not be debitable for that; but where she has exceeded that right, then she should be debited on the same principle as legatees? If she goes on taking it.

Adjustment of diversion.

5569. How is the debit to be made? Assuming you are entitled to x value of water; assuming you have taken twice x, and that you are still taking twice x, you must go back to x. The diversion would have to cease or some abatement be made for it. I am in the difficulty of not knowing how you propose to divide the waters between the various States. Shortly, put it this way: if Victoria has taken more than she had a right to take in some way or other, that excess ought to be made good.

Excess made good.

5570. The Commission says that we are "to make a diligent and full inquiry concerning the conservation and distribution of the waters of the river Murray and its tributaries for the purposes of irrigation, navigation, and water supply, and to report as to the just allotment of the waters of the Murray Basin to the use of each of the States of New South Wales, Victoria, and South Australia, and upon the best methods—joint or otherwise—for their conservation and distribution for the purposes aforesaid, and . . . . . to make the fullest investigation in regard to any other matters concerning the utilisation of the waters of the said river and its tributaries. . . . "? Supposing 100 feet for New South Wales and 100 feet for Victoria, and supposing you are taking 20 feet, I say that that should be taken from the 100 feet. I quite see that this is a very great difficulty. If they have taken more than those contributing streams represent, then I think they have taken in excess.

What constitutes excess.

5571. Assuming the obligations to have been entered into before Federation, the right as to tributaries within the State would be absolute;—as to diversions from the main stream, the principle to be applied would be the same as that in the case of legatees? If they have taken in excess of their rights.

5572. Suppose there are 100 units to be divided between New South Wales and Victoria, and Victoria has taken, say, 25, she would be entitled to 25 and New South Wales to 50;—supposing Victorian diversions now amount to 60 of the 50 units to which she would be entitled, what would follow? I would like to know how you get at the basis of title—the principle you work on, that Victoria is entitled to so much and New South Wales to so much. The answer to the question would be whether you have taken too much or too little.

5573. Would you not have regard to the riparian rights of the States below? Then there are the words "reasonable use."

Basis of allotment.

5574. That would come in to modify what you have said? Yes; since Federation. I do not think to get at the basis of one State's riparian rights as against another, you should either go per acre or per *capita* of the inhabitants. It would be a fairer way of getting over the difficulty by saying, "How much have we contributed, and how much have we taken"?

5575. Where the diversion is so great as to trench upon what might be considered the right of another State, the amount contributed by the diverting State would have to be considered? Yes.

5576. *Mr. Burchell.*] Supposing the whole of the waters were to be divided in the way of a just allotment between New South Wales and Victoria, half to one State and half to the other; supposing Victoria had already taken half of the water, do you think that that should be disregarded, and the other half divided between the two States, so that Victoria would get three quarters of the water and New South Wales one quarter? If that was the result of the operation of the division, I should think it would not be a just one. I do not myself see why it should work out that way.

5577. If Victoria has already taken half, do you think that that should be considered her share? What she has taken and what she is taking are different things. What she is taking is, of course, decreasing the volume of the stream. What she has taken is, probably, a matter of *no moment*. I do not think the sins of past Victorians should be visited upon their children; but if this is a continuous operation, and she goes on taking it, then that should be considered. If she has never taken more than what she has given, I I do not think she has taken too much, or has been given too much.

Federal legislation re distribution of Murray waters.

5578. *President.*] [Question No. 10.] If the three States represented on this Commission desired to enter into an agreement with regard to the utilisation of the waters of the Murray and its tributaries for the purposes of water conservation and irrigation, what would be the best method of making that agreement effective—would it be competent for the Federal Parliament, at the request of three States, to legalise such an agreement, or should the agreement be given effect by the passing of identical statutes in the State legislatures? As regards the latter part, certainly not. A Federal statute is, undoubtedly, the best method.

5579. Would you consider it necessary in order to get the Federal statute enacted that the States should by an enactment call upon the Federal Parliament to pass such an enactment? That is exactly what they can do. The States can approach the Federal Parliament, submitting a form of legislation, and ask them to legislate accordingly.

5580. *Mr. Murray.*] I see Mr. Glynn says that it would be competent for the Federal Parliament to legalise an agreement so far as affects the agreeing States only;—that would be binding only in so far as it affects the agreeing States? Quite so.

Maintenance of navigability.

5581. *President.*] [Question No. 11.] Should any such agreement or compact be subject to the maintenance and improvement for the purpose of inter-state commerce, of the navigability of rivers under Federal jurisdiction? I should imagine that that would be made a condition in the passing of such a measure, in other words, that the Federal Parliament would now have regard to a duty that is imposed upon it.

5582. [Question No. 12.] The power of legislation on the subject of navigation being now vested in the Commonwealth Parliament—(*a*) seeing that *inland* navigation is closely connected with water conservation and irrigation, do you think the control of all these matters should be under one centralised authority; (*b*) could the Commonwealth Parliament, at the request of the States, pass a statute governing not only *inland* navigation but also water conservation and irrigation; (*c*) if so, is it necessary or desirable

A. Oliver, M.A. 29 Sept., 1902.

desirable that such a measure should be of general application, and extend to the whole Commonwealth; (*d*) do you consider the riparian law of England suitable to the physical conditions of Australia, or do you think the principle laid down in the New South Wales Water Rights Act, 60 Vic. No. 20 (now Consolidated Statute No. 51 of 1902), which declares the rights of the Crown to the use and flow and to the control of the waters in rivers and lakes, should be extended throughout the Commonwealth; (*e*) do you think it desirable that the matters of water conservation and irrigation, together with inland navigation, should be controlled by a Department of the Commonwealth Government administering such a statute as referred to in subsection (*b*) of this question? (*a*) The Interstate Commission, I presume, would have nothing to do with this. I think this indicates the necessity for a special commission—an administrative body. (*b*) Yes—always with this vinculum, that there is still concurrent power vested in the States.

Central administrative body.

5583. With regard to (*c*), that is a matter of policy? Yes. I might say, in reply to (*d*), that that is a question that really deserves a good deal more attention than I have given to it; but, speaking as a matter of first impression, I should be inclined to think that a general extension of the Water Rights Act, with some modifications and a little enlargement, would meet the case. I think it would be far more likely to meet the popular concurrence, if, as I think is done in the Water Rights Act, the rights of riparian proprietors are preserved to a limited extent. That Act takes over—vests, so to speak, in the Crown—the right to the use and flow and control of the water. In all rivers and lakes, you will observe that the Crown is not given the water; it is given the right to the use and the control and the flow of the water. Then there is the restriction as to the reasonable use, subject to certain rights. I believe the general principles of that statute, with modifications, could be very usefully applied. As to the first part of the question—no; I do not think it is. I do not think you can rely upon a body of law which is notoriously inapplicable because of the incongruous physical conditions.

N.S.W. Water Rights Act.

5584. With regard to (*e*), that is a matter of policy again? Yes.

William Portus Cullen, LL.D., *Member of the Legislative Council of New South Wales*, Sydney, sworn and examined:—

5585. *President.*] What is your name? William Portus Cullen.

5586. You have been supplied with certain questions that the Commission desire to be supplied with answers to? Yes.

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

5587. Are you prepared to go into them? Yes.

5588. [Question No. 1.] Did section 5 of the Constitution Statute (18 and 19 Victoria, c. 54), which enacts that "the whole watercourse of the said river Murray, from its source therein described to the eastern boundary of the State of South Australia is, and shall be, within the territory of New South Wales," thereby make New South Wales the legal possessor of the waters passing along the bed of that river; if not (*a*), what was the right conveyed by that enactment; (*b*) How has that right been affected, if at all, by the passing of the Commonwealth Constitution Act? Section 5 of the Act 18 and 19 Victoria, chap. 54, is explanatory of section 1 of the Act 13 and 14 Victoria, chap. 59, whereby the Colony of Victoria was separated from the then Colony of New South Wales, with the Murray River as part of its boundary. According to legal principle, all land in this country was then owned either by the Crown or by some individual or corporation. The Act in question did not alter this; Crown property before the Act remained Crown property after it; private property before the Act remained private property after it. (*a*) The Acts in question, by leaving the watercourse of the Murray within the territory of New South Wales preserved to the Legislature of New South Wales, and excluded from the Legislature of Victoria, the right of legislation in respect of the watercourse of the Murray, except in so far as section 5 of the later Act gave express powers to the Legislature of Victoria. In the same way, and to the same extent, it preserved the powers of the Executive and Judiciary of New South Wales, and excluded the powers of the Executive and Judiciary of Victoria. This applies both to the channel of the stream and the water upon it; its physical situation within the boundary of New South Wales determined (subject to the reservations in section 5) the question of the exercise of all powers of Government. The word "watercourse" must be interpreted according to the context (*vide* Egremont *v.* Williams, 11 QB, 688; Taylor *v.* Corporation of St. Helens, 6 ch., D. 264). (*b*) The rights so preserved to the Legislature and Government of New South Wales, and further extended by the Schedule to Act 18 and 19 Victoria, chap. 54, have been affected by the passing of the Commonwealth Constitution Act only to the extent to which any enactment by the New South Wales Legislature conflicts with some enactment by the Federal Parliament passed under a power expressly conferred by the Commonwealth Constitution Act (*see* sections 107 and 109 of that Act). Such federal legislation might affect the subject-matter of this question by the exercise (*inter alia*) of the powers in section 51—subsection 6 as to naval and military defence; subsection 24 as to the service and execution of the civil and criminal process; subsection 31 as to the acquisition of property; subsection 37 as to matters referred to the Parliament of the Commonwealth by the Parliament or Parliaments of the States; and subsection 39 as to matters incidental to the execution of any power vested by the Constitution in the Parliament, &c.; also sections 98 and 100. I might point out that I have answered this question in regard to all the possible persons or authorities that can be affected by the question. I have not treated New South Wales as having an entity separate from the actual territory of New South Wales. New South Wales as used in this question can only mean the Legislature, the Executive Government, or some individual or corporation of New South Wales.

Section 5 of Act 18 and 19 Vic. explanatory of sec. 1, Act 13 and 14 Vic.

Effect of Act upon property and legislative powers.

Interpretation of "watercourse."

Effect of Commonwealth Constitution Act.

5589. Would you give us your opinion as to the meaning of the word "watercourse," used in the 5th section? So far as my opinion goes, it refers both to the channel of the stream and to the water upon it.

Meaning of words "watercourse" and "channel."

5590. What would you define the channel to be? The actual tract which carries the waters of the Murray; it would include the bank, but not the shore, on the Victorian side. It seems to me, when the river was made the boundary, the New South Wales territory extended as far as the water extended—to the Victorian territory.

5591. You know that the width of the Murray is very variable, sometimes it is wide and sometimes it is comparatively narrow; there does not seem to be any doubt as to the bed, but there seems to be some little difficulty as to what the bank means;—now how do you define between the bank, the shore, and the bed? I take it that that question would have to be decided according to the particular locality about which

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

which the question would arise. In the case of many rivers there is the ordinary bank, beyond which the water does not extend; sometimes there is a further bank beyond that, to which the water in flood-time might extend. What I understand by the bank is that part of the land which keeps the water in its place, certainly at all normal levels of the river. I should say it could be decided in this way: If the river overflowed its banks in time of flood, then the boundary of the two States is not altered. The normal level of the river would indicate what the banks of the river are.

"Banks."

"Shore."

5592. In what sense do you use the word "shore"? The land back from the channel, what I would call the "level land," such land as a person might use for the purpose of erecting a wharf or building a custom-house. I do not think the New South Wales Legislature had any jurisdiction over land in that position, unless access for the purpose of preventing damage to the bank.

5593. Are you quite clear that the term "watercourse" carries with it the water in the stream as distinct from the stream itself? You will see that I do not regard these Acts as altering the rights of property at all. In my opinion, the Legislature, in fixing this watercourse as the boundary, and declaring it to be in the territory of New South Wales, placed the water in that watercourse within New South Wales territory. Water that would escape or spread over the land in flood-time, I should think, would be in Victorian territory.

Rights conveyed by placing Murray in N.S.W. territory. Proprietorship not affected.

5594. In placing the water in New South Wales territory, what rights were conveyed to New South Wales in respect to that water? It conveyed the sole right of legislating, excepting so far as section 5, and, of course, there would be the power in the judiciary to execute justice, and the power of the Executive to see that the law was obeyed. I do not think the proprietorship of the water was in any way affected by the Act. The original Act separated Victoria from New South Wales; what was originally a part of New South Wales now became part of Victoria. The explanatory Act made it read that the boundary of Victoria was that watercourse; but as far as property is concerned, it did not alter it at all. Any property a Victorian owned he still owned, and any property a New South Wales man owned he still owned.

5595. What rights had Victoria in respect to the waters of the Murray, which, as you say, were vested for certain purposes in the State of New South Wales? I think you will have seen that I think it misleading to speak of New South Wales and Victoria as if they possessed some entity other than the territory; there is the territory of New South Wales subject to the New South Wales Legislature, and the territory of Victoria subject to the Victorian Legislature. In order to see how legal rights were altered by that enactment, I ask: How did it alter the powers of the New South Wales Legislature, or the New South Wales Executive, or the New South Wales Judiciary, or private persons in New South Wales? That is the only way in which I can see any legal meaning to be attached to those questions. The point of my answer is that I do not think the legal meaning can be given unless you break it up into these different points.

New South Wales and Victorian rights over the Murray waters.

5596. Had New South Wales a prior right, owing to the enactment of 18 and 19 Victoria, chap. 54, over Victoria in respect to the waters of the Murray? I say as regards legislating, yes. The New South Wales Legislature had the exclusive right, subject to the reservations in clause 5, which conferred certain powers on the Legislature of Victoria. I do not know any other position of pre-eminence that either the Government or private individuals obtained over those in Victoria by virtue of that statute. In my opinion it simply located the subject-matter in the State of New South Wales, and by virtue of so locating it, it gave the sole legislative power to the Legislature of New South Wales.

Act 18 and 19 Vic., c. 54, affected powers of legislation.

5597. In your opinion the enactment, referred to in Question No. 1, does not in any way refer to the rights in respect to the water? Not to riparian rights in any way at least, but by placing the watercourse in New South Wales, it enabled the New South Wales Legislature to alter those rights if it thought fit. In my opinion, the New South Wales Legislature could have altered the law in regard to the waters of the Murray just in the same way as the laws affecting any other part of New South Wales territory. But it is not a question of property. Any property was held either by the Crown or individuals, and it remained in the same way. But legislative authority, and everything that accompanies it, was altered by locating the river on one side and not on the other.

Rights of private ownership not affected.

5598. *Mr. Murray.*] Did not the first Act, 13 and 14 Victoria, constituting the State of Victoria, give to the State of Victoria, or to the owners of land within Victoria, or leave the owners of land in the State of Victoria, riparian rights? Yes; in my opinion it did not alter the rights of ownership; it did not give—it left them.

5599. Were those rights taken away by the 18 and 19 Victoria? No; 18 and 19 Victoria defined in a way which was found necessary the actual location of the boundary between the two States without in any way altering the rights of owners.

5600. Then, by so doing, it did not give to New South Wales the power to veto the rights of owners of land in Victoria? Yes; I think that any legislation passed by New South Wales, and assented to by the Crown, relating to anything in New South Wales, bound the Victorian people as much as New South Wales people, and the Victorian riparian owner had no more right to complain if such an Act were passed than a New South Wales owner who would be injured in a similar way.

Exclusive power of legislation.

5601. That left to New South Wales the exclusive power to legislate? Exclusive so far as Australia is concerned, except those things which are specially reserved in section 5. That, you will see, is also an extension of the power of the Legislature of Victoria, provided the New South Wales Legislature concurred.

5602. There seems a very serious conflict of opinion upon this point—that the Act 18 and 19 Vic. c. 54 expressly took away a right pre-existing? That is a proprietary right?

5603. A right of casement pertaining to property? I do not see that it did, in my opinion.

5604. Does not your answer involve that? The Act simply located the boundary; then the original 13 and 14 Vic. defined the powers of the Legislature of Victoria over its own territory. The 18 and 19 Vic. c. 54 was the latest definition of the power of the New South Wales Legislature. Now "the said Colony," as used in section 1 of the schedule, is defined in the covering section 5—that is to say, as regards the boundary where they had had a dispute. Once you define the boundary, then this Legislature has power to make laws for the peace, order, good government, &c.

5605. But the legislation pre-existed? There was legislation in New South Wales from the reign of George IV.

New South Wales power to alter pre-existing riparian rights.

5606. And in Victoria from 1851? Yes, under the Act—with which this section 5 has to be read as part.

5607. I understand your answer to be that the Act 18 and 19 Vic. did not alter the pre-existing riparian rights, but left to New South Wales the power to alter them by statute? Yes—that is my opinion.

5608.

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

5608. *President.*] [Question No. 2.] Prior to federation, what was the scope of the riparian law, as between the Colonies; has federation modified, and, if so, how, the tenor of this law as between States;—what tribunals are to be appealed to for the enforcement of interstate riparian law? The words "as between the Colonies," in this question, can only mean (1) as between individual residents of Colonies, or (2) as between the Executive Governments of the Colonies, or (3) as between the Legislatures of the Colonies. As regards (1), the ordinary riparian rights existed before the separation of the Colonies, and remained unaltered after the separation except in so far as they may have been subsequently modified by a competent Legislature. The lawfulness or unlawfulness of any act done by a riparian owner on the Victorian side had to be tested by Victorian riparian law, unless in doing it he trespassed on New South Wales territory as defined by the Act 18 and 19 Vic. c. 54. The converse applied to a New South Wales riparian owner. If either did an unlawful act, as so tested, he could, in my opinion, have been sued in the courts of the Colony where he resided, whether the person injured resided in that Colony or the other. As regards (2), I think that the Executive Government of a Colony, if it broke the law, as so tested, would have been equally amenable, provided there was (as in New South Wales) a law making the Government liable to be sued for torts. As regards (3), I think the powers of the Legislatures of Victoria and New South Wales differed by reason of the location of the watercourse in New South Wales, and not in Victoria. The former could diminish the rights of its own residents, or alter them *inter se*. But it could not, in my opinion, validly increase those rights by authorising any extraordinary use of the waters of the Murray which were outside its territory; and I do not think its right over the southern bank extended to the authorisation of any acts which would damage the watercourse itself. The Legislature of New South Wales, on the other hand, could, in my opinion, if it had thought fit, validly have authorised an extraordinary use of the waters of the Murray, and the Victorian residents would have had no remedy for any injury thereby done, any more than the New South Wales residents would have had. I do not think Federation has modified this, except to the extent mentioned in my previous answer. The creation of a new legal tribunal does not of itself create law. The Federal Court can only apply law existing before the Federation, or created by the Constitution Act itself, or coming into existence afterwards, *e.g.*, by some valid State or Federal legislation subsequently enacted, or some new Imperial Act binding the territory. I am not satisfied that, either before or after Federation, the United States decisions on the question of legislation affecting outside interests apply to this case. Even there, the case of United States *v.* Rio Grande Company, 174 U.S.A., 709, shows that the question had finally to be settled by an Act of Congress, which would have been outside the powers of our Federal Parliament. But, in any case, the relative positions of the Federal and State Legislatures in the two countries are so fundamentally different that many considerations applied by the American Courts would have no application here. Moreover, in all British possessions the Royal assent required before any enactment can become law, and the power of disallowance, afford a safeguard for outside interests, which, under a different system of Government, must be sought in a different quarter. And by the instructions issued to Governors, Bills whereby the rights and property of subjects of the Crown, not residing in the possession, may be prejudiced are required to be specially reserved, not because such enactments, if assented to, would be invalid if otherwise within the powers of the Legislature, but as a safeguard to outside interests. See also Powell *v.* Apollo Candle Co., 10 Ap. Ca., 282:—"A Colonial Legislature is not a delegate of the Imperial Legislature. It is restricted in the area of its powers, but within that area it is unrestricted." I think I can best answer the last part of the question by saying that wrongs done by any resident of one State, or by its Executive Government, whereby injury is caused to a resident in another State, or its Executive Government, now come within the original jurisdiction of the High Court, or any State Court invested with Federal jurisdiction. (Sections 75, 76, 77.)

Scope of riparian law prior to Federation.

Liability of an Executive Government.

Legislative powers of New South Wales and Victoria.

How modified by Federation.

Creation of a tribunal does not create law.

American decisions. U.S. *v.* Rio Grande Co.

Powell *v.* Apollo Candle Co.

Powers of Federal High Court.

5609. Mr. Glynn speaks of the powers of the Federal High Court as being limited to certain subjects? Section 75 of the Commonwealth Act says: "In all matters (1) arising under any treaty; (2) affecting consuls, or other representatives of other countries; (3) in which the Commonwealth, or a person suing or being sued on behalf of the Commonwealth, is a party; (4) between States, or between residents of different States, or between a State and a resident of another State; (5) in which a writ of mandamus or prohibition or an injunction is sought against an officer of the Commonwealth;—the High Court shall have original jurisdiction." I might point out that this seems to be the first instance in which the State was regarded as an entity; but if one examines these sections closely, one would see that, if there was a prosecution, it would be because either the Crown or individual rights were injured.

Object of sec. 5, Act 18 and 19 Vic., c. 54.

5610. [Question No. 3.] Must not the 18 and 19 Vic., c. 54, section 5, for the purpose of understanding its true purport and meaning, be read with the 13 and 14 Vic. c. 59, and, being so read, does it not appear that section 5 of 18 and 19 Victoria, c. 54, was passed to settle doubts as to the true meaning of descriptive words in 13 and 14 Vic., 59, and to get over difficulties caused by want of a clear delimitation of the boundaries of New South Wales and Victoria as to the imposition and collection of Customs duties, the punishment of offences, and the regulation of navigation? The two enactments must be read together. The difficulties the latter was passed to get over seem to me to have extended to every possible conflict of Legislative, Executive, or Judicial authority. The specific instances mentioned in the section are merely those as to which the Imperial Legislature thought it expedient to confer concurrent authority on the two Legislatures and on the proper officers of Customs of the two States.

5611. [Question No. 4.] One witness has stated that "any schemes which so interfered with the natural flow of the river (Murray) as to render it less navigable than formerly would be unconstitutional since Federation was established"; (*a*) do you concur in this; (*b*) is this statement supported by analogy of riparian relations as declared and administered between European States; (*c*) do existing conventions or treaties between any European States regulate the right to divert water for irrigation purposes? (*a*) 1. An act or intended act by an individual, or by an Executive Government, may be "unlawful," as being in breach of some law binding on him or it. 2. An enactment by any Australian Legislature may be "unconstitutional" as transcending the powers allowed to it by the Imperial Acts (including the Commonwealth Act) under which it legislates. As to (1), the establishment of Federation does not, in my opinion, affect the lawfulness of an act diminishing the navigability of the Murray, unless such act transgresses some valid enactment by the Federal Parliament on the subject of navigation. As to (2), the establishment of Federation does not affect the constitutionality of any State enactment bringing about a diminution in the navigability of the Murray, unless, and to the extent to which, such enactment conflicts with some enactment by the Federal Legislature on the subject of navigation. (*b*) I do not think

Unconstitutional diversions.

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

think any such analogy can help, except as indicating an amicable mode of settling differences by express agreement between States. There is no real analogy between agreements made by treaty and the comparative powers of the different Legislatures in this country. They are very useful, of course, as a guide in coming to an agreement, but otherwise I do not see that the analogy helps at all. (*c*) There are instances of this, but the differences in circumstances considerably diminishes their value even as a guide in coming to a voluntary agreement.

Bed of navigable river in Crown.

5612. [Question No. 5.] Is the alveus or bed of a public navigable river *inter Regalia*, or in the Crown? This seems to be so, unless the Crown has granted it, or part of it, away; but I do not see how this affects the question, inasmuch as the Crown can be bound by competent legislative authority, just as much as an individual can, and in this country the Crown (as represented by the Executive Governments) can be made just as answerable for breaches of the existing law as an individual can.

South Australian claim to waters of tributaries.

5613. [Question No. 6.] One witness has stated that South Australia's claim to a share in the waters of the Murray extends to all the tributaries of that river;—(*a*) has such a claim any legal or constitutional basis; (*b*) can the tributaries be diverted so as to interfere with the navigability of the main stream? (*a*) The only legal claim which, as far as I can see, could be asserted by anyone in South Australia in regard to the tributaries of the Murray in New South Wales or Victoria would be a claim by a resident of South Australia or its Government—(1) that riparian rights in South Australia have been unlawfully interfered with by some act done to those tributaries, or (2) that a valid Commonwealth statute dealing with navigation has been broken, causing damage to navigation in the South Australian part of the Murray. But no act done to the tributaries of the Murray, either in New South Wales or Victorian territory, under the authority of an enactment by the local State Legislature, would in my opinion be unlawful, however much it damaged riparian rights or navigation in South Australia, unless such enactment conflicted with some valid Federal statute respecting navigation. I do not see how there can be a "constitutional" as distinct from a "legal" basis for the claim mentioned. (*b*) Yes; by an enactment of the State Legislature dealing with waters within its territory and not conflicting with such a Federal statute as abovementioned.

Riparian rights of South Australia.

5614. What would you say, then, the riparian rights of South Australia were? The ordinary riparian rights, as laid down in English law, unless varied by some Legislature having power to do it. For instance, the South Australian Legislature could vary them as regards the water in South Australian territory. The Victorian Legislature could alter them as regards the tributaries within her territory, and the New South Wales Legislature with regard to the Murray or tributaries in New South Wales; but, until altered by a competent Legislature, the rights were as laid down in the English cases.

5615. They would be analogous to those of the individual? I am only speaking of the individual. In these States there is only the property of an individual or corporation, and property that has never left the Crown, or that has been resumed and held in trust for the Crown.

S.A. lakes.

5616. There are certain lakes near the mouth of the Murray that are affected by the sea water; they are also affected by the fresh water flowing down the river; the residents on the lakes claim that they have the right to the use of the water in the lakes for their cattle and otherwise; they claim that, supposing the water is diverted from the stream above, and in that way the water in the lakes rendered more salt, they are injured thereby;—what is your opinion? The question is: Is the injury unlawful? You test the lawfulness or unlawfulness of the act causing the injury by the law in force where that act is done. If that act is done in New South Wales, the question is: Is it lawful under New South Wales law? If it is done in Victoria, a similar question arises.

5617. Supposing, by the action of New South Wales and Victoria, the volume of water flowing down the Murray is materially reduced, and in that way the supply to the lakes is less than it formerly was, and the lakes are rendered less useful in consequence, would the rights of the individual abutting on the lakes be affected thereby? That would have to be decided entirely as a question of law, in my opinion. Was the act that caused the injury a lawful or unlawful act? If it has been legalised by either the Legislature of New South Wales or Victoria as regards its own territory, then the act becomes lawful. Of course, since Federation, if the Commonwealth passed an Act in respect to navigation, observing the limitations which are imposed upon it as regards irrigation and conservation, then any New South Wales or Victorian enactment which conflicted with that Act would have to give way; but, in every instance, the state of the law when the act is done causing the injury has to be looked to. If it is lawful, then there is no remedy; if it is unlawful, then there is a remedy.

5618. Supposing Victoria had diverted water that affected the individual on the lakes at the mouth of the Murray, you consider that there would be no remedy? If it was done lawfully, there would be no remedy; if it was done unlawfully, then there would be a remedy.

Riparian rights not dependent on contribution.

5619. In regard to the water along the river, that is to say, between the border of South Australia and the lakes, has South Australia rights in respect to that water, although she does not contribute to it? Riparian rights do not depend on the source of the water. A person living alongside running water has the legal right to use it, unless it has been taken away from him by some Act of Parliament. The mere fact that South Australia does not contribute to the waters of the Murray does not, in my opinion, diminish the rights of a riparian owner in South Australia. It seems to me that a Legislature, which has waters within its territory, can legalise any extraordinary use of those waters; the safeguard, of course, is the duty of the Governor to reserve, for the Royal Assent, Bills affecting individuals outside.

Powers of Legislature.

Safeguard.

5620. *Mr. Murray.*] As to the restraining right of the Governor, the practical difficulty would be that he would not know? It is not a sufficient safeguard, but still it is a safeguard, and then there is always the controlling power of the Imperial Legislature, if it thought the local Legislature was abusing its powers to the detriment of others outside its territory.

5621. *Mr. Burchell.*] Of course, the Royal Assent would have to be obtained? Yes.

5622. *President.*] [Question No. 7.] (*a*) Was the difficulty prior to Federation of the application of the principles of riparian rights between States or the citizens of different States, that there was no tribunal having jurisdiction to determine or enforce such riparian rights or equities; (*b*) is the law as to riparian rights to the use of flowing water authoritatively laid down in the case of Miner *v.* Gilmour, XII, Moore, P.C., 131, in which it is declared: "Every riparian proprietor has a right to the reasonable use of the water flowing past his land, namely for his domestic purpose and for his stock, and this without regard to the effect such use may have, in case of a deficiency, upon proprietors lower down the stream; he has also the right to the use of the water for any other purpose, provided he does not thereby interfere with the rights of the proprietor either above or below him"; subject to this condition, a riparian proprietor may

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

may dam up the stream for the purpose of a mill, or divert 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 of the other proprietors, and inflicts upon them a sensible injury; (*c*) does this decision bind the Australian States in their inter-State relations? (*a*) As already mentioned, I think the courts of the separate States had jurisdiction over breaches of the law committed within their territory, but there would have been difficulties where the wrong-doer resided in another State, or where the Attorney-General of a State, representing the public there, might have desired to invoke the jurisdiction of the Courts of another State; and, in any case, a Federal Court would be a more satisfactory tribunal for dealing with all such disputes. (*b*) I believe this to be correct. Miner *v.* Gilmour was cited with approval in Baily and Son *v.* Clark, Son, and Moreland (1902), 1 Ch. 649, a case heard by the Court of Appeal in February of the present year. (*c*) It expresses the law binding on the residents and Executive Governments of each of those States, except in so far as such law has been varied by their Legislatures within their respective spheres of competence, as above mentioned.

Riparian rights prior to Federation.

Miner *v.* Gilmour.

Rights of a Colony to water of river within its own territory.

5623. [Question No. 8.] (*a*) Before Federation, what was the right of a Colony as to the waters of a river wholly within its own territory, but forming a tributary direct or indirect of the Murray; (*b*) were the rights of New South Wales the same as to control and use of the waters of the Murrumbidgee, which is a tributary of the Murray, and, say, to the Hawkesbury, which flows into the Pacific Ocean near Sydney; (*c*) have such rights in either or both cases been affected by the passing of the Commonwealth Constitution Act, and if so to what extent, and in what way? (*a*) The Legislature of the Colony had full power to alter the law applying to any such tributary, and to make such use as it pleased of its waters. Until the law was so altered, the residents of the Colony and its Executive Government were, I think, bound by the law as laid down in Miner *v.* Gilmour. (*b*) Yes, subject to the rights conferred on the Victorian Legislature and officers of Customs in section 5 of 18 and 19 Victoria, chap. 54. But if any Bill were passed in New South Wales, whereby the rights and property of persons residing outside New South Wales, or the trade and shipping of the United Kingdom and its dependencies, might be prejudiced, the Bill, if of sufficient importance, would require to be reserved for the Royal Assent, in accordance with the Governor's instructions. The latter class of interference might easily occur in the case of a navigable river situated wholly within the territory of one State. In the case of the Hawkesbury, there might be considerable interference with His Majesty's subjects outside of New South Wales. The safeguard, of course, is the question of the Royal Assent; whether that has always been followed or not—whether it has been known to the Governor that such a case has arisen—is another matter.

Miner *v.* Gilmour.

State jurisdiction over territory.

5624. Do I understand that your answer is based on the opinion that the State has absolute jurisdiction over the territory vested in it? Yes.

Effect of Commonwealth Act on riparian rights.

5625. And that, as a consequence, it is within the province of Victoria or New South Wales to appropriate the whole of the waters of any river in their territory? It seems to me to be so. As to the tributaries of the Murray in the territory of Victoria, I think she has just the same rights. (*c*) Only so far as the State enactment conflicts with a Federal enactment on the subject of navigation, or on some other subject within the competence of the Federal Parliament.

Existing Victorian obligations.

5626. [Question No. 9.] Assuming the Government of Victoria to have entered into obligations with regard to the supply of water from the Murray and its tributaries, should any agreement between the three States especially interested in the Murray regard these obligations as validly entered into, and deal only with such of the waters as remain unappropriated after they have been satisfied;—will you state your opinion separately as to the main river and as to the tributaries? I think, for reasons already stated, that the Victorian Legislature had power to authorise its Government to enter into obligations with regard to the supply of water from the tributaries of the Murray, but not from the Murray itself. As regards the suggestion that in any agreement to be entered into between the three States existing obligations of this kind should be regarded as validly entered into, this is a question of politics, and not of law. Any party to the suggested agreement could seek authority from its Legislature to give up any legal right it may at present possess, if it thought sufficient inducement were offered; but if the Victorian Government were to insist on such a claim, I fail to see what *quid pro quo* it has to offer for any concession on the part of the Government of New South Wales. If the representatives of Victoria were to insist on the validity of those diversions being recognised, then I do not see what they have to give up in order to induce the other States to come to some agreement with her.

Powers of Victorian Legislature.

Rights as to the Murray.

5627. *Mr. Murray.*] Do I understand your reply to amount to this: that Victoria, in granting rights to its citizens or to trusts (constituted under its laws) in the waters of the Murray, would be doing a wrong? In the waters of the Murray itself, I think so.

5628. It would be doing something it had no right to do? Yes; and the authorities thereby granted do not render lawful the acts done under them.

Concession to Chaffey Brothers, Mildura.

5629. You may possibly have seen the deed making the grant to the Chaffey Brothers in respect to Mildura? I have read about it, but I do not think I have seen the draft itself.

5630. The deed was drawn up by Rogers, Q.C., and the words are frequently used—"the Crown grants in so far as it has a right to grant";—would that in any way qualify the wrong? I do not think so. Those words would not really affect the consideration of the grant itself; they would simply affect any question of compensation that might be made afterwards. The Government could say, "No; you had clear warning on the face of the grant that you were only getting what the Government had power to give."

5631. The introduction of those words would only safeguard the Victorian Government in respect to claims on the part of persons, not in respect to the rights of another State? That is how it would appear to me off-hand.

Method of legalising inter-State agreement.

5632. *President.*] [Question No. 10.] If the three States represented on this Commission desired to enter into an agreement with regard to the utilisation of the waters of the Murray and its tributaries for the purposes of water conservation and irrigation, what would be the best method of making that agreement effective;—would it be competent for the Federal Parliament, at the request of the three States, to legalise such an agreement by statute;—or should the agreement be given legal effect by the passing of identical statutes in the States' legislatures? I notice that certain objections have been pointed out to either of the proposed courses—(1) that if the three States passed identical measures, any of them could alter or repeal its Act without reference to the others; and (2) that if the measure were passed by the Federal Parliament it would only bind the States seeking such legislation. The latter objection would probably

Objections.

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

probably not occasion any practical difficulty, but I do not think the Federal Parliament would be bound to pass the measure in the identical form in which it might be presented to it by the three States, or to abstain from afterwards altering or repealing it without the consent of the three States. A third course possible would be to agree upon a Bill for submission to the Imperial Parliament, which, though equally free to do so, might be thought less likely to vary any arrangement now entered into without the further assent of all the three contracting parties.

"Reasonable use."

5633. While dealing with that, could you help us with regard to the words "reasonable use," as used in the Constitution Act, for conservation and irrigation? It is a new enactment, and a Court would have to take every possible point of view into account in giving a meaning to it. Probably, one element in such a consideration would be: What is regarded now as reasonable use by a riparian owner? Then, that would not be by any means the only consideration. The Court would have to consider what the different objects are, as to their relative importance. The Commonwealth Legislature has power to legislate in respect to navigation, and that is subject to these other rights as to conservation and irrigation. The relative importance of the three things would have to be considered by the Court. It would be very difficult indeed to offer any advice until one had the whole of the facts of one particular controversy before him.

5634. Each case would have to be taken on its merits? Yes. I do not think the Court would be bound by any interpretation you could extract from the cases dealing with the use by riparian owners, but it would certainly take it into consideration among other things.

Maintenance of navigability.

5635. [Question No. 11.] Would any such agreement or compact be subject to the maintenance and improvement for the purpose of inter-State commerce of the navigability of rivers under Federal jurisdiction? This, again, is purely a question of politics. So far as I can judge from such information as I have, the waters of these rivers are of much greater importance to the country as a whole, for the purposes of irrigation and water conservation, than for the purpose of navigation. If by a system of locking both purposes can be served, I should say so much the better; but if either object must be sacrificed for the other, I do not think the majority of the people interested would hesitate to secure water conservation and irrigation, even at the risk of injuring the navigability of the Murray and its tributaries.

Centralised authority.

5636. [Question No. 12.] The power of legislation on the subject of navigation being now vested in the Commonwealth Parliament—(*a*) seeing that *inland* navigation is closely connected with water conservation and irrigation, do you think the control of all these matters should be under one centralised authority; (*b*) could the Commonwealth Parliament, at the request of the States, pass a Statute governing not only *inland* navigation, but also water conservation and irrigation; (*c*) if so, is it necessary or desirable that such a measure should be of general application and extend to the whole Commonwealth; (*d*) do you consider the riparian law of England suitable to the physical conditions of Australia, or do you think the principle laid down in the New South Wales Water Rights Act, 60 Vic. No. 20 (now Consolidated Statute No. 51 of 1902), which declares the rights of the Crown to the use and flow, and to the control of waters in rivers and lakes, should be extended throughout the Commonwealth; (*e*) do you think it desirable that the matters of water conservation and irrigation, together with inland navigation, should be controlled by a Department of the Commonwealth Government administering such a Statute as referred to in subsection (*b*) of this question? (*a*) This is also a question of politics. To do so would need an amendment of the Federal Constitution; and the basis of the present Constitution is, in my opinion, too narrow to make such an amendment by itself likely to work well. A radical readjustment of the balance of power between the States and the Commonwealth would be needed, and this is not likely to find favour, so far as past or present appearances indicate. (*b*) It could do so, but, except for the settlement of immediate differences between the three States concerned in this Commission, I greatly doubt the value of such a Statute. Under the present frame of the Federal Constitution, the Federal Executive would be practically powerless to carry out works which are certain to be required in the near future; these the State Governments can arrange more satisfactorily to their own peoples, and possibly to the peoples of other States also, if a common basis could be agreed on that would be fair to all. (*c*) I think it would be almost impossible to make any such enactment apply satisfactorily to the whole Commonwealth, without careful inquiry into the circumstances of each part, and local modification accordingly. (*d*) Inasmuch as the physical conditions differ very much in different parts of Australia, I think the English riparian law is good as a general basis, but that, as time goes on, more and more legislative modification of it will be required, to suit the circumstances of particular localities. In some features, I think the New South Wales Water Rights Act worthy of being copied, inasmuch as it enables, though it does not compel, the Government to have works executed for the general benefit, which would otherwise be neglected; but I question whether it was necessary or desirable to vest the whole right to the flow of water in the Crown, at least without a much clearer definition of its rights and duties, as well as of the rights of individuals. It seems to me that the experience of the American States which have dealt with such questions ought to be closely studied before such an Act is extended. (*e*) See answer to (*b*). Even if desirable to pass such an Act, I greatly doubt whether a Department of the Commonwealth Government could be worked satisfactorily under an enactment passed, as this would be, at the request of the States, and not in the exercise of the ordinary constitutional powers of the Commonwealth Parliament. Referring back to my answer to (*b*), very great difficulty would arise if there were a Commonwealth Department which did not appear to deal with some of the States, and only appeared to deal with others.

Question of politics.

Federal legislation.

Practical difficulties.

English riparian law.

N.S.W. Water Rights Act.

American experience.

Difficulty of Federal control.

Federal legislation on reference.

5637. *Mr. Murray.*] Subsection 37 of section 51 of the Commonwealth Act has some bearing on the matter; it reads, "Matters referred to the Parliament of the Commonwealth by the Parliament or Parliaments of any State or States, but so that the law shall extend only to States by whose Parliament the matter is referred, or which afterwards adopt the law"? Supposing these three States applied for such an Act, and a Commonwealth Department were created, Queensland would not be interested in that Department, neither would Western Australia. Queensland and Western Australia, therefore, even if the Act could work successfully in their absence, would have to face in the Federal Parliament discussions about a department over which they had no control, or might have no control. Certainly, their interference would be resented by the other States. Then the question of voting the money necessary to work the Department might occasion a great deal of difficulty when the Parliament was considering it, and also the necessary legislative alterations from time to time to make the work of the Department efficient. One knows that all Government Departments occasionally have to set the Legislature in motion in order to have a Bill passed so as to have their work carried out satisfactorily.

5638.

W. P. Cullen, LL.D., M.L.C. 29 Sept., 1902.

5638. Going back to the question of modifying the Common Law, I understood you to say that the Common Law would probably undergo modification in its administration here owing to the operation of local circumstances and conditions? I am speaking here of legislation, not the administration of the law; but I think that, in administering the law, without legislative alteration, the courts would undoubtedly have regard to the local circumstances. In different parts of one country local circumstances may have some operation, and determine the rights of parties; what may be reasonably good in one set of circumstances might not be reasonably good in another.

Views of Mr. W. H. Hall.

5639. I would like to ask you your opinion as to the view expressed by Mr. William Hammond Hall, in his report to the Government of Cape Colony in 1898, in the following words:—"wherever (such) extreme physical conditions exist, the development of law soon leads to the recognition of fundamental principles, which are put forward as embodying elements of right and justice amongst men, and so they do for men within the physical environment where these principles have had birth; but where the physical conditions governing life are absolutely the reverse, fundamental legal rulings born of necessities totally foreign can be adopted only in violation of right and justice among men"? There is a great deal in that statement, but as a rule the modification of the legal rule, which the circumstances of the different cases call for, is generally left to be dealt with by the Legislature.

5640. Not by the courts? Not by the courts; but, no doubt, the courts insensibly modify the old rule as the habits of men change. But, inasmuch as our courts have the soundness of their decisions tested by the Privy Council, any modification by the courts generally follows the lines of changes in England rather than changes here. The courts here would, in many instances, hesitate to modify the law, because it has to stand the test of an appeal to the Privy Council, standing on purely English precedents and its own decision on appeals which have gone to it before.

Arthur John Hare, Chief Draftsman, Department of Lands, Sydney, sworn and examined:—

A. J. Hare. 29 Sept., 1902.

5641. *President.*] What is your name? Arthur John Hare.

Area of irrigable Crown lands.

5642. You have prepared certain maps, giving, approximately, the area of Crown lands within the irrigable area, as given in evidence? Yes; I produce two maps [*Exhibits* 122 and 123]. On map No. 1 [*Exhibit* 122], the area "B," adjacent to the Darling River, extending from the Murray up to the Western Division boundary, contains 13,303,500 acres of Crown lands; area "C," adjacent to the Murrumbidgee and Lachlan Rivers, contains 8,430,900 acres, making a total of 21,734,400 acres. That is all the information shown on map No. 1, except that on that map the alienated land is shown by red tint. Map No. 2 [*Exhibit* 123] shows the Crown lands within the irrigable areas "D," "E," and "F." in the Central Division. Area "D" contains: reserves, 1,719,300 acres; settlement, improvement, and scrub leases, 1,820,200 acres; pastoral leases and vacant Crown lands, 565,200 acres; total, 4,104,700 acres. Area "E" contains: reserves, 1,536,500 acres; settlement, improvement, and scrub leases, 338,100 acres; pastoral leases and vacant Crown lands, 773,100 acres; total, 2,647,700 acres. Area "F" contains: reserves, 85,800 acres; settlement, improvement, and scrub leases, 31,500 acres; total, 117,300 acres. Total irrigable area within the above: reserves, 3,341,600 acres; settlement, improvement, and scrub leases, 2,189,800 acres; pastoral leases and vacant Crown lands, 1,338,300 acres; total, 6,869,700 acres. The total area of Crown lands within the irrigable area, shown on maps Nos. 1 and 2, is 28,604,100 acres.

James William Boultbee, Superintendent of Artesian Boring in New South Wales, Public Works Department, Sydney, sworn and examined:—

J. W. Boultbee. 29 Sept., 1902.

5643. *President.*] What is your name? James William Boultbee.

5644. You are Superintendent of Artesian Boring in New South Wales? Yes.

5645. You recently visited America, with a view to reporting on water conservation and artesian boring there? Yes.

5646. You had an opportunity during your investigations, of examining what the duty of water was in the United States, as well as certain methods that they have adopted for the measurement of water? Yes.

5647. You have prepared a statement, setting forth the information which you obtained? Yes. [*Exhibit* 123a.] In the course of what I have written, reference will be found in many instances to the terms "cubic foot per second," "acre foot," and "miner's inch"—expressions which are used to describe the quantity of water used; and as they may not be generally understood, the following explanation is offered:—The "cubic foot per second" is the unit of measurement very largely in use for expressing the volume of water flowing in streams, and used for irrigation. This "second foot," as it is also termed, is a convenient unit, as it is easily reducible to any of the other expressions which represent the volume of water. It is 1 cubic foot of water—*i.e.*, a body of water 1 foot deep, 1 foot broad, flowing a distance of 1 foot in each second of time. It amounts to 6¼ gallons each second, or 540,000 gallons per twenty-four hours. In regard to the acre-foot, the flow of 1 cubic foot per second for 12·1 hours equals 1 acre-foot—that is, it is enough to cover 1 acre, 1 foot deep; or, in other words, it represents 43,560 cubic feet, or 271,814 gallons; so that no difficulty should present itself in realising the exact volume of water in those cases in which the expression "acre-foot" has been used. The unit of measurement, however, more generally in use throughout the irrigated area of the Western States is the miner's inch. It is a unit that is defined by law (General Statutes, Colorado), and represents the volume of water flowing through an opening 1 inch square under a head pressure of 4 inches. There is, however, some variation in the different States as to its value. The two forms of this unit most generally in use are the California inch and the Colorado inch. Each have a different value. Under the Californian custom, 50 miners' inches equal 1 cubic foot per second, or 540,000 gallons; 1 Californian inch, therefore, equals 10,800 gallons per twenty-four hours. Under the Colorado custom, 38·4 miners' inches equals 1 cubic foot per second, or 540,000 gallons; consequently, 1 Colorado miner's inch equals 14,062 gallons. Where, however, the miner's inch is referred to in this report, the California inch has been used. For a continuous flow, the cubic foot per second is the most serviceable, not only in determining the flow in streams, but also in defining the appropriations from them. Its unsuitability has been demonstrated in more cases where irrigators do not require a continuous flow. On most canals the supply to consumers is regulated by rotation. It has

Cubic foot per second.

"Acre foot."

"Miner's inch."

Californian inch.

Colorado inch.

J. W. Boulthee. 29 Sept., 1902.

has consequently been recognised that this form of measurement of a continuous flow does not correspond with the requirements of the irrigator. Another unit of measurement—the acre-foot—has, therefore, been evolved, and wherever it has been adopted it has proved satisfactory. By its use as the unit of quantity, the arbitrary assumptions involved in the use of the miner's inch or the cubic foot per second are avoided, and its employment is equally correct and convenient whether the supply comes from streams, wells, or reservoirs, whether the use is continuous or intermittent, and whether it ends in a month or extends throughout the entire twelve. The flow of a cubic foot per second for twenty-four hours, *i.e.*, 540,000 gallons, amounts to 1·98 acre feet, so that the conversion of volumes from one unit to another can be readily made. As to the measurements of the duty of water made in the different States —while individual cases disclose eccentric variations, still the general results where the canals and the management are good, show very great uniformity. The following tables illustrate the results :—

Duty of water.

Utah	2·60 acre feet.
Idaho	2·40 "
California	2·24 "
Wyoming	2·53 "
Arizona	2·82 "
Colorado...	1·82 "
Montana	2·10 "
Nebraska	2·47 "

or an average duty of 2·37 acre feet. These are instances in which the water is measured from the main or lateral canals to the land, and in which no account is taken of the loss by seepage and evaporation in transit on the main canal. In cases where the losses from the above causes in the main canal are taken into account and are included, the observations give the following results :—

New Mexico	6·61 acre feet.
Arizona	3·81 "
Utah	6·24 "
Colorado	4·92 "
Idaho	5·06 "

These figures, especially those of the first return, are in agreement with the published returns of the Ganges' Canal India, where the duty is placed at 2·8 acre feet. In regard to the second return, the measurements are also in accord with Indian experience, viz., that the loss in transit is equivalent to 50 per cent. of the volume entering the head gates. These results only serve to emphasise the necessity for a properly constructed canal such as the Gage Canal, where the loss in transit, owing to the perfection of the system, is only 6 per cent., and where irrigation is practised from an artesian source, and where the water is naturally more expensive to obtain than from a gravity canal, it follows that the canal formation to be adopted is the one in which there is the least waste, and this lesson is peculiarly applicable to our own conditions. The prime cost may appear heavy, but the economic results justify it. In those districts where irrigation succeeded mining, the miner's inch has been generally adopted. It is, however, not adapted to the measurement of rivers, as the conditions of measurement cannot be applied to a large stream in a practical way. The great care and accuracy of the measurement of water that has been observed in all irrigation ventures of more than ordinary extent, and which are managed on a business footing, and where the avoidance of waste and consequent loss is a feature of the management, has been impressed upon us very forcibly. The theoretical duty of 1 miner's inch to 5 acres may be taken as a generally sufficient average; some culture will not require so much, others will require more, and it can be readily realised what an influence the nature of the soil and the crop grown will have upon the volume of water required. Still, for all practical purposes, we can assume the above average as sufficient to meet requirements in this state under existing conditions. The tendency in America, like it has been here, is to waste water, to use more than is required, with a result detrimental to the plant, and the effect of so water logging the lower lying lands that drainage has become in instances necessary. It is only careful measurement and rigid observance of the by-laws that enables the different Water Corporations to deal successfully with the various demands and temperaments of a body of settlers. As an instance of what is done, take *Riverside; the volume of water flowing into the canal is measured*, and a record taken by the automatic appliance in use, which shows, day by day, the volume flowing into it. The canal is arranged in divisions; the supply sent on from Division No. 1 is measured into Division No. 2, and so on; the water sent down each lateral, and to each consumer, is also measured, that any discrepancy in volume, after allowing a percentage for seepage and evaporation, is at once inquired into, and the point of waste located; and this, where a cubic foot per second is said to have a capital value of £10,000, is necessary. Compared with other canals, the loss on the Gage Canal owing to its construction and management, only 6 per cent., has great significance, as in other canals a loss of 25 to 75 per cent. is shown. What the duty of water is must sooner or later be a question of moment to us in this State. It has been made, as I have shown, the subject of close investigation in America, as they believe "that a more general understanding of the causes which increase or diminish the duty of water is one of the most urgent needs of agriculture; by irrigation the determination of this duty was made a leading subject of investigation." Several makes of instruments are in use for keeping a continuous and automatic record of the quantity of water used, viz. :—Mr. Elwood Mead's, Richards Bros.' registers, the Wyoming Nileometer, the Friez Register, and the Gage Canal Register being those most in use. These are placed in position at the measuring weirs or flumes. They are simple in their operation, and their use is a great check on waste. The one which gives most satisfaction, and appears best adapted to meet all requirements and contingencies is that designed by Mr. Elwood Mead. The rise and fall of the water in the canal or lateral raises and lowers a float and counterweight. The latter are connected by a cord which passes over the end of a cylinder which is revolved by the cord's movement as the float rises or falls with the changes of depths in the canal. Around the cylinder is fastened a paper divided into rectangular spaces. The time divisions being parallel to its axis, and the depth divisions at right angles thereto, the pen or pencil making the record is moved along the back cylinder by clock work, passing from one side to another in a week, when the paper is changed and the pencil returned to the starting point. The fluctuation in the discharge creates a zig-zag line, a wide variation in depth sometimes causing the cylinder to make a complete revolution.

Necessity for proper canals.

Economic management necessary.

Excess of water detrimental to plants.

Losses on Gage Canal.

Satisfactory water meter.

TUESDAY,

TUESDAY, 30 SEPTEMBER, 1902.

[*The Commission met in the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Joseph Hector Carruthers, M.L.A., solicitor, Sydney, sworn and examined :—

J. H. Carruthers, M.L.A. 30 Sept., 1902.

5648. *President.*] What is your name? Joseph Hector Carruthers.
5649. You are a solicitor, and also a member of the Legislative Assembly of New South Wales? *Yes.*
5650. You have seen the questions prepared by the Commission, bearing on the legal aspect of the matter remitted to them, and we should be very glad if you would supply us with answers to them, so far as you are able to do so? I desire to break away from your questions, because in preparing my evidence last night I did not have my copy of them with me; but I think I went over the whole of the ground. I think the first subject is as to the rights of New South Wales over the Murray River—as to how her rights and those of Victoria are affected by the Constitution Act. There is no doubt in my mind, as a matter of law—and I have had to give consideration to it as Minister for Lands in this Colony—that New South Wales is entitled to territorial rights over the Murray River under the Imperial Acts which conferred a Constitution upon the Colony. Those Imperial Acts confer an exclusive jurisdiction over the Murray, and I take it that that jurisdiction goes to the bed of the river and right up to the Victorian bank. Now, it is necessary to analyse how far that jurisdiction conflicts with riparian rights; and it is clear, to my mind, that the purpose of the Constitution Act was to create a governing influence over a tract of territory—calling the waters and the bed of the Murray "territory"—over which a divided jurisdiction would be inadequate, and over which no jurisdiction to any State would be a calamity. It was necessary that there should be some of the self-governing States which were then being constituted, some or one of them, which should have the right of government and the authority of government exclusively—rather than divided—over a tract of water which would be very frequently used, and which would be used in a public way. I give a common instance of what occurs now. You have two municipalities divided by a road, where the centre of the road divides the two municipalities, one having a jurisdiction right up to the centre, and the other a jurisdiction right up to the centre. There may be an instance arise such as that of not carrying lamps on vehicles after dark—a breach of the municipal by-laws—and then you have to come to the question and prove where the vehicle was, and the divided jurisdiction practically ends in no jurisdiction at all. In a Bill which is now before this Parliament it is provided by an agreement that jurisdiction might be conferred entirely on one or the other. And the policy of this State in regard to the constitution of municipalities has been, as far as possible, to avoid contentions of that character—to put the road entirely in one municipality or another. And so, in our Constitution Act, it has been deemed wise, for the purpose of the good government of the people, that the river Murray should be exclusively in one State or the other, and New South Wales, being the oldest State, that was, no doubt, the reason why the authority was vested in New South Wales. The mere ownership of river banks, riparian ownership, does not give any governing power at all. The two things are quite distinct. People owning land on either side of the river have certain rights of property in the river, but they have no rights of government; they have no authority over the river. Notwithstanding the fact that there is ownership of river beds conferred upon an owner who owns both sides of a river, still there is the sovereign right of government vested in the State, and it appears to me that it must be considered that that clause in the Constitution has really conferred the right of government, and of making laws, upon the State of New South Wales in respect to the river Murray—as I said before, right from the New South Wales bank and the bed of the stream up to the Victorian bank. Now the question arises: how far would this affect the riparian rights of the adjacent owners? I believe it would only affect those rights to a certain degree—that is to say, it would not abrogate those rights, and I dismiss at once from my view any idea that the conferring of an exclusive jurisdiction over the Murray upon New South Wales destroys the riparian rights of Victoria as an adjacent owner. At the same time I assert, as a legal opinion, that that Act robs Victoria of any jurisdiction over the Murray waters and the Murray as a stream. I say she cannot pass laws which affect the waters of the Murray, because she has no power of legislation outside the territorial limits of Victoria as a State. The moment she attempts to pass laws which touch anything which is territorial in the State of New South Wales, and outside the limits of Victoria, those laws are beyond her constitutional power, and they are an invasion of the constitutional rights of the State of New South Wales. Now, I have stated, and I want to emphasise this, that the right of Government jurisdiction, which is exclusively vested in New South Wales, would not affect Victorian ownership of the Victorian bank of the river. Generally, when a person has exclusive property in a river, it is assumed that it is the property which goes with ownership of the banks; we know of no such thing as the exclusive property of a river without the banks. This is a different thing—a jurisdiction. I say that jurisdiction would not affect Victorian ownership of the Victorian bank, nor certain of the rights which that ownership confers upon her. Whatever the common law rights may be, which run as an easement concurrently with the ownership of the river bank, those rights appear to me to attach to Victoria until they are altered by New South Wales legislation. As far as I can gather, they have not been altered—that is to say, New South Wales has passed no law which alters them, unless the Water Rights Act alters them, and I do not think it does. There has been a case decided by the Privy Council, the papers relating to which can be procured by the Commission from the Lands Department—the Pental Island case. This was a case which went to the Privy Council, and it was decided there very tersely, very clearly, that the common law rule with regard to a river altering its course applied to the Murray River, and that Victoria, as the owner of the south bank, was entitled (the river having altered its course), under the common law rule, to Pental Island, which had formerly been New South Wales territory. Now, that is a very, very strong decision. Since then we have had several other cases with regard to the islands in the Murray; and they have been subjected to the opinions of Attorney-Generals in this State, and they have adopted the Privy Council decision in the Pental Island case. From 1896 to 1900 a case was pending between this State and Victoria with regard to an island which had hitherto been Victorian territory, but the river changed its course. The Victorian Government had leased the

New South Wales territorial rights over the Murray.

Purpose of Constitution Act.

Illustration.

Effect of riparian ownership.

Victorian riparian rights

Limits to Victorian legislative action.

Effect of vesting jurisdiction.

Pental Island decision.

J. H. Carruthers, M.L.A. 30 Sept., 1902.

the island, with the option of purchase. The lessee was to pay so much a year, and, after paying for so many years, he was to have a grant of the island. It was then discovered that New South Wales laid claim to the island. That claim was eventually admitted by Victoria, and the Victorian Government of Sir George Turner asked this Government to ratify the arrangement which had been made by the State of Victoria. That could not be done, because we were bound by our land legislation here; and I think eventually some other arrangement was made by which this person got some tenancy from the State. It may practically be looked upon as a settled thing between New South Wales and Victoria that the ownership of the southern bank of the river confers common law rights which go together with that ownership. That is laid down very well in the case of Lyon *v.* The Fishmongers' Company (*1876, L.R.I. App. Cas.* 662):—"The rights of riparian proprietors do not depend upon the ownership of the river bed, but exist because their lands have the advantage of being washed by the stream." (Recent Encyclopædia of the Laws of England, vol. 12, page 569.) I do not think that the vesting of the jurisdiction of the ownership of the Murray under our Constitution Act confers on New South Wales the ownership in the current of the river. It is laid down by authorities, some of which I will cite later on, that there are rights over the current of a river; but there is really no ownership, no more than there is in light and air, which are necessaries of life. You may have rights over the current, the flow of the water, but the ownership of it, in the absolute sense, I do not think is recognised by law. You have easement rights to it (as laid down in this case), which are conferred because of your ownership of the bed and bank of the river. Those easement rights are to the use of the water for your reasonable requirements, restricted according to the common law doctrines. Whatever may be the law relating to river flows or currents, the English law or otherwise, New South Wales, as a State, in equity ought to respect that law just as much as any State owner ought to do. I say the law ought to be respected. Whatever the equity may be, whenever the law is discovered regarding the rights of the State of New South Wales to the current, that law ought in equity to be respected. Prior to Federation jurisdiction had not been discovered; at any rate, New South Wales did nothing to warrant an invocation of the law. I assert undoubtedly that, so far as regards the Murray and other rivers, New South Wales did absolutely nothing which would warrant an invocation of the law. If anything, she has been slumbering upon her rights and upon the prudent use of water. Now, the Federal Constitution does provide a jurisdiction to a limited extent. So far as regards the jurisdiction of the Federal Government to make laws, it is limited to navigation. This talk about appealing to the Federal Government by petitions and otherwise to restrict Victoria from diverting the waters of the Murray: it is not a subject for Federal administrative interference, and it is not a subject upon which you can get adequate Federal legislation, because the scope of Federal legislation and jurisdiction, except in respect to the High Court, is limited to navigation and commerce. And by pretending to legislate for the rights of navigation and commerce can the Federal Parliament legislate for irrigation and water conservation? The Federal Government have no right of legislation with regard to irrigation and water conservation. It has only the right of legislation with regard to navigation and commerce, and the States at present retain their rights of legislation with regard to irrigation and water conservation with this limit: that neither their administration nor the actions of individual members of the State can infringe the Federal rights to navigation or commerce if the act of infringing denotes an unreasonable use of the waters. I want to make that as clear as possible. The Federal is not the authority in regard to water conservation and irrigation.

Lyon *v.* Fishmongers' Co.

Ownership of current of river.

Easement rights.

Federal jurisdiction. Limits.

Federal Government control of water conservation and irrigation.

5651. Would it be competent for the three States concerned to pass legislation asking the Federal Government to construct and control certain works that are connected with water conservation and irrigation? I do not think so. The Federal Government cannot budge one inch beyond the limit of its jurisdiction, neither have the State Governments the right of amending that Constitution, or extending the powers of the Federal Government. There is only one way by which the Constitution can be amended—if they do not do it under that Constitution they cannot do it by agreement. Section III provides that "the Parliament of a State may surrender any part of the State to the Commonwealth; and upon such surrender, and the acceptance thereof by the Commonwealth, such part of the State shall become subject to the exclusive jurisdiction of the Commonwealth." It is possible for the States to do it by surrendering territory, and thus conferring Federal jurisdiction over that territory, but I do not think a proposition of that kind would be assented to. Then the 37th subsection of section 51 gives the power to the Federal Parliament to make laws upon "matters referred to the Parliament of the Commonwealth by the Parliament or Parliaments of any State or States, but so that the law shall extend only to States by whose Parliament the matter is referred, or which afterwards adopt the law."

Legislation by reference.

5652. Would that not have a bearing on the question I put to you? It would have a bearing if each Parliament passed a law to do it. The only way that a State Parliament can speak to the Federal Parliament is by law—there is no provision providing exchange of messages. The only way this Parliament of New South Wales can refer this question to the Federal Government, is by an Act of Parliament of New South Wales. Well, if an Act of Parliament is passed in New South Wales, and an Act of Parliament in Victoria, and an Act of Parliament in South Australia, they could have done the same long before we had a Federal Constitution, and they could have referred it to the Governor of Ashantee if they liked. What I mean to say is, that the State Government cannot make a mere agreement to do these things; they must do so by the power of legislation. That power may take the form of relegation to the Federal Parliament of a power to make a law with regard to this specific thing.

State Parliaments—method of addressing Federal Parliament.

5653. Would not that cover the grounds such as I have indicated? Yes; but you are no "forrarder" than before. We could have done that before Federation. They could have vested the power in you, sir, and three under-secretaries if they liked. We could always have arrived at a common agreement, and having arrived at that and given statutory effect to it we need not go to the Federal Parliament to do it. They can do it by nominating any other authority they like, so long as that authority is subject to the Crown. It appears to me that the three States themselves will have to settle this irrigation question, if it is to be settled at all. They may use the Federal Government afterwards as some higher or more dignified power for the purpose of bringing them and their legislation and agreement into unison. Then we come to another section of the Constitution Act, which gives a jurisdiction to the Federal High Court, but the Commission must have it clearly in its mind that the judicial function is one thing absolutely distinct from the executive and legislative function. Giving a jurisdiction to a court to settle the rights of parties under the existing laws, does not confer a power

Irrigation a State question.

Federal High Court.

J. H. Carruthers, M.L.A. 30 Sept, 1902.

power *ipso facto* of altering the law or of putting the law into execution. The Federal High Court gets power, and original jurisdiction, under section 75 in all matters between States or between residents of different States. That, therefore, will confer a jurisdiction upon the Federal High Court where a conflict occurs between two States as to respective rights, and where a conflict occurs between citizens of two States as to their respective rights, but it will not alter the law one iota. It fills up a very great hiatus in our old Constitutions, where there was no court, with that jurisdiction, and where, consequently, wrongs went without their remedies, and rights could not be enforced, because there was nobody to enforce them. Now there is this body under section 75, but it will take years and years before its influence and power are thoroughly understood. How far it will go, it is beyond my powers to say. It certainly extends the powers, or brings into operation powers which always ought to be in operation, because we consider the Crown is the source of justice; but up to this stage it has provided—while the source is there—no machinery to give justice, but has not altered the law one iota. As far as regards the Murray, and the clause in our Constitution, that Federal Constitution does not amend any section of our New South Wales Constitution, which vested the jurisdiction and the authority over the Murray in New South Wales, except to this extent: that where a dispute occurs in regard to the Murray waters, and the disputants are not both New South Welshmen, where there would be one in one State and one in the other, they will have to go to the High Court which was brought into existence, but which was not in existence before. But where two New South Welshmen have a dispute, they will go to the State Court. Supposing a Victorian fisherman is caught hauling his net in the Murray waters, he is subject to the jurisdiction of the New South Wales Court, that is to say, if he is taken there—arrested there—he would be brought to the nearest Police Court. And so with injury to property, New South Wales Courts would still have their own jurisdiction. Irrespective of that question of jurisdiction, the New South Wales Parliament has the only power to make laws with regard to the river Murray, except as regards navigation. Victoria has no right to do it, and if New South Wales passes a law which declares that the common law right of England with regard to the waters of the Murray no longer exists, I think that law will govern the Murray. That piece of territory is vested in her, and the New South Wales Parliament has the right to pass laws respecting it, and if she likes to pass a law wiping clean away the common law of England, that law will operate right up to the last atom of water in the Murray—right up to the Victorian bank. Then I do not see how Victoria could claim that they have common law rights in a property or in waters, which their river bank fronts, which would not be under common law at all, but under a law more powerful superseding it. Now, I do not suppose anyone will contend that we have not got the power to make a law with regard to the Parramatta River, or with regard to any other fresh water stream, and we can wipe out all the riparian rights if we like—Parliament can do it. In fact, the Water Rights Act declares the waters in the rivers to be the property of the Crown, and it is a matter for consideration how far that Act has affected the Murray. It was certainly never intended to go to the full extent of what I say might be done. Would anyone contend that the English Government, for instance, could not make a law breaking the common law right to use the waters of any river in England. They could pass a law to-morrow, wiping out of existence all the common law rights of riparian owners of any river in England; they are not likely to do it, but they have the power. Well, we have just those same rights with regard to that which is within our own territory, subject to those powers which have been conceded to the Federal Government with respect to commerce and navigation. Victoria on the other hand cannot do it; she cannot do it over the Murray, because it is outside her territory. Now, can Victoria step in and take these waters by cutting down her bank and letting them flow? It is practically what she has been doing, and practically what she proposes to do. I contend she cannot do it. She owns that river bank, but I will cite authorities to show that the mere owner of a river bank, while he has the right to the riparian use of the river, has no right to divert the river, no right to cut his bank down and permanently divert the water from the river, so that the owner on the other side never gets that water back again. If Victoria attempted to do that, there are many remedies open to this State. Probably the simplest and most effectual would be an appeal to the High Court to prevent her from doing it. New South Wales has not attempted, or is likely to attempt to amend any laws with regard to the authority vested in her. The diversions of the waters of the Murray which are going on, and which have been proposed by Victoria, are diversions which are based probably on an agreement. There was an agreement made by a Commission appointed by New South Wales and Victoria many years ago.

Federal Constitution—effect on N.S.W. Constitution.

Powers of N.S.W. Parliament.

Water Rights Act.

Victorian powers.

Former Commission.

5654. That agreement was never ratified? But it seems to have been assumed that that agreement was a decided arrangement which would not be avoided or repudiated. That is the only thing which I can find. I contend that Victoria has acted without the consent of the Government authority of New South Wales, and I may say there is a strong and growing feeling in this State at the present time that Victoria proposes to go too far. Recent proposals made by Victoria are creating a feeling of concern in New South Wales, and it is very probable that proposals will be made in our Parliament—of course, I cannot speak as to what the Government are likely to do—to put a check on the action of Victoria in diverting, or attempting to further divert, the waters of the Murray until some common agreement is arrived at on a fair and equitable basis. Now, that is what I have to say in respect to the local aspect of the case in regard to the Constitution Act, and the Murray more particularly. Now the great question, of course, which has to be considered with regard to the watercourse is: What is the state of the law? And I presume the Commission have had a pretty good innings, and have come to the conclusion that the state of the law is very difficult to ascertain. I venture to express the opinion that if we adopt in this country the common law, as it is known and adopted in England, well then quite two-thirds of Australia will be for all time a barren waste. The common law doctrines of England on water rights are not applicable to this country; they are not applicable to five-sixths of Australia. The common law doctrines in England have been superseded in America by doctrines which are based upon common sense, and I think that the Commission can discover—if they chose to wade into the subject—that the common law is not a fixed and inflexible law which does not change. It is a law which is built up according to the requirements and necessities of the changing condition of affairs in the community; it is a law which adapts itself to custom and usage, and custom and usage are largely founded upon what experience teaches to be public necessity and public requirements. In a country like England, where there is very little evaporation and a fair rainfall, affected as it is by the different currents of the ocean and the currents of the air, you may get a region where droughts are practically unknown. Well, the doctrine with regard to the use of water grew up, founded on that condition of affairs—the climatic condition of the country. That doctrine has never

Present state of law with regard to the Murray.

Flexibility of common law.

J. H. Carruthers, M.L.A. 30 Sept., 1902.

never been applied in a place like Spain, or in other countries where the rivers only run in ill-defined courses, and at certain periods of the year. And the American Colonies, after attempting to live under the English common law, the common law applicable to England, found that it was absolutely impossible to people and develop the country under that law, and there grew up there a new common law, which grew up exactly in the same way as the common law of England grew up. The miners who went to California found it was necessary for the development of the mines that there should be some difference in law of ownership with regard to water. They went to the old doctrine, "First come, first served," the doctrine of appropriation, and that now stands in place of the common law in a large part of the United States of America. It has stood every test, and is defended as the sound common law of that country. It is now practically applied as statute law. I propose to shortly glance at the state of the common law in England, and then refer to the growth of common law in America, and then conclude my remarks as to what I think is the best method of dealing with riparian rights and the ownership of the waters. In the "Encyclopædia of the Laws of England," volume 12, page 547, it says:

American doctrine of appropriation.

Riparian rights and obligations.

Water, when standing or flowing, being a provision of nature, like air and light, for the common use of mankind, whether it arises in land in the form of springs, or settles on land in a pool, or flows along in rivers, brooks, or rivulets, is clothed by the law with natural rights in favour of landowners in whose land it happens to be, and with corresponding obligations on the part of such landowners in favour of others. In addition to these natural rights, easements of various kinds may be acquired by grant, express or implied, or by prescription.

I think that clearly lays down the kind of ownership that one can have vested in him in the current or the flow of a stream. Page 548:—

Lyon *v.* Fishmongers Co.

It has been questioned whether an owner of land on the banks of a public navigable river has the same natural rights as one who has land abutting on a private stream, and whether the fact of a river being tidal makes any difference. These questions, however, have been set at rest by the case of Lyon *v.* The Fishmongers Company (1876, L.R. 1 App. Cas. 662), in which it was held that the same rights exist in each case, though in the case of a public navigable river the rights of landowners must be subject to the public right of navigation.

That brings me to point out to the Commission that the law of navigation is one thing in respect of tidal rivers and another thing in respect of rivers which are not tidal, and in which the public have acquired by user their right of navigation. Page 548 again:—

Riparian right is a "reasonable use" of water.

The riparian right to the flow of the water of natural streams is a right which every riparian owner has to the uninterrupted flow without diminution, deterioration, or alteration of the current of the water (Embrey *v.* Owen, 1851, 6 Ex. Rep. 353; Gaved *v.* Martyn, 1865, 19 C.B.N.S. 733); but by this it is not meant that the quantity of water is in no degree whatever to be diminished, or the current altered, or the quality depreciated, for if that were the right all other riparian owners would be debarred from using it at all, and such user is one of their natural rights; but each owner has a right to use the water reasonably as it passes his land, and to divert the stream to his own works or lands for use, provided he returns it to its original course before it reaches his neighbour's bounds without substantial diminution or deterioration, and all riparian owners have equal rights; therefore, no one of them can make such a use of the water as to prevent any of the others from having an equal use of the stream when it reaches them.

And then:

Right modified by rights of others.

If a lower proprietor has a right to the free flow of the water without diminution or alteration, a right to consume the water before it reaches him is apparently irreconcilable with it; but such inconsistencies are to be met with in all natural rights, and the law reconciles them by holding that each is only to be enjoyed reasonably—that they are not absolute rights without limit, but that they are rights modified by all the rights of others. The right to uninterrupted flow of water is therefore subject to limit by the right to reasonable use and consumption of the water by others, and the right to use and consume must be exercised so reasonably and moderately that others may not be immoderately deprived of the quality of water they are entitled to.

Page 549:—

Embrey *v.* Owen.

But in Embrey *v.* Owen (1851, 6 Ex. Rep., p 371) Parke, D.B., said: "On the one hand, it could not be permitted that the owner of a tract of many thousand acres of porous soil abutting on one part of the stream could be permitted to irrigate them continually by canals and drains, and to cause a serious diminution in the quantity of water. . . . On the other hand, one's common-sense would be shocked by supposing that a riparian owner could not dip a watering-pot into the stream in order to water his garden, or allow his family or his cattle to use it. It is entirely a question of degree.

Page 551:—

Water frontage involves riparian rights.

The last point we shall notice on this subject is the effect of dividing a riparian estate. If the division—

(Taking the case of Victoria and New South Wales, of course Victoria is not entirely divided.)

separates one part entirely from the watercourse, without doubt that part ceases to be endowed with riparian rights (Stockport Waterworks Co. *v.* Potter, *supra*), but if the division gives a portion of the water frontage, however small, to each part, each will be entitled to water rights.

So that the decision in that case shows, although there has been a division by the Imperial authority of the riparian estate, that is, the Murray watershed and the Murray itself, giving New South Wales one bank of the Murray and Victoria the other, as it says here, "If the division gives a portion of the water frontage, however small, to each part, each will be entitled to water rights." Now we come to the question of navigation. Page 567:—

Common law right of navigation.

The public have no common-law right of navigation in rivers and streams above the flux and reflux of the tide.

There is very little of the Murray or the Darling which is not above the flux and reflux of the tide. I do not know whether Lake Alexandrina is subject to tidal influence, but the Murray and the Darling are not. Page 567:—

Right of navigation simply a right of way.

A public right of navigation acquired by user is simply a right of way, "similar to the right the public may have to pass along a public road or footpath through a private estate." (Orr-Ewing *v.* Colquhoun, 1877, 2 App. Cas. 839, 846, 868.)

All these I am citing are decisions in the highest Courts in England—the Appeal Courts. Page 567:—

Erection by riparian owners on bed of stream.

The public cannot complain of an erection by a riparian owner on the bed of the stream, unless there is a present interference with such right of passage, or it can be shown that the erection will necessarily produce effects which will interfere with that right (*ibid.* p. 854). The fact that the erection interrupts the flow of the stream, or that it may in future, under a change of circumstances, cause an obstruction to the navigation, does not entitle the public to demand its removal (*ibid.* pp. 862, 871, 873).

Indirect benefits no answer to indictment for obstruction.

Page 568:—

It is no answer to an indictment for causing a nuisance by an obstruction to a public navigation, to say that the obstruction, though some hindrance to the navigation, is beneficial to the public in some other way, and that the advantage to the public more than counterbalances the inconvenience (R. *v.* Ward, 1836; 4 Ad. and E., 384).

Page

Page 566:—

J. H. Carruthers, M.L.A. 30 Sept., 1902.

Common law right of navigation in tidal navigable rivers, which is paramount to the power of the Crown, is a right of passage in every part of the space between the banks.

Federal jurisdiction would be absolutely supreme there. Page 566:—

Right to obstruct passage.

And therefore a right to obstruct part of the passage can no more be acquired by grant from the Crown than a right to obstruct the whole of the passage.

Page 569:—

In A.G. *v.* Terry, 1874, L.R. 9 Ch. 423, where piles were driven into the bed of a public navigable river by a riparian owner, extending a wharf so as to occupy 3 feet out of 60 feet of the available space for navigation, it was held that the obstruction was a nuisance, and an injunction was granted for its abatement. This principle does not, however, apply to a right of navigation acquired by user, the extent of such a right being limited to the extent to which it has been actually exercised (Orr-Ewing *v.* Colquhoun, 1877, 2 App. Cas. 839, cited *supra*).

Extent of Federal rights as to navigation.

5655. Do I understand you to hold that, although the rights so far as navigation is concerned are vested in the Federal Government, those rights do not extend beyond that portion of the river that is tidal? I have just been pointing out that they do extend; but they are not common law rights. Page 567:—

The public have no common law right of navigation in rivers and streams above the flux and reflux of the tide; but such a right may be acquired either by user or by Act of Parliament.

Ancient user.

When user gets beyond the recollection of man, and in the hoary mist of ages, when they cannot look back to the user, it then becomes common law, the origin of which perhaps no one knows.

5656. Any rights that may have grown up as the result of using would be vested in the Federal Government? Yes.

Limits of navigation right.

5657. Nothing more than that? No; and it says here, "The extent of such a right being limited to the extent to which it has been actually exercised." That is to say they could not suddenly come in and claim a right of navigation in the Darling above Bourke where there never has been navigation.

5658. *Mr. Murray.*] You say that the right of user could not be extended by the Federal Parliament? It could not be extended in non-tidal rivers.

5659. Would that doctrine apply in respect to time or locality, or both? I fancy in the case of the Darling we would have to admit that it is a navigable stream by user. It is navigable, I understand, for all purposes as far as Wentworth, then for certain seasons of the year to Wilcannia, and during certain seasons to Bourke. We would have to take that as a fact established by many years of knowledge and many years of actual user of the river, but I will refer to that later on, dealing with it from the American standpoint, where there is a very much better volume of law for our purposes than in England, that is speaking of the public right of navigation. Page 569:—

Navigation rights of riparian proprietors.

Proprietors on the banks of a public navigable river have a special interest in the navigation, by reason of their right of access to the river, which they enjoy apart from the rest of the public. The rights of riparian proprietors do not depend upon the ownership of the river-bed, but exist because their lands have the advantage of being washed by the stream (Lyon *v.* Fishmongers Co., 1876, 1 App. Cas. 662, 673, 682); and a riparian proprietor has the same right of access in the case of a public navigable river as in the case of a river which is not navigable; and an obstruction which interferes with such right of access is an actionable wrong, without proof of special damage (North Shore Railway Co. *v.* Pion, 1889, 14 App. Cas. 612; Dobson *v.* Blackmore, 1817, 9 Ad. and E.N.S. 991; and see Marshall *v.* Ullswater Co., 1871, L.R. 7 Q.B. 166).

American law.

That is the English law on the subject. When you come to the American law, the law of a country much more similar to Australia than England, you will get a volume of information which certainly ought to be applied in regard to legislation and government in this country as being much more applicable than the English law. Where the Americans have departed from the English law, they have departed from it after solid thought and argument, and in every case they have attempted to show that the departure has been in sympathy with the English jurisprudence—supposed to be based on natural law and justice. I have here a treatise on the law of irrigation by C. S. Kinney. He has collected a valuable fund of information with regard to the American law and irrigation in America. He says on page 11:

Arid region and common law doctrines.

It must be borne in mind that there are two separate and distinct systems of water rights in the arid regions of the United States; one, the arid region doctrine, whose law is priority of appropriation; the other, the common law doctrine, whose basis is equality between all those who own lands upon the stream.

The common law doctrine is the doctrine of the English law, which I have just cited, and the other doctrine is the doctrine of priority of appropriation, which is the ancient civil law of the Romans, which has been reapplied because the natural conditions of the country required its existence. Pages 11 and 12:

Rights of riparian owners.

All the rights of the riparian proprietors upon the same stream are equal, and, if all have their natural wants supplied, and there is still water in the stream, they all have an equal right to use the surplus for any artificial purpose or want. But, upon the other hand, in a hot and arid climate, water is indispensable for the cultivation of the soil, and, as between those who claim the water by the priority of their different appropriations, water for irrigation may be classified as a natural want. This question was discussed at length by the Supreme Court of Illinois, in the case of Evans *v.* Merriweather, in which the Court said:—"The use must be a reasonable one. Now, the question fairly arises, is that a reasonable use of running water, by the upper proprietor, by which the fluid is entirely consumed? To answer the question satisfactorily, it is proper to consider the wants in regard to the elements of water. These wants are either natural or artificial. Natural are such as are absolutely necessary to be supplied in order to his existence; artificial, such only as by supplying them his comfort and prosperity are increased. To quench thirst, and for household purposes, water is absolutely indispensable. In civilised life water for cattle is also necessary. These wants must be supplied, or both man and beast will perish. The supply of a man's artificial wants is not necessary to his existence. He could live if water was not employed to irrigate his lands, or in propelling his machinery. In countries differently situated from ours, with a hot and arid climate, water doubtless is indispensable for the cultivation of the soil, and in these water for irrigation would be a natural want." Hence it follows that, if the prior proprietor should consume all the water of a small stream for irrigating his land without waste, it would still be to supply his natural wants.

"Reasonable use."

Natural and artificial wants.

That shows tersely the difference which has grown up in regard to the American law in one region and the American law in another region under the same Federal Government. As to the word "reasonable," according to natural requirements there have grown up two totally different applications of the same principle, and these would now be regarded as different principles. Now, this writer points out that if

the

J. H. Carruthers, M.L.A.

the common law doctrines had been applied to Egypt and to other arid countries, which have subsisted entirely by the artificial storage and use of water, their history would have been a blank. There is a very learned opinion, given by Mr. Justice Barnes, pages 21, 22, and 23:—

30 Sept., 1902.

Antiquity of right of irrigating.

Mr. Justice Barnes, in rendering the decision of the Supreme Court of Arizona, in the case of *Clough v. Wing*, in the year 1888, went into the history of the subject, and in the course of his very able opinion said:—The right to appropriate and use water for irrigation has been recognised longer than history and since earlier than tradition. Evidences of it are to be found all over Arizona and New Mexico in the ancient canals of a pre-historic people, who once composed a dense and highly civilised population. These canals are now plainly marked, and some modern canals follow the track and use the work of this forgotten people. The native tribes, the Pimas and Papagoes, and other Pueblo Indians, now as they for generations have done, appropriate and use the waters of these streams in husbandry, and sacredly recognise the rights acquired by law and use, and no right of a riparian owner is thought of. The only right in water is found in the right to conduct the same through their canals to their fields, there to use the same in irrigation. The same was found to prevail in Mexico among the Aztecs, the Toltecs, the Vaquis, and other tribes at the time of conquest, and remained undisturbed in the jurisprudence of that country until now. It existed also in Peru, though there the appropriation was by the State, which constructed and maintained the canals for the use of the tillers of the soil. The Spanish conquerors brought the same idea with them from Spain, where they prevailed then as now. Escriche, tit "Agua," §§ III, IV, and "Acequia." "The Lombard kings following the Roman practice encouraged and extended irrigation in Italy. From Lombardy the art extended to France; while the Moors encouraged it in Spain, Sicily, and Algeria." "Ency. Brit.," 9th edition. "Necessity required it in the districts which comprise parts of the South of Spain, Portugal, and Italy, including Sicily and Greece." Id. "Ruins of ancient irrigating works are found in Spain." Id. In Egypt and in some parts of Persia, India, and some parts of China, this form of husbandry has been practised from time immemorial, and still continues. Under the civil law, water was *publici juris*, and by that law the "first person who chooses to appropriate a natural stream to a useful purpose has title against the owner of the land below, and may deprive him of the benefit of the natural flow of the water." Per Denman, in Mason *v.* Hill, 5 Barn. and Adol. 1. Thus we see that this is the oldest method of skilled husbandry, and probably a large number of the human race have ever depended upon artificial irrigation for their food products. The riparian rights of the common law could not exist under such system; and a higher antiquity, a better reason, and more beneficent results have flowed from the doctrine that all right in water in non-navigable streams must be subservient to its use in tilling the soil."

That is the doctrine that I certainly desire to see adopted in regard to the arid districts of New South Wales; and I venture to tell this Commission—what I stated in the Federal Convention, and what I have repeated since—that, as far as I have experience and knowledge to guide me, unless that principle is applied to what is called our Western Division, and the country served by the tributaries of the Darling, the central and western districts of this Colony will lie undeveloped for centuries. In America they have wiped out the whole thing; they have applied now these other principles, and as this learned Judge says, "a higher antiquity, a better reason, and more beneficent results have flowed from the doctrine that all right in water in non-navigable streams must be subservient to its use in tilling the soil."

Navigation subservient to irrigation.

WEDNESDAY, 1 OCTOBER, 1902.

[*The Commission met in the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, ESQ. (PRESIDENT).

STUART MURRAY, ESQ. | FREDERICK N. BURCHELL, ESQ.

Professor Pitt Cobbett, M.A., D.C.L., Challis Professor of Law in the University of Sydney, sworn and examined:—

Professor Pitt Cobbett, M.A., D.C.L.

1 Oct., 1902.

5660. *President.*] What is your name? Pitt Cobbett.

5661. You are a Professor of Law at the Sydney University? Yes.

5662. You have been furnished with a list of questions bearing on the legal aspect of the matter that has been remitted to us for consideration? Yes.

5663. And you are prepared to answer them? Yes.

5664. [Question No. 1.] Did Section 5 of the Constitution Statute (18 and 19 Victoria, c. 54), which enacts that "the whole watercourse of the said river Murray from its source therein described to the eastern boundary of the State of South Australia is, and shall be, within the territory of New South Wales," thereby make New South Wales the legal possessor of the waters passing along the bed of that river. If not:—(*a*) What was the right conveyed by that enactment? (*b*) How has that right been affected, if at all, by the passing of the Commonwealth Constitution Act? (*a*) The effect of Section 5 of the Constitution Statute was to deprive the Colony of Victoria of any territorial interest in the watercourse of the Murray, and, within the geographical limits indicated by the Act, to constitute the entire river bed up to the high-water mark of the ordinary flood, a part of the territory of New South Wales. The legal title to the soil of the river bed remained in the Crown for and on behalf of the Colony of New South Wales, in the same way as other unalienated lands of that Colony. With respect to the water, it is true that as between private proprietors there is strictly no property in water, but a mere usufruct of it as it passes along; but as against this it has to be remembered that the water in question passes over a course, or channel, which the Act expressly constitutes an integral part of the territory of New South Wales. From this I gather that both the river bed itself, and the usufruct of the water, became subject to the legal control of the Legislature of New South Wales. As regards Victoria, this was subject to concurrent right on the part of the latter State—(1) to make and enforce Customs regulations as regards goods entering that Colony by way of the river; and (2) to make and enforce regulations with respect to the navigation of the river by Victorian vessels. The latter proviso may, perhaps, be regarded as reserving a right of navigation to the inhabitants of Victoria, although it may equally well rest on a presumed acquiescence in such user by New South Wales as a matter of comity. From this time on, I take it that the Legislature of Victoria had no more right to exercise any control of the waters of the Murray than it had over any other waters flowing over, or through, the territory of New South Wales. As regards the other riparian State, South Australia, I do not think it can be said that the control vested in the Legislature of New South Wales was subject to any legal limitation such as exists between private riparian owners; but I think it may fairly be said that it was subject to a somewhat similar limitation as a matter of comity. As to the value of a right of comity, it is true that a violation of such a right as between independent States is commonly met by mere revision, but in the case of two British colonies I think than a serious invasion even of such rights might conceivably have afforded good

Effect of Section 5 of Constitution Statute.

River bed and usufruct of water.

Rights of comity.

good ground for a petition addressed to the Crown with a view to the correction of the injury by Imperial legislation, and that such a petition might well have formed the subject of a special reference to a general committee of the Privy Council under 3 and 4 William IV, chapter 41, section 4, as a matter involving, *not so much a legal issue as a question of general policy.* (*b*) In view of the provisions of sections 106, 107, and 123 of the Constitution, I do not think that the passing of the Commonwealth of Australia Constitution Act has affected the legal position of New South Wales, except in so far as it would not now be competent either for the Legislature or Government of New South Wales to deal with the river in such a way as to obstruct interstate trade; or in such a way as to derogate from any law made by the Federal Parliament in relation to the Murray as a channel of interstate commerce under section 51, subsection 1, and section 98; subject to such federal law, however, not abridging the rights conferred by the Constitution on New South Wales and its residents under section 100—that is, to a reasonable use of the waters for conservation and irrigation.

Professor Pitt Corbett, M.A., D.C.L.

1 Oct., 1902.

Effect of Commonwealth Act.

5665. Will you explain to us the exact rights that Victoria had in respect to the river Murray outside the territorial rights? I think that Victoria's right was merely a right to navigate, what is a right on the part of the residents in Victoria to navigate the river. But what I was trying to point out was, that the Victorian Government had no legal control over the waters; the two rights reserved by the Act were to make and enforce Customs regulations, and to share in the navigation of the river.

Victorian rights in the Murray.

5666. On equitable grounds I understood you to say that South Australia had rights in respect to the waters of the Murray, although she does not contribute to those waters to any appreciable extent;—now what rights had Victoria? At the best a similar right in comity; but, for my part, I do not think Victoria had any right to withdraw the waters of the Murray. If a river is made specifically a part of the territory of one Colony, as I apprehend was done by this enactment, an adjoining Colony would have no right whatever to either control or even use the water, except in so far as such rights were conceded by the enactment in question.

Limits.

5667. I suppose the crux of the question would be involved in the term "watercourse" in the 5th section of 18 and 19 Victoria, chapter 54;—and, therefore, it would turn on what the term "watercourse" means? I think that is right. I was looking at other evidence which has been given, and I confess it does not seem to admit of any other meaning, unless you deem the law applicable to private proprietors, to have been applicable as between the separate colonies. A view which I confess seems to me untenable. Watercourse to my mind means: the bed of the river, the bank of the river up to the level of the ordinary flood, the title to which carries a usufruct of the flowing water.

"Watercourse."

5668. Had Victoria a right to use it? I think not, because this was made a river within the territory of New South Wales. If my view is correct, she had no right to use the water.

5669. *Mr. Murray.*] The Act 18 and 19 Victoria, how did it come to be made? Of course, we know the history of it. First there were the Land Regulations of 1840 that fixed the boundary as the course of the river Murray. Then the Act of 1842 again fixed the boundary as the course of the river Murray. Then came the 13 and 14 Victoria which adopted the same limitation of boundary. And then suddenly the Constitution Act goes home; it is partly remodelled by the English lawyers, and the Constitution Statute is also framed. And in that Statute we find this particular provision.

History of Act 18 and 19 Victoria, c. 54.

5670. I understand you to say that the Act referred to took away any rights that Victoria might have had to legislate in respect to the Murray? Yes.

Effect of 18 and 19 Vic., c. 54.

5671. And also that Victoria never could have had any rights to divert? What I said was that this Act had the effect of depriving Victoria of any territorial interest in the watercourse of the Murray. Under the previous Acts Victoria had a concurrent right to the usufruct of the water.

5672. Prior to the passing of that Act? Yes.

5673. The exclusive territorial jurisdiction over the Murray River, the legal title of the soil, remained to the Crown? The Crown on behalf of New South Wales. The territory was New South Wales territory, and the legal title to the soil was in the Crown.

5674. And that right was taken away, so far as Victoria was concerned, by that Act? Yes.

5675. I also understood you to say that Victoria had rights of navigation in the river? I think that is impliedly deducible from the terms of the Act, because it gives Victorian Government officials rights to make and enforce rules of navigation in connection with Victorian vessels.

5676. Would you hold that Victoria had rights of usufruct in the Murray prior to the passing of the Act 18 and 19 Victoria, chap. 54? I think so.

Victorian rights prior to Act 18 and 19 Victoria.

5677. How were they taken away? By the provisions of this Act, which says in substance the whole river bed of the Murray shall be in the territory of New South Wales. Before, it was not in the territory of New South Wales; the territory of each Colony was reckoned up to the centre of the deepest channel.

5678. Could you explain to us how those rights were taken away? By the provisions of this Act; the watercourse—the bed of the river, the bank of the river up to the level of the ordinary flood, together with the usufruct of the water flowing over it—was to be part of the territory of New South Wales. It came within the territory, and was therefore subject to the Legislature of New South Wales, just like any other part of the Colony of New South Wales.

How affected by Act.

5679. Prior to the Act 18 and 19 Vic., chap. 54, what was the position of things in regard to the Murray River? Prior to that Act and under the statute of 1850 (by which Victoria became a separate Colony) the boundary between Victoria and New South Wales was the Murray River; or more exactly a straight line drawn from Cape Howe to the nearest source of the river Murray, and thence to follow that river to the boundary of South Australia. That was the boundary in the Act of 1850, by which Victoria became a separate Colony. Under that enactment each State owned its side of the river bed up to the middle of the deepest channel, and had the concurrent right to the use of the water flowing over the whole channel. Then 18 and 19 Victoria was passed, and that provides that the whole watercourse of the Murray shall be part of the territory of New South Wales. That means that the whole bed of the river, and the bank up to what you may call the level of the ordinary flood, are to be a part of the territory of New South Wales, and subject to the legislative control of the Government of New South Wales. It may not be fair or reasonable, but it is what the Act provides.

Position in regard to the Murray prior to Act 18 and 19 Victoria, c. 54.

5680. Do you think that the action that was taken with regard to Pental Island, which was declared by a Committee of the Privy Council to be within the State of Victoria, has any bearing on the subject;—do you think the view of the judicial mind, as represented by the Privy Council, throws any light on it? I should like to consider that question before answering it, but the terms of the Statute seem to me paramount.

Pental Island.

5681.

Professor Pitt Cobbett, M.A., D.C.L.

1 Oct., 1902.

5681. *President.*] [Question No. 2]. Prior to Federation, what was the scope of the riparian law as between the Colonies;—has Federation modified, and, if so, how, the tenor of this law as between States; what tribunals are to be appealed to for the enforcement of interstate riparian law? I agree with the view ordinarily held, that prior to Federation no common riparian law can be said to have been in force as between the different Australian colonies, and that these colonies were, as regards the title to, and the right of, user of the rivers forming a boundary between, or flowing through, two or more colonies, in the position of independent political communities, as between whom there can be no mutually binding law enforceable by reference to a common tribunal. This, of course, in default of Imperial legislation applicable to the matter. At the same time it is necessary to remember that the Australian colonies were parts of a larger political community, and subject alike to the Crown, and, in the last resort, to the Imperial Parliament. Hence I think (1) that a violation of any right resting on an Imperial enactment—such as that contained in section 5 of the Constitution Statute—might very well have been justiciable in the courts of the Colony in which the wrong was done or begun; whilst (2) a denial of the ordinary rights of comity might conceivably have formed the subject of a special petition to the Crown, with a view to its intervention in its executive capacity or to Imperial legislation. In reply to the second part of the question, the establishment of the Commonwealth has altered this to the extent that the States are now restricted by the Constitution itself from exercising their rights over navigable waters of the Commonwealth in such a way as to obstruct interstate trade (this by section 92—and quite irrespective of the Federal Parliament passing any law. If any State were now to set up a bold obstruction which prevented the passing of traffic and the carrying on of trade and commerce, it would be a violation of the Constitution). The State will also be bound by any law which may be made by the Federal Parliament in relation to any navigable water constituting a channel of interstate trade (section 51, subsection 1, and section 98 of the Constitution), so long as such law does not abridge the right of a State to the reasonable use of the waters for conservation and irrigation (under section 100). As to the third part of the question, any such violation of the Constitution or Federal law, as above described, would now constitute a good ground for proceeding in the High Court, either under section 75 or under section 76—in one case, a matter between the States, and in the other case for the enforcement of the law of the Commonwealth. But there is still no common law of the Commonwealth on this subject other than such as is contained in the provisions of the Constitution above referred to.

Prior to Federation no common riparian law in force between the colonies.

Violation of right justiciable in colonial court.

Commonwealth jurisdiction over navigable waters.

High Court.

5682. [Question No. 3]. Must not the 18th and 19th Vic. c 54, section 5, for the purpose of understanding its true purport and meaning, be read with the 13 and 14 Vic. c. 59, and being so read, does it not appear that section 5 of 18 and 19 Vic., c. 54, was passed to settle doubts as to the true meaning of descriptive words in 13 and 14 Vic. c. 59, and to get over difficulties caused by want of a clear delimitation of the boundaries of New South Wales and Victoria, as to the imposition and collection of Customs duties, the punishment of offences, and the regulation of navigation? The boundary originally fixed for the Port Phillip district by the land regulations of 1840 and by the Constitution Act of 1842, and also for the newly-created Colony of Victoria under 13 and 14 Vic., chap. 59, section 1, was a straight line drawn from Cape Howe to the nearest source of the river Murray; and thence the course of that river to the eastern boundary of the Province of South Australia. That was the original boundary. By the Constitution Statute, section 5, this boundary was altered, as has been already described. The reason for the change of boundary has never, I think, been satisfactorily explained; no such provision was contained in the Colonial draft of the Constitution Act, which is quite different from the Constitution Statute. Probably a search into the archives of the Colonial Office might solve the difficulty. One might fairly surmise that the English lawyers who drafted the Constitution Statute anticipated that legal difficulties might arise from a joint control of the river, and sought to avoid this by inserting in the Constitution Statute the provisions contained in section 5. But the difficulty of understanding the motives which led to the change does not constitute any reason for limiting or stinting the clear legal effect of the section as it stands.

Alteration of boundary by Constitution Statute.

5683. *Mr. Burchell.*] Do you not think it was recognised that ownership of the whole river and both banks would be challenged when the words were used:—"Provided also that it shall be competent for the legislatures of the said two Colonies by laws passed in concurrence with each other to define in any different manner the boundary line of the said two Colonies along the course of the river Murray, and to alter the other provisions of section 4?" The object of that was, that if the boundary were found inconvenient or unreasonable then the Colonies were able to legislate and alter their boundaries, without having recourse to the Imperial Parliament, which, in default of that provision, they could not have done. If the two legislatures liked to alter this by any arrangement then it would have been competent for them to do so. But it was like saying to a man who had come into an inheritance, "You may give it away if you like." It merely said if the two agree, then, without any further reference to the Imperial Parliament, they could alter their boundaries.

Power to alter boundary by legislation.

5684. *President.*] [Question No. 4.] One witness has stated that,—"Any schemes which so interfered with the natural flow of the river (Murray) as to render it less navigable than formerly would be unconstitutional since Federation was established." (*a*) Do you concur in this? (*b*) Is this statement supported by analogy of riparian relations as declared and administered between European States? (*c*) Do existing conventions or treaties between any European States regulate the right to divert water for irrigation purposes? (*a*) I would rather put this statement thus: Any scheme interfering with the natural flow of the Murray, and constituting a complete or even serious obstruction to its navigability for the purpose of interstate trade, would probably be held to be an infringement of section 92 of the Constitution. Further, whilst in the event of the Federal Parliament taking advantage of its powers under section 51, subsection 1, and section 98, and prohibiting by law or regulation of commerce any interference with the navigability of rivers capable of being used for the purpose of interstate commerce, then any scheme—whether undertaken by a State or by an individual—which impaired the navigability of any such river would be illegal under such Federal law, subject, however, to the restrictions imposed by section 100. (*b*) This statement does not rest upon the analogy of riparian relations existing between European States, but upon the express provisions of the Constitution, interpreted in the light of United States decisions, which decisions the debates of the Convention showed to have been fully appreciated, and to have been intended to apply to Australia, so far as relates to the control of the Federal Parliament over navigable waters, subject to the restrictions imposed by section 100. That is not an argument by law, but it is an argument available before gentlemen such as yourselves, who are considering a matter of policy as

Unconstitutional schemes.

Professor Pitt Cobbett, M.A., D.C.L.

1 Oct., 1902.

as well as law. The great navigable rivers of Europe, such as the Rhine and the Danube, have been the subject of various international agreements, which may now be said to constitute a part of the public law of Europe; but the question of the use of the water for irrigation has not, so far as I am aware, ever been directly raised as between European states, although by treaties, in 1856 and 1871, relating to the Danube, a European Commission has been established, which is charged with the maintenance of the navigability of the stream, and it has, I believe, regulated the diversion of the water for the purpose of irrigation. There is no direct treaty or agreement with respect to irrigation, but by virtue of having charge of the navigability of the stream, the European Commission has proceeded to regulate diversion of the water and its use, but I have never been able to discover the exact regulations which have been made. The question of the diversion of water as between States has, however, arisen as between the United States and Mexico, and is referred to in certain correspondence between the respective Governments of those countries in June, 1880, but I am not able to say whether the protest of the United States against the diversion of the waters of the Rio Grande by Mexican citizens produced any effect. (*c*) So far as I know, existing treaties and conventions between European States do not deal directly with the question of diversion of water for the purpose of irrigation.

Danubian Commission.

U. S. and Mexico.

European treaties.

5685. [Question No. 5.] Is the alveus or bed of a public navigable river, *inter Regalia*, or in the Crown? Under the English law, the Crown has an absolute proprietary interest in the bed and banks of a navigable river up to high-water mark, subject, however, to a right of navigation on the part of the public; and though the Crown may make grants to private persons, it cannot by any such grant derogate from the public right to navigate. But, according to English law, the test of a navigable river lies in its being within the ebb and flow of the tide. With regard to other rivers, that is, non-navigable (non-tidal) rivers, riparian proprietors are *primâ facie* entitled to the soil *ad medium filum aquæ*. This law appears to obtain in New South Wales as between private proprietors, subject, however, now to the provisions of the Water-Rights Act, 60 Vic. No. 20, sections 1 and 2. The test of a navigable river (as a river within the ebb and flow of the tide) for the purpose of determining the right to the ownership of the bed is not a satisfactory one. It has been discarded in the United States and Canada, where the test of the navigability of a river consists in the capacity for being used as a channel of trade or commerce. Navigable, if it is really navigable in fact, that is the United States test. The Canadian test is, when it is actually being used as a channel of trade and commerce.

Bed of navigable river vested in the Crown.

Non-tidal rivers *primâ facie* in riparian proprietors.

5686. What rule would you apply to the navigation clauses in the Constitution Act, that is to say, what, in your opinion, would constitute a navigable river within the meaning of that Act? I should say clearly, one capable of being used as a channel of trade or commerce between the States.

Navigable river.

5687. [Question No. 6.] One witness has stated that South Australia's claim to a share in the waters of the Murray extends to all the tributaries of that river—(*a*) has such a claim any legal or constitutional basis; (*b*) can the tributaries be diverted so as to interfere with the navigability of the main stream? If the Federal Parliament should legislate on the subject of navigation of rivers constituting a channel of trade between the States, then South Australia would be entitled to share in the benefits of such legislation so far as it related to the maintenance of the navigability of such rivers, and if South Australia, or any resident therein, were injured by the action of another riparian State, then South Australia, or the party injured, would be entitled to proceed in the High Court for the purpose of vindicating her rights. Such a matter would fall within the jurisdiction bestowed or contemplated by sections 75 and 76, but such a Federal law must not abridge the right of any other State, or its residents, to a reasonable use of its waters for irrigation or conservation. This by section 100. (*b*) Assuming that the maintenance of the navigability of interstate rivers were duly established under a law of the Federal Parliament, then I think that on the analogy of the United States' decisions this would involve a right on the part of any State not to have the navigability of any such river interfered with, directly or indirectly. I, therefore, think that the diversion of the waters of a tributary stream would, if it could be shown in fact to have affected the navigability of the main stream, constitute an infringement of the Federal law, but again it must be pointed out that such Federal law would only be valid subject to the restrictions imposed on the Commonwealth Parliament by section 100.

South Australia's claim to tributaries of Murray.

Maintenance of navigability.

5688. Do I understand you to say that the only rights that South Australia has under the Commonwealth Constitution relate wholly to navigation? The right to have the navigability of the river not interfered with by any other riparian State in such a way as to injuriously affect South Australia, subject, however, to section 100—that every State has a right to a reasonable use for the purposes of irrigation and conservation. If, apart from any Federal law, a State were to block any river, it would be a violation of section 92.

South Australian right *re* navigability.

5689. So long as the navigability was preserved in the main river, and any other rivers which are usually navigable, would it be competent for a State to divert the whole of any tributary within its own territory? Yes, I should say so.

Right of State to divert tributaries.

5690. *Mr. Murray.*] Diversions from tributaries such as to impede navigation would be a good cause of complaint on the part of South Australia, subject to the reservations under section 100? That is to say, New South Wales might divert water for irrigation or conservation if it constituted a reasonable use; saving that, it must not do anything to impede navigation by an unreasonable use of the water to the detriment of South Australia.

Impeding of navigation.

5691. The great difficulty we have in interpreting this is the word "reasonable"; a State, for example, might think it a very reasonable use to divert the greater portion of a tributary in order to promote the cultivation of land, but South Australia might think it very unreasonable that the navigation should be impeded by the diversion of this water;—where would the delimitation come in? It consists of the balancing of the respective claims of navigation and of industry. If you could show that a particular industry of a very important kind could not be carried out without irrigation, and if the diversion of water would establish that industry, and there were other channels of communication, and if the navigation in this particular case were not of an important character and the amount of trade carried not very large, or the river were only navigable for certain portions of the year, I should say the use of an extensive quantity of water for the purpose of establishing an important industry would be a reasonable use, even though it interfered with navigation. On the other other hand, if there were a large trade on a navigable river, and the diversion of water for the purpose of any trade or industry would interfere with the conduct of that important trade, and there were no other means of communication, I should say the diversion would be an unreasonable use of the water.

Interpretation of "reasonable use."

Guiding principles.

5692. One witness cited an American authority, stating that the use of water for navigation must be subservient

Professor Pitt Cobbett, M.A., D.C.L. 1 Oct., 1902.

subservient to its use in the cultivation of the soil;—do you agree with that? Must, under certain conditions, be deemed subservient to its use in the cultivation of the soil—that is, where the navigable trade is not a very important one and the industry to be supported or created is very important.

Guiding principles.

5693. The witness ventured the opinion that if the common law doctrines of England were strictly enforced here, five-sixths of the Australian Continent would remain uninhabited for all time? If it could be shown that a large and important industry could be created and supported by the diversion of water which would impede navigability, then it would be necessary to balance the respective claims of the navigable trade on the one side and the proposed industry on the other. For this purpose one would have to take into consideration what trade already existed as regards navigation, what other channels of communication existed, and if you could show that but for the diversion of the water there would be no trade or industry, then I should say the interests of navigation would have to be sacrificed to the larger interests of the trade or industry. If it could be shown in this case that there was not a very large navigable trade, or that it could only be carried on for a portion of the year, I should say the interests of the industries would be paramount over those of navigation. The principle is the balancing of the respective claims.

5694. Would you consider that such a question would be for the Federal High Court? The question would have to be decided in view of the circumstances of each particular case, but in the light of general principles as to what is reasonable and not reasonable.

Navigation *v.* irrigation.

5695. *Mr. Burchell.*] Where irrigation and navigation could be carried on together, do you think it would be advisable to sacrifice navigation for rail carriage? No. I do not think it would be legitimate to sacrifice navigation—assuming navigation to be established and an important trade—to the creation of a new industry; but if the navigation were not already important, or if it were occasionally interrupted, then the establishment of a new industry by the diversion of water which would impair navigation, might be a reasonable use.

5696. Where navigation was first established, what would you say? It would require a very strong case to warrant any diversion of water impairing that navigation; but even where there had been a long custom of navigation, and if some boats only went up once a week, and it could be shown that a large tract of country could be made fertile and contribute to the wealth of the State by irrigation, then I say this spasmodic navigation, however long carried on, would be subservient to irrigation.

Miner *v.* Gilmour.

5697. *President.*] [Question No. 7] (*a*) Was the difficulty prior to Federation of the application of the principles of riparian rights between Colonies or the citizens of different Colonies, that there was no tribunal having jurisdiction to determine, or enforce such riparian rights or equities; (*b*) is the law as to riparian rights to the use of flowing water authoritatively laid down in the case of Miner *v.* Gilmour, XII Moore P.C., 131, in which it is declared: every riparian proprietor has a right to the reasonable use of the water flowing past his land—namely, for his domestic purpose and for his cattle—and this without regard to the effect such use may have, in case of a deficiency, upon proprietors lower down the stream; he has also the right to the use of the water for any other purpose, provided he does not thereby interfere with the rights of the proprietor either above or below him; subject to this condition, a riparian proprietor 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 waters of the other proprietors, and inflicts upon them a sensible injury; (*c*) does this decision bind the Australian States in their interstate relations? (*a*) The difficulty was that there was in general no law on this subject mutually binding as between the different Colonies or the citizens of different Colonies; each Colony was at liberty to alter the inherited common riparian law. (*b*) Miner *v.* Gilmour establishes a distinction between the ordinary and extraordinary use of water by a private riparian owner, laying down that every riparian owner has a right to the ordinary use of water without regard to the effect of this upon other proprietors, but that he has a right to use it for extraordinary purposes only if he does not interfere with the rights of other proprietors. This principle has been affirmed and developed in later decisions; but it does not appear to me to affect State rights in the matter.

Prior to federation no general riparian law.

Riparian owner's rights.

Rule not binding on States.

(*c*) No. This rule does not appear to me to be applicable as between the different States of the Commonwealth: it is only a rule of English law, binding as between private proprietors. It is submitted that under the existing provisions of the Constitution, which have been already referred to, and assuming the Federal Parliament legislates with respect to the navigability of rivers serving as channels of interstate commerce, the result would be as follows:—(1) Every State, and the residents of every State acting under their State law, will be primarily entitled to divert the waters of rivers passing through their territory, to such an extent as may be reasonable, for the purpose of irrigation and conservation—say, for the purpose of supplying a town with water. (2) What is reasonable, will be a question of fact to be determined by the Court in the circumstances of each case; but, on the analogy of American decisions, I should say that, for the purpose of determining this question, the claims of local industry or agriculture on the one hand, and the value of maintaining the navigability of the river on the other hand, must be compared and balanced (*see* case of the United States *v.* The Rio Grande Dam Company, 51 Pac. Rep., 674). (3) Subject to the restrictions imposed by section 100, the Federal Parliament will have full power to legislate with respect to the navigability of the waterways of the Commonwealth.

Reasonable use as between States.

5698. [Question No. 8.] (*a*) Before Federation, what was the right of a Colony as to the waters of a river wholly within its own territory, but forming a tributary, direct or indirect, of the Murray; (*b*) were the rights of New South Wales the same as to control and use of the waters of the Murrumbidgee, which is a tributary of the Murray, and, say, to the Hawkesbury, which flows into the Pacific Ocean near Sydney; (*c*) have such rights in either, or both cases, been affected by the passing of the Commonwealth Constitution Act, and, if so, to what extent and in what way? (*a*) Prior to federation, each Colony had full control and power to use all waters within its own territory, irrespective of any effect which such use might have on the waters of the Murray itself. The Constitution Statute, 18 and 19 Vic., section 5, does not appear to me to have affected the right of Victoria to deal with the tributary streams of the Murray.

Right of Colony to waters wholly within its own territory.

(*b*) Yes, save that an unreasonable use of the waters of the Murrumbidgee producing serious injury to a lower riparian State, might conceivably have provoked a petition to the Crown in Council, with a view to influencing the Executive action of the Crown, or with a view to Imperial legislation. (*c*) The control of New South Wales over the waters of the Murrumbidgee has been affected by Federation to the following extent: that it would not now be competent for the State of New South Wales to deal with the Murrumbidgee in such a way as would impair or impede the navigability of the Murray, subject always

How affected by Federation.

Professor Pitt Cobbett, M.A., D.C.L. 1 Oct., 1902.

always to the rights reserved to New South Wales and its residents under section 100. The right to control and use the Hawkesbury has not been affected by Federation, inasmuch as it does not appear to be a channel of interstate trade or commerce.

Existing Victorian obligations.

5699. [Question No. 9]. Assuming the Government of Victoria to have entered into obligations with regard to the supply of water from the Murray and its tributaries, should any agreement between the three States, especially interested in the Murray regard these obligations as validly entered into, and deal only with such of the waters as remain unappropriated after they have been satisfied;—will you state your opinion separately as to the main river and as to the tributaries? So far as the claim referred to in this question relates to the tributaries of the Murray, it appears to me that Victoria, in entering into such engagements, was within her legal rights, and that such obligations should remain unimpaired. So far as relates to the Murray itself, however, it appears to me that Victoria would have exceeded her legal rights, and that it would be unreasonable to exact from the other States a recognition of the obligations so incurred.

5700. To what States do you refer? New South Wales and South Australia. What I submit is that, inasmuch as Victoria had no right to legislate with respect to the waters of the Murray, it would be unfair to recognise her obligations in any agreement between New South Wales and Victoria; but Victorian obligations with regard to the tributaries ought to be acknowledged, because I think in that case Victoria was within her legal rights.

5701. I understand you to say that so far as the water in the Murray is concerned—say for the purpose of water conservation, irrigation, and navigation, so far as New South Wales is concerned, and navigation only so far as South Australia is concerned—the obligations entered into by Victoria should not be respected? I think it would be unreasonable to exact this as a condition of entering into such an agreement; but, as a matter of policy, it might be well to do so.

Method of legalising interstate agreement.

5702. [Question No. 10]. If the three States represented on this Commission desired to enter into an agreement with regard to the utilisation of the waters of the Murray and its tributaries for the purpose of water conservation and irrigation, what would be the best method of making that agreement effective;—would it be competent for the Federal Parliament, at the request of the three States, to legalise such an agreement by statute, or should the agreement be given legal effect by the passing of identical statutes in the State Legislatures? I should say that any arrangement between these three States would necessarily be subject to the provisions of the Constitution already referred to—that is, establishing the Federal Parliament a right to legislate on the subject of navigation and preserving freedom of interstate trade, and also to any legislation passed by the Federal Parliament by virtue of its powers under section 51, subsection 1, and section 98. If identical statutes were passed by the States such statutes might be repealed at the discretion of any of the States. In view of these difficulties, I should say that it would be expedient that any arrangement come to between the States should, if possible, be given effect to by Federal Legislation. This might be done under section 51, subsection 37, although only at the request of the Parliaments of the States concerned. Such arrangement or legislation would also be subject to the rights reserved by section 100.

Difficulties.

Maintenance and improvement of navigability.

5703. [Question No. 11.] Should any such agreement or compact be subject to the maintenance and improvement for the purpose of interstate commerce, of the navigability of rivers under Federal jurisdiction? If this question means: Should any such agreement, if entered into, contain provisions for the maintenance and improvement for the purpose of interstate commerce of the navigable rivers comprised therein, then it seems to me that such an arrangement, although within the competence of States, would always be liable to be overridden by an exercise of its powers by the Federal Parliament. This difficulty, however, could be avoided by adopting the course recommended in my answer to question 10.

Centralised authority.

5704. [Question No. 12.] The power of legislation on the subject of navigation being now vested in the Commonwealth Parliament: (*a*) Seeing that inland navigation is closely connected with water conservation and irrigation, do you think the control of all these matters should be under one centralised authority; (*b*) Could the Commonwealth Parliament, at the request of the States, pass a statute governing not only inland navigation, but also water conservation and irrigation; (*c*) If so, is it necessary or desirable that such a measure should be of general application and extend to the whole Commonwealth; (*d*) Do you consider the riparian law of England suitable to the physical conditions of Australia, or do you think the principle laid down in the New South Wales Water Rights Act, 60 Vic. No. 20 (now consolidated statute No. 51 of 1902), which declared the rights of the Crown to the use and flow and to the control of waters in rivers and lakes, should be extended throughout the Commonwealth; (*e*) Do you think it desirable that the matters of water conservation and irrigation together with inland navigation should be controlled by a Department of the Commonwealth Government administering such a statute as referred to in subsection (*b*) of this question? (*a*) The control of the subjects of inland navigation, water conservation and irrigation by one central authority seems no doubt very desirable; at the same time I am doubtful whether any agreement for the submission of these matters to one common authority would suffice to debar a State or its residents from the rights conferred by section 100. You may agree as much as you like, but if any State should choose to say, "The central authority is depriving us of a reasonable use of the water," under section 100, it would be an infringement of the Constitution.

Central control of navigation, conservation, and irrigation desirable.

Effect of section 100.

5705. And therefore the agreement would be *ultra vires?* To that extent. With regard to (*b*), if the Federal Parliament were to legislate, either at the request of particular States or at the request of all the States of the Commonwealth, even this, I think, would not suffice to debar States or their residents from a right to the privileges conferred by section 100, and from appealing to the High Court for the protection of such rights. (*c*) I do not think that either section 51, subsection 37, or section 51, subsection 38, can be utilised as a short road to alterations of the Constitution; such alterations can only be effected as prescribed by section 128. (*d*) I think the riparian law of England is probably unsuitable to the physical conditions of Australia; at the same time, the question of the alteration of this law, or of the adoption by other States of legislation similar to that of the Water Rights Act, 60 Vic. No. 20, New South Wales, appears to me to be a question primarily for the States, and not for the Commonwealth. (*e*) For the reasons I have already given, I am doubtful whether any such arrangement could be made effective.

Riparian law of England.

Modified by Water Rights Act.

5706. Going back to the answer you gave to (*d*) Question No. 12, I understood you to say that while the common law of England, although not suitable, to the conditions of Australia, is applicable, to private ownership, yet it does not apply as between States? So I apprehend. The law exists as between private riparian owners. It remains part of the law of New South Wales. It has been modified by the Water Rights

Professor Pitt Cobbett, M.A., D.C.L. 1 Oct, 1902.

Rights Act, which vests the control of the water flowing through different lands in the Crown. The question whether it should be altered further, and by other States, is a question primarily for them and the Legislatures of those States.

5707. *Mr. Burchell.*] Do you think it would have any bearing or value on the decision of a case arising out of a dispute between States? The Court to which such a matter was referred might see fit to be guided by the analogy, but that is a very different thing to making it binding as an existing rule or law. The High Court is not bound by the English decisions, but they can be used as guiding principles or useful analogies.

Walter Gibbons Cox, Civil Engineer, Dowling-street, Sydney, sworn and examined:—

W. G. Cox, C.E. 1 Oct., 1902.

5708. *President.*] What is your name? Walter Gibbons Cox.

5709. What are you? A civil engineer.

5710. Where do you reside? Dowling-street, Sydney.

5711. Will you tell us something about your experience? In England I was engaged as a Government engineer for water supply and land drainage. I obtained the diploma as an Associate of the Institution of Civil Engineers, London. I then went to the Western States of America, and whilst there I was engaged on Government commissions for lands improvement and artesian boring and irrigation connected therewith. As regards the subject under consideration, I may say I took a great deal of interest in irrigation. On arrival in Victoria, in 1877, I was engaged in artesian boring, and during my practice I travelled a great deal over Victoria, and took a professional interest in the irrigation from the rivers there. Since then I have been in Queensland mostly, and have taken similar interest in the subject there. With regard to this question of the allotment of the water rights between the three States—New South Wales, Victoria, and South Australia—it seems to me that the whole subject is fraught with very great difficulties. The same trouble existed in the Western States of America when I was there, but I believe it is being much simplified now by treating it in a comprehensive manner, and this is the gist of my opinion upon it: The riparian common law of England is not adapted to the different conditions of Australia. The fundamental principles ruling should be, I think, that the water is the property of the federated people, and its use subject to priority of appropriation, dependent upon its beneficial use. If that applies to landholders in the vicinity of the rivers, it might equally apply between the three States. It appears to me that New South Wales, according to the riparian law of England, has priority of right to the water in question, but that right seems to me to be inconsistent with using it for the purpose of irrigation. I think if the rights are restricted to a beneficial use, and that use is promptly followed by an assessment of those rights by competent officials of a Federal Irrigation Department, that the whole subject would be much simplified. Considering the complicated nature of the subject, the variations in the volume of water in the river, the changing seasons, priority of rights, and many other considerations, I am of opinion that the greatest latitude should be given to a Federal Irrigation Department in charge of the combined interests of the three States, subject, of course, to review by the courts. I think it would simplify the matter very much if it was managed by the Federal Government and delegated to experienced men—that is, engineers—men who thoroughly understand the whole business.

English riparian law not adapted to Australian conditions.

5712. You are acquainted with the conditions obtaining in the arid portions of New South Wales, and also with the condition of the rivers;—will you give us the benefit of your opinion as to the relative values of irrigation and navigation? There is no comparison, in my opinion. If you take the country, the main consideration is the improvement of the lands, and inducing population. For producing more crops, and getting the full value out of these lands, I think every assistance should be given to irrigation for their improvement. The navigation interests I look upon as quite inferior to those. The river Darling, even at high flood, is only navigable with difficulty, and with a low river it is not navigable at all.

Irrigation more important than navigation.

5713. *Mr. Burchell.*] How would you suggest the country adjacent to the river Darling being put under irrigation? I am afraid it would have to be done by pumping.

5714. Where from? From the river.

5715. How would you obtain the water from the river? Well, there is no water there at all now.

5716. Would you suggest weirs? That would be the readiest way of doing it.

5717. Where from? A certain section. Unless the banks are sufficiently high above the general level of the ground to supply by gravitation, of course it would be necessary to pump.

Weirs necessary.

5718. Would you construct weirs even then? To keep up a regular supply. Irrigation would require a regular and constant supply, and that could only be done by conserving the flood water by means of weirs.

5719. If you had the water maintained in the river, would it enable boats to navigate, provided you had locks? Yes.

5720. All you would require, then, to make the river navigable would be a lock, in addition to the weir which would impound the water? To maintain navigation you would require locks.

5721. Would there be any waste of water? There would be no waste of water.

5722. I suppose you know that the river is the means by which the wool that is grown on the banks of the Darling is taken to market? Except in certain seasons of the year.

5723. The works referred to would ensure them getting their wool away, whereas at present they can only do so during certain seasons of the year? No doubt of that. It is a question of cost, of course.

Stations dependent on navigation.

5724. You know that the stations up there are dependent on the navigability of the river in order to get their wool away? I can quite understand that, having seen it for years; it is the only means that they have.

James Adam Brodie, Secretary and Chief Inspector of the Fisheries Department of New South Wales, Sydney, sworn and examined:—

J. A. Brodie. 1 Oct., 1902.

5725. What is your name? James Adam Brodie.

5726. What is your position? Secretary and Chief Inspector of Fisheries for New South Wales.

River pollution injurious to fish.

5727. We have had brought under our notice the condition of the Murray above Corowa, and extending some distance above Albury; it has been alleged that the pollution from the mining has materially affected the fish in that length and impaired their productiveness;—can you help us in the matter? Generally speaking, the pollution has a very injurious effect upon the fish, much more so on the ova that are deposited in the streams than on the adult fish. Of course, the discolouration of the water may not be sufficient to immediately injure the mature fish if it is not of a very turbid character. The fish are so constructed that they may enter gradually into turbid water, and they are naturally able to prevent

J. A. Brodie. 1 Oct., 1902.

prevent this material from entering their gills, but if it comes suddenly or in a rush, as after a heavy storm, then it frequently has a fatal effect upon the fish—it chokes them. This suspended matter gets in the gills, and it has an injurious effect upon them. With regard to the eggs of fish, any matters in suspension, even of a fine character (in fact the finer it is the more harmful it would be), would be injurious to the eggs. As to the Murray River, the fish—such as cod and perch—generally deposit their eggs on logs, stakes, &c., and if the suspended matter settles upon them, it prevents the oxygen from entering the eggs, and it will eventually destroy them. This, of course, applies merely to the solid matter. There may be some chemicals used in treating the ores; and, if that is so, it would be more serious.

5728. What would be the effect of arsenic? From a lay point of view, I believe it would have a bad effect. I could not give any expert opinion as to that. I have taken from the annual report for 1900 on the Canadian fisheries, particulars of certain experiments carried out by Professor A. P. Knight, of Ontario, in connection with an investigation in 1900 on the effects of polluted waters on fish life in Canada. He found:—

Effect of waste from pulp mills, gasworks, and nail works.

That a 10 per cent. mixture of waste water from pulp mills, with river or brook water, was poisonous to fish life. Sulphuric acid was present in great quantity in the waste water.

That fish placed in a 5 per cent. solution of waste water from gasworks with lake water died in twenty minutes. Immersed in a 2 per cent. solution, the same kind of fish survived for thirty minutes, and in a ½ per cent. solution the fish lived half a day. The chemical analysis showed that it was composed principally of ammonia, nitrogen, and sulphuric acid.

That waste water from nail works was found to be the most deadly one examined, as it was found that $\frac{1}{10}$th per cent. solution was sufficient to kill some fish in from ten to thirty minutes, the deaths being caused by the adhesive precipitate sticking to the gill filaments, and preventing the passage of oxygen through the gills. The compound consisted of iron, zinc, and hydrochloric acid.

I have also a paper prepared by Mr. D. G. Stead, Scientific Assistant to the Fisheries Department, on the subject:—

Two kinds of pollution—liquid and solid.

Water pollutions may be of two kinds, viz., liquids, floating in solution, and solids, the latter either being in the water in a state of suspension or accumulating in decaying masses at the river or harbour bottom, whatever the case may be; and while there, during the process of decomposition, giving off noxious gases, notably carbon dioxide, in such quantities as to render the waters uninhabitable to the fishes.

Liquids, usually speaking, exert a chemical action. This is most deadly and insidious, not only, as it often does, injuring the fishes' breathing organs or gills, but also detroying the oxygen in the water, upon which the fishes are as dependent for their existence as we are upon the land. In either case the effect upon the fish will be the same, viz., certain death.

Ordinary town sewage.

Under the heading of liquids likely to be noxious in their effect upon fishes may be included ordinary town sewage and the products of many factories, notably tanneries, containing, as they often do, many harmful and poisonous chemicals, but in any event the deleterious effect must be, and is, altogether dependent upon the amount of refuse being discharged, and the area of water into which it is being emptied. In the case of refuse pouring out into large lakes or the ocean, for instance, so many agencies are at work that the noxious compound is quickly broken up into its chemical component parts, and, by diffusion through a large amount of water, is rendered quite innocuous. In rivers, however, the circumstances are quite different, and the amount of deleterious matter may be so great as to almost turn the river itself into a kind of great sewer; but even in this case, before the noxious fluids have travelled very far, they may have been so altered as to be rendered quite harmless. I only refer here to fluids, properly speaking. In sewage matter, and the refuse from many factories, there is generally a large amount of decomposing matter in suspension. This decomposing matter, of course, ultimately becomes fluid, and if present in large enough quantities, will again affect the fishes by poisoning the water.

Sediment.

I have merely spoken of sewage and decomposing matter generally, as it is a matter which is always bound, sooner or later, to occupy the attention of authorities wherever there is a large town or a growing one upon the banks of a river, especially when that river is of limited proportions, and likely to become greatly reduced in size suddenly, as are most of our Australian rivers and watercourses. What concerns us mostly at the present juncture, however, is the effect that solids—that is, matter in a state of suspension—are likely to have, either directly or indirectly. Generally speaking, sediment of any kind, if present in large quantities, is likely to be harmful to fishes. There are a few fishes which naturally live in places where the water is constantly stirred up, but they are not usually the edible kinds. The sediment, especially when very fine, may affect the fishes themselves directly, by so clogging their gills that they are unable to breathe. This is more particularly likely to be harmful if the sediment comes along suddenly. In fishes there is an arrangement whereby the gills are kept free of dirt, and if the fishes travel gradually into an area where sediment is usually present, the organs are so modified in many instances that they are enabled to keep the gills free of the sediment; but if, as just mentioned, the sediment-filled water overtakes the fish suddenly, then the gills become clogged, and the fish is choked. Some local instances of this have come under our notice. Mullet, which, under ordinary circumstances, are able to proceed *gradually* into fresh water having a good deal of sediment mingled with it, have been found dead at times, and in many instances their gills were completely clogged with sedimentary matter. This has been after heavy freshets in places like Middle Harbour, when the water has become greatly discoloured with matter brought down by the various creeks and watercourses. Other fishes, too, have been found dead at such times; and though there is a possibility that these were killed by the sudden influx of fresh water, it must be conceded that it is extremely likely that the bad effect was greatly aided, if not totally brought about, by the sediment.

Fine sediment injurious to ova.

The effect of fine sediment upon fish ova.—Generally speaking, all river fishes deposit their spawn in clear waters, particularly where there is a current such as might be caused by the water eddying round a stone or log. Such is the case with our own Murray cod. The reason for this must be patent to all. In such localities, if a little sediment be present, it has no opportunity to settle; and secondly, the running water exerts a splendid vivifying, oxygenating effect upon the ovum. Now, it must be plain that, if the water is full of a fine sediment—and the finer it is the more harmful it is likely to be—the fish is not likely to deposit its eggs there; and if it is not overcome itself, it is sure to go to other places. But if the water be disturbed over a wide area, the fish will be forced to deposit its eggs in some portion of it, the result being that the ova will become enveloped in a fine layer, perhaps a thick layer, of sediment, this effectually preventing the embryonic fish from receiving from the water the oxygen which is so necessary to its well-being and development. Consequently, a large number of eggs will be destroyed, and the supply must suffer.

We have had evidence, on various occasions, of the sudden deaths that have been caused to fish-life by the impurities that have been brought down from tanneries, paper-mills, woolwashing establishments, &c., and they have been very detrimental to fish-life.

Pollution destroys fish food.

5729. Have you had any evidence that there have been injurious effects to the fish in the length of the Murray to which I referred in the question I put to you? No direct evidence as to that. I might say that another effect it would have would be to destroy the living food which should exist in these waters.

FRIDAY,

FRIDAY, 3 *OCTOBER*, 1902.

[*The Commission met at the Court-house, Bourke, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

John Plunkett Fitzgerald, Manager of Fort Bourke Station, on the River Darling, New South Wales, sworn and examined:—

J. P. Fitzgerald. 3 Oct., 1902.

5730. *President.*] What is your name? John Plunkett Fitzgerald.
5731. What are you? Manager of Fort Bourke Station, on the Darling, near Bourke.
5732. What is the area of your station? 180,000 acres.
5733. How many sheep will it carry in a good year? From 40,000 to 50,000.
5734. How many are you running now? About 15,000.
5735. Are you irrigating any portion of your station? Just a little, some from the bore and some from the river.

Area irrigated.

5736. What area do you irrigate from the river? About 2 acres.
5737. Have you any idea of extending that area? No.

Suitability for irrigation.

5738. What is your idea as to the success or otherwise of irrigation, judging from your experience at Fort Bourke? It does very well on the small area irrigated, but I do not think the black soil is at all suitable for the purpose. Personally, I do not think it would be a financial success where water has to be pumped.
5739. Would it answer on the red soil? Partly; but the loamy soil takes less water and grows as good crops.
5740. Which way do you send your wool? By rail to Sydney.

Wool delayed two years by river.

5741. When you get a good river do you send it by river to South Australia? No. Our experience of the river has been unfortunate. We have had wool stuck in the river close on two years, and for that reason prefer the railway as being more certain.
5742. What is the difference in cost? I could not say. We have not sent wool by river since I have been here.

River should be locked.

5743. Do you wish to make any general statement in regard to the question at issue? I think that the river should, if possible, be locked all the way up to ensure navigation, as I believe the general feeling is that the settlers would prefer to use the river rather than the railway; but, personally, I am not very keen on the matter.
5744. *Mr. Murray.*] What area do you irrigate altogether? Twenty acres, and we should extend it if the water were available.
5745. Is the irrigation you carry on sufficient to give you a reasonably clear idea of the results to be obtained thereby? I think so.
5746. Have you had experience of navigation on the river also? Not personally; we have never used the river since I have been here.

Navigation paramount interest.

5747. Could you offer any opinion, supposing the question arose between the conservation of water for irrigation and the conservation of water for navigation in connection with the Darling, which interest you think should, from a public point of view, be the paramount one? I think navigation.

Edward Daniel Martin, manager of the Bourke branch of Messrs. E. Rich and Company, Merchants, Forwarding Agents, and Shipowners, sworn and examined:—

E. D. Martin. 3 Oct., 1902.

5748. *President.*] What is your name? Edward Daniel Martin.
5749. What are you? Manager of the Bourke branch of Messrs. E. Rich and Company, Merchants, Shipowners, and Forwarding Agents.
5750. How long have you occupied that position? I have been fourteen years in the employment of the firm, and five years in charge.
5751. Are you well acquainted with the conditions of trade in the district, both by rail and river? Yes.
5752. When the river is available, in which direction do you send goods? We send all we possibly can by river.

River freight cheaper than rail.

5753. Why do you prefer the river? It is cheaper; we save 25 to 50 per cent. Take flour, for instance: from Orange, Dubbo, Wellington, and Bathurst, the average trainage would be 17s. 6d. per ton, whereas by river, say we are loading a boat of 150 tons, and only have 100 tons of cargo, we fill up the balance with flour.
5754. Can you tell us how your firm regards the question of navigation, so far as the trade of the Darling is concerned? If the river were navigable we should secure every bale of wool possible down the river, and, consequently would be able to bring up goods much cheaper. With a permanent river we could save at least 25 per cent. on the freight of wool, and up to 50 per cent. on goods from Adelaide to Bourke as against Sydney.
5755. Does that apply to the trade above Bourke? The conditions are altered so much on account of having to send steamers away with half loads owing to the shallowness of the water. Since the railway opened to Brewarrina, we have secured for Adelaide the wool from two large stations above, which used to make Bourke their port, viz., Booroona and Gugie. Previously the wool was brought to Bourke by our boats, and then railed to Sydney. Now we have to find work for our steamers, and, therefore, cut rates as against the railways. I have a few figures here showing the tonnage of trade from Walgett, Bourke, and Wilcannia:—In 1892-3 it was 1,833 tons between Brewarrina and Bourke, between Walgett and Brewarrina, 1,641½ tons; Bourke to Walgett and other stations, 2,733½ tons. In 1893-4 Brewarrina and Bourke, 1,882¼ tons; from above Brewarrina and Walgett, 1,659½ tons; at Bourke, for Walgett and other stations, 1,691¾ tons; Wilcannia to Bourke, 9,750 bales of wool; Bourke to Wilcannia, 1,760 tons. In one year the wool forwarded by our firm amounted to 67,558 bales, and this has dwindled to 5,500.

Volume of trade.

5756. How do you account for that? The drought is accountable for a good deal of it. We have lost a good deal of the Queensland wool in consequence.
The following is a list showing the number of bales of wool forwarded by our firm for the past ten years:—1891-2, 53,095; 1892-3, 49,333; 1893-4, 61,277; 1894-5, 67,558; 1896-7, 41,000; 1898-9, 37,000; 1899-1900, 22,000; 1900-01, 7,000; 1902, to date, 5,500.

5757.

5757. Is the whole of the wool brought to Bourke by river? No.

E. D. Martin. 3 Oct., 1902.

5758. Are the figures you have given for 1892-3 a fair average of what would be delivered under ordinary circumstances when the river is navigable? Yes.
5759. What happens when the river is not navigable? We have to get our goods from Sydney and send all the wool there.
5760. How do you get the wool to Bourke? By teams and camels.

Road carriage.

5761. Does that increase the cost very materially? Yes; in some instances from £3 to £8 per ton.

Periods of navigability.

5762. Have you a record of the periods during which the river was navigable since 1882? Yes. 1882, 84 days; 1883, 44 days; 1884, 21 days; 1885, 31 days; 1886, 222 days; 1887, 269 days; 1888, 82 days; 1889, 190 days; 1890, 354 days; 1891, 285 days; 1892, 247 days; 1893, 336 days; 1894, 282 days; 1895, 54 days; 1896, 64 days; 1897, 135 days; 1898, 101 days; 1899 to 30th April, 276 days. For the past twelve months the river has not been navigable at all.
5763. *Mr. Murray.*] Do you get some wool here from Queensland when the river is navigable? Yes.
5764. How far up is the river navigable? Mungundi is our furthest port. The river is not navigable into Queensland. The wool I spoke of comes from out back, not by river.

River fleet.

5765. *Mr. Burchell.*] How many steamers have you on the river? Nine of our own, with a barge each, and we are agents for three more,
5766. How long have they been laid up now? Twelve months.

Capital value of fleet.

5767. What capital would they represent? Approximately, £10,000, and are capable of carrying 10,500 bales of wool at one time.
5768. How would the people of Wilcannia, for instance, be affected if they had no river? They would have to make use of the Broken Hill Road.
5769. Would that apply to all the stations between Bourke and Wilcannia? No; we supply all those 120 miles down river.

Rail carriage.

5770. What is the rail carriage on wool to Sydney? Greasy, £3 3s. 9d., scoured, £4 5s. The rates have been reduced during the past few months.
5771. What is the freight from Sydney to Bourke? Wool packs, £3 1s. 9d.; salt, £2 1s. 9d.; flour, £1 15s. 4d.; sugar, in 6 ton lots, £4 10s. 0d.; general goods, in special truck loads, £6 per ton.

Mathew Allison Todd, Manager, of Beemery Station, on the Darling River near Bourke, New South Wales, sworn and examined:—

M. A. Todd. 3 Oct., 1902.

5772. *President.*] What is your name? Mathew Allison Todd.
5773. What are you? Manager of Beemery Station.
5774. Where is that station situated? On the Darling, about 33 miles above Bourke.
5775. What is the area of the station? About 200,000 acres.
5776. How many sheep do you run? About 10,000 just now; in good seasons up to 100,000 have been carried;—say, an average of 40,000, for fair seasons in future (say, about 20 inches of rainfall).
5777. How do you get your wool to market? By road to Bourke, then to Sydney by rail.

Rail carriage.

5778. Supposing the river were navigable, how would you send it? By rail I think, it is so much quicker. If the river were reliable it would be better to use the river, but under present circumstances I prefer to use the railway.
5779. For what distance in a westerly direction is Bourke the trade centre? Out as far as Wanaaring, 117 miles; but if their market is Melbourne, Adelaide, or London, they would use the river, if reliable, and insurance not too great.

Cost the main consideration.

5780. Is the market the chief consideration—that is, assuming the river is navigable—or the cost, in deciding whether the railway or river is used? The cost is the main thing.
5781. Are you prepared to give an opinion as to irrigation? I have never done any, but intend to start, say, 100 acres for horse feed if water is available.

River only valuable as water frontage.

5782. What is your opinion as to the importance of the navigation of the Darling in respect of the station you manage? I do not think it of much use. The river is only valuable as a water frontage. But I only speak as the result of four years experience at Beemery when the river has been practically unnavigable. Under ordinary conditions of river traffic the insurance is a heavy charge, and when near a railway there is so little difference between rail and river (including insurance) charges that it has been better to use the railway so far. I have been in the Bourke and Brewarrina districts for over nineteen years, and since the railway came to Bourke it has carried most of the wool from the district, owing to the heavy insurance charges on the river. A good deal of wool has been carried down the river to the Bourke railway, and also up the river for about 100 miles below Bourke. This station is so near Bourke that the river is seldom made use of to that place, as road and river rates are nearly the same in ordinary seasons.

Arthur Senior, wool scourer, on the Darling, near Bourke, sworn and examined:—

A. Senior. 3 Oct., 1902.

5783. *President.*] What is your name? Arthur Senior.
5784. You are owner of a wool-scour on the Darling, near Bourke, are you not? Yes.
5785. How long have you been there? Since 1893.
5786. Are you kept fully occupied at the works? No; we only worked three months last year.
5787. How many bales were scoured during that time? 1,800.
5788. What number do you scour, on an average, per season? I have done 4,750.
5789. Do you pump water from the river? Yes.
5790. Does the present low condition of the river affect the works? It is, of course, much heavier on the pumps, and the water is not so good. We have to use ingredients to dissolve the minerals in it.

Navigation valuable.

5791. From your point of view, as a wool-scourer, how do you regard the question of the navigation of the river? It would be of great assistance to the district generally, both for sending wool away and for getting goods up river.
5792. Are settlers put to great extra cost under present conditions? Yes. At the present time, they are sending wool to me from Wilcannia, at a cost of £4 10s. per ton; with a navigable river, it would cost only £1 5s.
5793. *Mr. Burchell.*] Would not a permanently navigable river increase the demand for labour in the town? The town is more prosperous generally when the river is navigable.

George

George Dickinson Pickhills, captain of river steamer, of Bourke, sworn and examined:—

G. D. Pickhills. 3 Oct., 1902.

5794. *President.*] What is your name? George Dickinson Pickhills.
5795. What are you? Captain of river steamer.
5796. How long have you known the river trade? Since the inception of navigation on the Darling—about 1861.
5797. I suppose the volume has greatly increased since then? There were only about five steamers at that time.
5798. About what time did it reach its maximum? In 1890; it has declined since then.
5799. Supposing the river were navigable the whole year round, would it be more used than it is at present? Undoubtedly.
5800. To any great extent? I think so. Water carriage is two-thirds cheaper than land carriage.
5801. I suppose the conditions were pretty much the same before 1890 as since, so far as navigation is concerned? Yes—except that the river has been cleared.

Navigable river would assist settlement.

5802. Why do you think the river would be more used if it were navigable the whole year round than it is now? A great area of land would be taken up along the river, if it were permanently navigable.
5803. *Mr. Murray.*] Would that be on account of the increased facilities for navigation, or because it would provide water for irrigation? For both reasons.
5804. *Mr. Burchell.*] Was it not owing to the river being navigable that settlement first took place? Yes.
5805. You are surveyor for the Underwriter's at Sydney, are you not? Yes.
5806. Could you give us the number of boats registered on the river, and an estimate of the value of the fleet? There are about 130 steamers and barges, of an approximate value of £250,000.

Arthur William Mullen, Surveyor and Inspector under the Western Lands Commissioners, sworn and examined:—

A. W. Mullen. 3 Oct., 1902.

5807. *President.*] What is your name? Arthur William Mullen.
5808. You are a surveyor and inspector under the Western Lands Commissioners, and resident in Bourke, are you not? Yes.
5809. How long have you been in this district? Thirteen years.
5810. What is the extent of your district? From Miningie, on the Queensland border, to South Australia, and 100 miles south of the Queensland border.

District unsuitable for small holdings.

5811. Do you think the district, speaking generally, is suitable for selection? Not in small holdings.
5812. Supposing the river Darling were made navigable the whole year round, what effect, in your opinion, would it have on settlement? It would not affect it to any great extent, unless irrigation is taken into consideration.

Limited market for irrigated products.

5813. Supposing irrigation were taken into consideration? I think some irrigation might be carried on in proximity to towns, and for feed for station working horses in times of drought; but I do not think there is a market for irrigation products on a large scale.
5814. In what way would that increase settlement? It would increase it in the vicinity of towns to a small extent only.

Navigation would not greatly increase trade.

5815. May we take it that, in your opinion, if the river were navigable, the trade would not be increased to any appreciable extent for many years to come? I do not think it would.
5816. *Mr. Murray.*] You say that if the river were made navigable, the conditions for settlement would not be improved, except in so far as it would promote irrigation? Yes.
5817. The river would be made navigable by putting in locks and weirs? Yes.

Irrigation could not be carried out to any large extent.

5818. Would that promote irrigation to any great extent? Water would always be there.
5819. But if it is pumped out for irrigation, the river would be no better for navigation than at present? I spoke of irrigation to a small extent only. Even with a big river, irrigation could not be carried out to any large extent away from the river.
5820. Do you know of any suitable sites for storage higher up? Only the ana branches.
5821. Have you considered the question of how much water could be retained in the river itself by means of weirs and locks? I suppose they could construct a weir 15 feet high, which would retain a large quantity.
5822. Do you think the quantity which could be conserved by such a weir, for any purpose outside navigation, would be an equivalent for the cost of the weirs? I do not think so; the storages are too small.
5823. *Mr. Burchell.*] Do I understand you to say that trade would not benefit at once by the river being made navigable? It would do so to a small extent.

Storages.

5824. Do you know of any storages at the head of the Darling or its tributaries? Only ana branches, such as the Dry Bogan, in New South Wales. I do not know the watershed in Queensland.

William Haslep Sutton, storekeeper, and Secretary to the North Bourke Progress Association, sworn and examined:—

W. H. Sutton. 3 Oct., 1902.

5825. *President.*] What is your name? *William Haslep Sutton.*
5826. What are you? Storekeeper, and secretary to the North Bourke Progress Association.
5827. As secretary to that Association you some time ago made a proposal for an irrigation settlement in the vicinity of North Bourke, did you not? Yes.

Proposed North Bourke irrigation settlement.

5828. Will you give us the particulars of that proposal? It is proposed that an irrigation settlement be established at a convenient place near the Darling River, and less than three (3) miles from North Bourke. It is suggested that at a point on the river about two (2) miles above North Bourke a lock and weir should be constructed. The spot, in the lay mind, is a magnificent one for such work, having a good foundation. This would always ensure a plentiful supply of water, as even at the present time, after seven years' drought, there is still plenty of water in the river at the spot referred to. It is then suggested that a tower tank be erected convenient to the river into which the water could be pumped. It is believed a windmill would be sufficient for that work, but it is a matter that could be easily determined by engineers. From this tower the water could be run either by pipes or fluming to a receiving reservoir or tank for the supply of the settlement. At about three quarters of a mile north from the point on the river I first referred to commences a large

large tract, over 7,000 acres, of very valuable land, composed of the best chocolate soil, now held in reserve by the Government nominally for travelling stock, but which in reality is seldom or never used for such purpose. This land, with a decent supply of water such as could be obtained from the river, would grow anything, and a most valuable and successful settlement could be established. It is considered the engineering difficulties would be comparatively small. It is proposed that the settlement, for a start, should comprise 640 acres. This could be divided into eight or sixteen lots, as deemed advisable by the Government, all being supplied by pipes, fluming, or open drains from the receiving reservoir or tank. The land is of a flat nature. Reasons why a settlement should be established:—(1) The land asked for, which is a very small block, 640 acres, on Glasheen's Plain, is of excellent quality, there being a depth of fully 7 or 8 feet of the best chocolate soil, and is being wasted; a few travelling stock run over it occasionally throughout the year. (2) If this land be cut up into blocks as suggested, and leased to *bona fide* men who desire to settle, the benefit, not only to themselves but the communities of North Bourke and Bourke, would be enormous, the national asset would be made much more valuable, and the only scheme that will populate the land on the rivers in the interior would be successfully initiated. (3) A lock and weir at the spot indicated in the river, and previously referred to, would materially assist in the great national scheme of locking the Darling River from end to end. (4) The land is close to the river, the nearest point being a little over half a mile away, and beyond the reach of floods. (5) The rights of the public would not in any way be infringed. (6) The lucerne and other products that could be so cheaply grown on the settlement would be a tremendous boon to the district, especially in times of drought. (7) The land being irrigated with the river water would be much more productive and far more easily worked than if irrigated by artesian water. The land is practically open country, and the excellent nature of the soil and its close proximity to the towns of North Bourke and Bourke carry enormous advantages. It is proposed that the settlement should run in a northerly direction, east of the main Barringun-road, the western boundary to be about a quarter of a mile east of the road named. If the conditions are made easy and acceptable to *bona fide* men, there is no doubt whatever that the whole of the settlement would be quickly taken up.

W. H. Sutton. 3 Oct., 1902.

Reasons for establishment of settlement.

5829. Why did you fix on that particular spot for the proposed settlement? We thought it the most convenient site adjacent to the town.

Site of proposed irrigation settlement.

5830. So far as you know, speaking for your Association, there is need for such a settlement? I think so.
5831. Have you taken into consideration how much water per acre per annum will be required if your suggestion is adopted? No; we thought we should get further information on the subject by submitting a scheme.
5832. Then, as a matter of fact, I suppose we may take it that you have not fixed upon any particular spot for the settlement, and that you have no definite ideas in connection with the matter? That is so.
5833. And that you want the whole matter formulated? Yes.

Whole matter requires formulating.

5834. From what you know of the feeling in the district, do you think the people would be willing to take over any responsibility which might be incurred in carrying out the necessary work? We have no definite knowledge of such matters, and wanted to get information from head-quarters on the subject.
5835. *Mr. Murray.*] You spoke of the settlement as comprising 640 acres, and suggested dividing that area into eight or sixteen blocks of 40 or 80 acres each;—would you not consider such blocks very large for an irrigation settlement? Eighty acres might be; but I do not think 40 acres any too large.
5836. Is the land within reach of floods? The 1890 flood, which was the highest known, did not flow over it.
5837. *Mr. Burchell.*] What distance above the weir is the proposed site? Seven miles by water.
5838. Why not make use of the present weir? We would be prepared to do so if advised it was suitable.
5839. How far back does the present weir throw the water? About 9 miles by land, or, say, 27 miles by water. I put in plan of the proposed irrigation settlement. [*Exhibit* 124.]

Jacob John Hammond, farmer, at the Government Farm, Pera Bore, sworn and examined:—

J. J. Hammond. 3 Oct., 1902.

5840. What is your name? Jacob John Hammond.
5841. You are farmer at the Government Farm, Pera Bore, are you not? Yes.
5842. What is the area of the farm? Sixty-six and a half acres.
5843. How many settlers are there? Ten.
5844. How many acres each have they? The areas vary from 7 to 19 acres under crop.
5845. How much is irrigated? A total of 161 acres, including the Government Farm.

Government irrigation farm at Pera.

5846. What is the flow per twenty-four hours from each of the two bores? No. 1 bore, 140,487 gallons; No. 2 bore, 115,973 gallons; a total of 256,460 gallons per day.
5847. Is the whole of the water used for irrigation on the settlement? Yes, except what is used at the public watering-place, which is only a small quantity.
5848. What crops do you find answer best? Wheat, for hay.

Crops.

5849. Is that better than fruit? It is better than peaches or apricots; but I think oranges may prove to be the best.
5850. Can you say whether the settlers have been successful? Some have made a good living at it, others have not.
5851. How much per annum do they have to pay for water for the 20 acres? £5 and £10. After they have been on the land five years it is raised to £10.

Price of water.

5852. Have you looked at the land proposed to be utilised for an irrigation settlement at North Bourke? Yes.
5853. How does it, in your opinion, compare with the land at Pera Bore? I think it better. In my opinion it will not cake so hard. It is a light soil.

Light soil best for irrigation.

5854. From what you have seen at Pera, you would, if you were going to select, get as light a soil as possible? Yes; it is much easier to irrigate.
5855. *Mr. Murray.*] What sort of soil is it at Pera? Loamy.
5856. What was the character of the soil before it was irrigated? Some light, some very heavy; but it was nearly all irrigated before I came here.
5857. Was it timbered? Yes; very heavily, I believe; but I did not see it.
5858. Was it blue-bush country? Yes.

5859.

J. J. Hammond. 3 Oct., 1902.

5859. Was the blue-bush amongst the timber? Yes.
5860. Do you generally find the land more amenable to natural drainage where it has been timbered? Yes.
5861. Then timbered land is the best for irrigation? Yes.
5862. Have you generally found blue-bush growing on soil which is sandy underneath? Yes.

Subsoil at Pera.

5863. What kind of subsoil is it at Pera? Limestone rubble.
5864. What depth of soil is there before you come to that subsoil? Twenty inches, on an average.
5865. *Mr. Burchell.*] How often do you apply the water to the various crops? To fruit trees, once every six weeks during the summer.
5866. How is it applied? In furrows drawn along each side of the trees.
5867. What quantity? The full flow of the bore for 12 hours to each 20 acres.
5868. Is it then turned to the next block? Yes.
5869. Does that quantity serve the whole 20 acres? No.
5870. What is the smallest area you have known to be served in that way—*i.e.*, full bore for twenty-four hours? Two acres.
5871. What do you consider that quantity would irrigate properly? Five acres, if the land is in good order.
5872. Is the water utilised to the full now? Yes.
5873. You could not extend the settlement without additional bores? No.

SATURDAY, 4 OCTOBER, 1902.

[*The Commission met at the Court-house, Warren, New South Wales.*]

Present:—

JOSEPH DAVIS Esq. (President).

STUART MURRAY, Esq., | FREDERICK N. BURCHELL, Esq.

John Symonds, Assistant Engineer, Public Works Department, New South Wales, sworn and examined:—

J. Symonds. 4 Oct., 1902.

5874. *President.*] What is your name? John Symonds.
5875. You are Assistant Engineer in the Public Works Department, are you not? Yes.
5876. You had charge of the weirs and regulators, &c., recently constructed on the Macquarie River? Yes.

Effect of Warren weir.

5877. What is the effect of the weir recently constructed at Warren? It diverts the water through a short cutting into the Gunningbar Creek. The water flows down that creek some 15 miles, and is then diverted by two other channels. A portion of the water diverted into Crooked Creek is then diverted by another cutting into Duck Creek. All this water ultimately reaches the Darling, either through the Bogan or the Crooked Creek. The water is used chiefly for stock. I might also mention that the weir diverts water through the Belaringar cutting into the Belaringar Creek, and that this water reaches the same destination, *via* Gunningbar Creek.

Cost.

5878. What was the cost of the weir and regulator? The cost of the weir and cutting, approximately, was £6,000; regulator, about £1,750. The cost of the different cuttings was:—Duck Creek cutting, £3,427; the cost of No. 1 cutting, £1,000; that of No. 2, £1,066; Crooked Creek and Belaringar cutting, £4,254; and the regulator, £1,737.
5879. If it were not for the weir, the water which is now diverted from the river would go down to the Macquarie Marshes, would it not? The Macquarie rarely reaches the Darling. It only does so in exceptional seasons; the water is generally evaporated in the marshes. By these works the water reaches the Darling much more quickly than it would otherwise do, and in no case is the water diverted from the rivers altogether.

Cost of Gin Gin weir.

5880. What was the cost of the Gin Gin weir? £5,000 was spent on the original weir, which was destroyed by a flood when near completion. The present weir cost £14,600—a total of £19,600. The cost of the regulator was £1,639; the channel and bridge cost £5,500, making a total cost of £26,739.

Object of work.

5881. What was the object of that work? To divert water into the Ewenmar Creek (a creek 85 miles long, which runs into the Macquarie just below Warren) and other creeks, with the idea of providing water for stock purposes along the course of the creeks.
5882. Has any water, so far, been diverted into those creeks? Not down the Ewenmar, but there has been down the others.
5883. To what extent? Pending the construction of regulators, no absolute fixed quantity has been discharged.
5884. Was any diverted before last year? Yes; for the past five or six years from the Warren weir down the Gunningbar Creek, and down the Belaringar Creek for the past eighteen months.
5885. *Mr. Murray.*] How was the work paid for? By the Government.
5886. Under what Act was it constructed? Under the Public Works Act.

Edward Harvey Kater, pastoralist, of Mumblebone Station, on the Macquarie River, New South Wales, sworn and examined:—

E. H. Kater. 4 Oct., 1902.

5887. *President.*] What is your name? Edward Harvey Kater.
5888. You are a pastoralist? Yes.
5889. Of what station? Mumblebone.

Area of Mumblebone.

5890. What is the area of that station? 75,000 or 76,000 acres.
5891. What number of sheep does it carry? About 30,000.
5892. Where is it situated? On the Macquarie River, Crooked Creek, and Duck Creek.
5893. Have you been affected by the works recently carried out on the Macquarie, and the works connected therewith? The Macquarie and Duck Creek works have not affected me, so far; the water has only twice passed my place down Crooked Creek.

E. H. Kater. 4 Oct., 1902.

5894. Do you anticipate that the works will be of value to you ultimately? No; the water is turned down the Gunningbar Creek; Crooked Creek does not get it.
5895. Have you, in conjunction with your neighbours, made any proposals in regard to the diversions from the Macquarie River? No.
5896. Then, as far as you are concerned, you have not been affected, either one way or the other? That is so.
5897. *Mr. Burchell.*] How far is your station below the weir? About 20 miles, in a direct line.
5898. Are you the nearest station-holder below the weir? No; there are others immediately below.

James Walker, Manager of Gillendoon Station, Macquarie River, sworn and examined:—

J. Walker. 4 Oct., 1902.

5899. *President.*] What is your name? James Walker.
5900. You are manager of Gillendoon Station, are you not? Yes.
5901. What is the area of the station? About 31,000 acres.
5902. What sheep do you run? In ordinary seasons 25,000, but at present about one-seventh of that number.
5903. Where is the station situated? On the eastern side of the Macquarie, extending from Warren to about 20 miles down, and abutting on the Ewenmar Creek.

Gin Gin works.

5904. Will you benefit by the Gin Gin works? I think so, in future; but there has been no water put into the Ewenmar Creek as yet.
5905. The water will be used for stock and domestic purposes only, I presume? Yes.

Not sufficient water for irrigating.

5906. Have you any idea of irrigating? I do not think there will be sufficient water to allow of it unless a scheme which I understand has been proposed for conserving water in the Ewenmar Creek is carried out.
5907. What is that scheme? I do not know the details, but understand it is proposed to lock the creek and put weirs in.

John Montgomery, grazier, Gunningbar Creek, near Warren, sworn and examined:—

J. Montgomery. 4 Oct., 1902.

5908. *President.*] What is your name? John Montgomery.
5909. You are a grazier, living near Warren, are you not? Yes.
5910. How much land have you? 5,000 acres?
5911. Where is it situated? On the Gunningbar and Duck Creeks.
5912. How long have you held the land? Since 1885.
5913. Do the several works benefit you to any appreciable extent? Yes.
5914. In what way? They provide me with water for stock in dry times.

Water diverted by Gunningbar Creek has reached the Bogan.

5915. How far does the water diverted from the Macquarie River get down the Gunningbar Creek? It has got right through to the Bogan several times.
5916. Can you speak as to what you think will be the effect of the new works? I think that if the river were locked these would be of great benefit by conserving the water.
5917. What is the water in Gunningbar and Duck Creeks used for? Stock purposes; there is not sufficient water for irrigation.

Ferdinand Church Tompson, stock and commission agent, of Warren, sworn and examined:—

F. C. Tompson. 4 Oct., 1902.

5918. *President.*] What is your name? Ferdinand Church Tompson.
5919. What are you? A stock and commission agent.
5920. How long have you been in the district? Since 1868.
5921. Are you acquainted with the works carried out for the improvement of the flow in the various creeks near Warren? Yes.
5922. Will you tell us what, in your opinion, will be the effect produced by those works? I consider they will be of great benefit.
5923. Do you consider the expenditure was warranted? Yes. Of course, we have had very bad seasons since the completion of the works; but there is a good deal of water running to waste even now. I think that if a series of dams were put in the Duck and Gunningbar Creeks the water would be conserved instead of running into the Bogan, and thence into the Darling.

Series of dams required.

5924. What do you think of the Gin Gin weir? I think it most beneficial. Large holdings are to be served by it, and if water is impounded no doubt it will be of great benefit along the Ewenmar Creek.
5925. *Mr. Burchell.*] Are there any station-holders on the Macquarie below the weir? Yes; a good many.

Residents below weir deprived of water.

5926. Are any of them deprived of water, owing to the diversion from the river? I could not say from personal knowledge; but there have been some complaints, I believe.
5927. How many, do you think, are affected in that way? A good many. There is land at the lower end of the river which, if not watered by the river, is of no use whatever.
5928. Do you think the diversions will prevent that land being flooded? A succession of floods might serve them, but not an ordinary flood.
5929. Do you think the land will be materially affected? Yes.
5930. Has all the land referred to a river frontage? Not all; but all of it has a frontage to the reed beds.
5931. Do the owners depend upon the river water for stock and domestic purposes? The channels supply that.

Marshes useless unless flooded.

5932. *Mr. Murray.*] Did I understand you to say that none of the land in the vicinity is of use unless flooded? I said that about the marshes.
5933. Is the water brought down by the river channels spread over those marshes? Yes.
5934. And if it is diverted the marshes would be rendered valueless? The area supplied would be curtailed very much.

Heinrich Te Kloot, wool-scourer, sawmill proprietor, and grazier, Ewenmar Creek, sworn and examined :—

H. Te Kloot. 4 Oct., 1902.

5935. *President.*] What is your name? Heinrich Te Kloot.
5936. You have a wool-wash on the Ewenmar Creek, have you not? Yes; and hold a block of land on the Macquarie River, about 1½ miles above the weir.
5937. What is the area of the land? About 2,560 acres.

Wool washed annually.

5938. How many bales of wool do you wash annually? From 800 to 1,500; it depends on the season.
5939. Do you have any difficulty in obtaining water for the work? Yes, at times.
5940. Do you think the works carried out at Gin Gin will benefit you? Yes, if the works asked for—viz., a series of weirs or locks—are constructed in the creeks, so as to render the water permanent. With regard to the river itself, the weir is of great benefit, giving almost permanent water on my frontage land, and it has been successfully utilised by a neighbour for the irrigation of a small piece of land. It is my intention also to eventually irrigate land near my house, when the works before referred to are constructed.
5941. What area is irrigated at present on the river? From 30 to 40 acres.
5942. Is that done the whole year round? He has only been there a short time, but has irrigated constantly since he commenced, about eighteen months ago.
5943. How does he get water on to his ground? By means of a 6-inch pump.

John Kinnivane, farmer, Gunningbar Creek, near Warren, sworn and examined :—

J. Kinnivane. 4 Oct., 1902.

5944. *President.*] What is your name? John Kinnivane.
5945. What are you? A farmer.
5946. What area of land do you farm? Ninety-six acres conditional purchase and 266 homestead selection.

Gunningbar Creek.

5947. Where is the land situated? Within half a mile of the regulator on the Gunningbar Creek, and since the weir has been constructed I have never had water in the creek, nor have my neighbours lower down.
5948. What is the reason for that? I think the creek has been filling up with sand and soil. I took up the land four years before the works were constructed, and was never without water in the dry season. My opinion is that if a bore had been put down at the head of the creek it would have been of more benefit than the works carried out.
5949. Your opinion is that the Warren weir, and the regulators and channels, which have cost the Government some thousands of pounds, could have been dispensed with and a bore put down instead? Yes. I believe that if a bore were put down, say, every 10 miles on the channels, all parties would be supplied with water. As it is now, when water is most needed, no one gets it. The weir does not answer the purpose for which it was constructed.
5950. *Mr. Burchell.*] How far below the weir is your place? A quarter of a mile.
5951. Do I understand you to say that before the weir was constructed there was a constant flow down the bed of the creek? Yes.
5952. And that the weir has shut the stream off? It does not give us a supply in dry weather; we should have been just as well off without it.

MONDAY, 6 OCTOBER, 1902.

[*The Commission met at Gin Gin Weir, New South Wales.*]

Present:—

JOSEPH DAVIS Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL.

Thomas Mitchell Scott, Manager of Burroway Station, Macquarie River, sworn and examined :—

T. M. Scott. 6 Oct., 1902.

5953. *President.*] What is your name? Thomas Mitchell Scott.
5954. What are you? Manager of Burroway Station, on the Macquarie River, about 4 miles from here.
5955. What is the area of the station? 70,000 acres.
5956. How many sheep do you run? 30,000 to 35,000 in an ordinary season; about 6,000 at the present time.

Effect of Gin Gin weir.

5957. In what way is your station affected by the Gin Gin weir and the Ewenmar regulator? It is impossible to say, but I anticipate that the river will be backed up, say, 6 feet at the head station, about 12 miles away.
5958. How will your station be benefited by that? By providing permanent water for irrigation.
5959. Have you suffered owing to want of water for stock and domestic purposes? Not on the river for domestic purposes. Further back they do, and we have suffered from want of water for stock.
5960. Does the water diverted down the Ewenmar Creek affect you? No.
5961. Have you any water besides that in the river? Yes, we have tanks and dams.
5962. *Mr. Burchell.*] Have you any wells? No, but there are wells near us.
5963. What are they like? There is a fair supply, but they have never been really tested. Some are salt, others are fresh.
5964. *Mr. Murray.*] Have you had any actual experience of irrigation in this district? No.
5965. Can you give us any idea of what quantity of water it would take to effectually irrigate land here? No. Since 1882 the river has been absolutely stopped six times, for periods varying from one month to seven months.

River has stopped flowing six times since 1882.

5966. *President.*] I understand you can tell us how often, and under what circumstances, the river broke into Crooked Creek before the cutting was put in? It has done so on two or three occasions at flood times since I have been in the district. The natural channel for a considerable portion of the flood waters of the Macquarie River, after it rises, say, 26 feet, used to be through Crooked Creek into Ewenmar Creek, before the junction of Crooked Creek and the Macquarie was silted up.

Frederick

Frederick Edmund Body, grazier, Ewenmar Creek, sworn and examined :—

F. E. Body. 6 Oct., 1902.

5967. *President.*] What is your name? Frederick Edmund Body.
5968. What are you? A grazier.
5969. Where is your land situated? About 10 miles north from here, on the Ewenmar Creek; also on the Macquarie River and at Dubbo. The area of the land where I am living is 60,000 acres, and about 120,000 acres at Terramungamine.

Area.

5970. How many sheep do you run? About 100,000 on the two places normally, or about 50,000 at present.

Number of sheep.

5971. Taking Ewenmar Creek first, in what way are you affected by the construction of the weir and regulator? We have not had the creek running for years, and we think the weir will make it run through by-and-by.
5972. What frontage have you to the creek? About 12 miles.
5973. Do you propose to do anything in the way of water conservation on the creek? We have an overshot dam there.
5974. What do you propose to use the water for? Stock.
5975. Do you propose to irrigate at all? I do not expect to have sufficient water. We do a little about the house at present, and in the summer it takes about 2,000 gallons each per day to keep plots 4 yards square green.

Necessary that works be proceeded with.

5976. Have you anything else you wish to say? Only that it is absolutely necessary that the works should be gone on with. The people down lower may be injured until the weirs are filled, but not afterwards. I think when the weirs are once filled they will get as much water as they do now.
5977. *Mr Murray.*] Would there not be some loss by evaporation and soakage? A little, doubtless.
5978. *Mr. Burchell.*] You mentioned that your land has a frontage of 12 miles to the creek;—is that freehold? Yes.
5979. Are there any settlers on the creek below you? Yes, about twelve families.
5980. Have you a rain-gauge? Yes.

Rainfall.

5981. What is the average rainfall? About 19 inches.
5982. How long has the present drought continued? We have been feeding stock since last November.
5983. Are there many others in the district feeding stock? Everyone, I think.
5984. Would you have to depend on the water passing through the regulator above this weir in order to get your supply from the Macquarie River? I think so, in a great measure.
5985. *President.*] Did you get water down the Ewenmar Creek before the construction of the weir? Yes.
5986. Did you get any from the river? I understand there have been overflows from the river, but cannot speak from personal knowledge.
5987. How long have you been in the district? Thirty-three years.
5988. What is your experience in regard to wells in the district? We have eight wells altogether, ranging from 120 to 200 feet deep. Most of them give a very good supply. The quality varies. Down here it is brackish; near Dubbo it is beautiful water.

Andrew Kerr Butter, stock and station agent, of Trangie, sworn and examined :—

A. K. Butter. 6 Oct., 1902.

5989. *President.*] What is your name? Andrew Kerr Butter.
5990. What are you? A stock and station agent.
5991. How long have you been in the district? Eleven years.
5992. Are you well acquainted with the locality? Yes.

Proposed works required.

5993. Have you something to say with reference to the proposed works? Yes; at present Trangie is suffering from a water famine. Except for private wells there is no water. There is a Government supply, which will be sufficient for the township alone, without stock, but it is not yet available for use. Trangie is situated on a lagoon, which, in times of flood or high river, is filled from the river. That is the only stock supply in the district of Trangie. To obtain water there it would be necessary to make a small cutting on Mr. McKillop's property, say, 2 feet deep. I have only seen the water out there once in all my experience, and should it be taken out there by a cutting as suggested it would benefit over twenty settlers. In order to show the necessity for a permanent supply for stock purposes, I put in the following returns:—For one quarter last year 68,218 sheep were trucked; the produce inward for the last six months of the present year was 6,996 tons; outward, 1,221 tons. At the present time there are twenty-four horse-teams of ten horses each, and four teams of four horses each engaged constantly, and these horses have to be watered from private wells. Some of these teams have to be paid for; others have not. There is a scheme to provide water by filling a big cowal at Narromine. It is an old watercourse silted up in places. I have seen it running once; it is 200 miles long. It was surveyed by the late Edward Barton, sixteen years ago. The scheme would benefit, to my knowledge, over forty residents, going through practically close settlement the whole way. These settlers are badly off for water for all purposes. A great many of their wells have proved unavailing, and their tanks are nearly all dry.

Necessity for permanent supply for stock purposes.

5994. What works would be required to divert water into the cowal near Trangie? A cutting about 2 feet deep, about half a mile long, to bring in the water when the river is high.
5995. What work would be required in connection with the other scheme you referred to? I am not sufficiently familiar with the country to say.
5996. *Mr. Burchell.*] Will the Government supply of which you spoke be sufficient for the teams when it is available? I do not think so.
5997. You say that the town of Trangie is situated in a basin;—would it not be risky to make the cutting you refer to, and thus let water in sooner than at present? No; I saw the biggest flood known. The water all gravitates back to the river.

Michael Forrest, selector, of Forrestvale, near Trangie, sworn and examined :—

M. Forrest. 6 Oct., 1902.

5998. *President.*] What is your name? Michael Forrest.
5999. Where do you reside? At Forrestvale.
6000. What are you? A selector.
6001. How many acres do you hold? 2,560.
6002. How much do you cultivate? 120 acres

6003.

M. Forrest. 6 Oct., 1902.

6003. You heard the evidence given by Mr. Butter regarding the diversion of water from the Macquarie River into the big cowal;—what is your opinion in regard to the matter? I consider it could be put into the big cowal just above Narromine.
6004. What works would be necessary? A cutting from the river to the cowal, a little over 1 mile long.
6005. What length is the cowal? 200 miles.
6006. Would the whole of that be filled by such a cutting? Yes; and there are selectors all along the cowal.
6007. *Mr. Burchell.*] How long have you been in the district? Thirty-two years.
6008. Where have you resided most of the time? At Dandaloo and Forrestvale.
6009. What is the average rainfall? About 20 inches.
6010. Have you had any experience of wells for stock purposes? I put down one well, but got only a fair house supply.

William John Bowen, station manager, Bowen Park, near Gin Gin Weir, sworn and examined:—

W. J. Bowen. 6 Oct., 1902.

6011. *President.*] What is your name? William John Bowen.
6012. What are you? A station manager.
6013. Where do you reside? At Bowen Park, 4 miles by road from here, on the opposite side of the river.
6014. Do you agree with what the previous witnesses have said here this morning? Yes.
6015. Do you wish to add anything to it? Only that I have lived here all my life, and expect to be benefited by the weirs, owing to their keeping permanent water in the river, and that the water diverted into the Ewenmar Creek will also be of benefit to me during times of drought.

WEDNESDAY, 15 OCTOBER, 1902.

[*The Commission met in the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, Esq. (President).
STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

John Wright, Civil Engineer, of Sydney, sworn and examined:—

J. Wright, C.E. 15 Oct., 1902.

6016. *President.*] What is your name? John Wright.
6017. What are you? A civil engineer.
6018. I understand that you have been acquainted with the Colony and its rivers, more especially the Murray, for fifty odd years? Yes.
6019. You have prepared a statement on the question remitted to us, have you not? Yes.
6020. Will you read it, please? Regarding the contention of many, that the Darling River should be made navigable, and so maintained, *I beg to submit, for your consideration*, details of the commerce on that river for ten years—from 1891 to 1900:—

Darling trade.

Analysis of the Darling River Trade.—80 Steamers.

Year	Tonnages—Wentworth.	Tonnage to other Ports.	Total Tonnage.	Tonnage per Steamer, per Annum.	Number of calls at Ports.	Average Tonnage to each Port.
1891	37,988	31,753	69,741	.....	} Details not given.	
1892	31,071	28,781	59,852	748·10		
1893	39,888	33,359	73,247	915·60		
1894	47,224	41,403	88,627	1,107·8		
1895	37,489	40,723	78,212	977·7	731	107·00
1896	38,623	36,800	75,423	942·8	1,524	47·49
1897	24,522	48,894	73,416	917·8	1,259	59·66
1898	22,319	39,919	62,238	779·9	1,324	47·00
1899	21,646	47,596	69,242	865·5	1,489	46·50
1900	20,466	58,886	79,233	990·4	1,534	51·60

Trade gradually decreasing.

From which it will be seen that the tonnage reached its highest point in 1894, 47,224 tons; in 1900 it fell to 20,466 tons, a decrease of over 50 per cent. The decrease has been gradual, indicating that the water carriage is decreasing in volume, no doubt by reason of the railways to Bourke and Broken Hill conveying a lot of the tonnage that formerly went by steamer. You will also note that the commerce to other ports on the Murray and Murrumbidgee rivers has increased no less than 33 per cent. during the same period, from 47,403 tons in 1894 to 58,886 tons in 1900. Now, it has been given in evidence before you that there were no less than eighty steamers engaged in the trade, and their average annual tonnage has only been 812 tons each, so that water carriage cannot be a very remunerative business. It has been proposed by the advocates of continuous navigation that the sum of £500,000 should be expended in the construction of locks and weirs on the Darling. This proposal, in view of the fact that the railways will tap the river at several points in the near future, seems to me to be an absurdity. The railway lines to Bourke and Broken Hill have without doubt caused the decrease of tonnage on the Darling, and it is only reasonable to assume that when the extension to Wilcannia, and the proposal of the Victorians to run a line to the river opposite Wentworth in their own territory, have been carried out, the tonnage on the river will be still further reduced. To expend £500,000 on locks and weirs, which would involve an annual expenditure of £20,000 for maintenance, wages of lock-keepers, and interest on initial costs, in order to carry about 20,000 tons of commerce, is out of all reason. And any such undertaking is not likely to yield any return at all, whereas railways in time will undoubtedly do so. The Darling, as a carrier, undoubtedly very materially aided the development of the country through which it flows, but the railways will, as they have done in other countries, reduce its utility to a minimum, and it should now be the objective of legislation to put its water to a better use, such as irrigation and the maintenance of stock. Objection will no doubt be taken by South Australia to the diversion of the Darling waters and to their being used extensively for irrigation; but in flood-times the volume of water is so great as to be incalculable. I have seen it in 1860 flowing at about 10 feet per minute 70 miles on the south of the Lower Talywalka, and to within a few miles of the western boundary of Mosgiel. In 1870 a steamer went

Water carriage not remunerative.

Railway facilities account for decreased water carriage.

Expenditure on locking not justified.

Volume of flood

went from a few miles above Wilcannia to beyond the Queensland border, a distance of over 180 miles. It is presumed that she kept to or near the course of the Paroo. In ordinary floods the water extends on either side to a distance of from 30 to 60 miles; and if these flood-waters were held up as they are in Egypt, where they practise basin irrigation, I fail to see how, or in what way, South Australia could suffer. In fact, I venture to say that if all the depressions that exist on either side of the Darling were filled and their waters held up to flood level, navigation would be possible for a longer period than if the river were locked and the water in the depressions allowed to go to waste as it does at present. Take the Poopolloe depressions, for example—I think its area is about 50 square miles, and the depressions about and around Menindie exceeds 120 square miles—if the flow from them were regulated, I am sure, from the immense quantity of water they would hold up, that navigation would be prolonged and there would be an ample supply for irrigation purposes. If that would not meet the view of the South Australians, then the only possible way would be to adopt the principle proposed by the Mexican Government in regard to the water of the Rio Grande River and its tributaries—viz., that the water should be divided, each of the American States through which the waters flowed to take a part and Mexico the same. That proposal has not been carried out, the American States use the whole of the Rio Grande waters. And the Secretary of the United States Department of Agriculture says, in his 1900 report, "Many most important rivers are inter-state streams. Some of them are used for irrigation in half-a-dozen different states. The water-rights of these several states deal with a common supply. They vary so widely in their character that there must sooner or later come a time when their differences must be reconciled, or at least be brought to the attention of the Federal Government and become a subject for legislation by Congress." "Facts are being collected to determine whether or not the control of rivers used in irrigation should be left as at present, or whether the present practice should be overturned and the streams be divided under the operation of Federal laws and under the control of Federal officials." So that in America, after years of experience in the use of water, the rights of states to the whole or partial appropriation has not been determined, and endless litigation is the result. Whoever may have a right, or partial right, to the Darling waters, I feel constrained to say that the beneficial occupation of the Western Division of this State involves the absorption of the bulk of the Darling waters, and the sooner the question of whom do they belong to, and whether the production and maintenance of animal life, and the profitable use and occupation of 80,000,000 of acres of land is of less importance than the maintenance of a highway for the conveyance of 20,000 tons of goods and produce, is determined, the better. Within the last ten years, upwards of 10,000,000 of sheep have been lost in the Western Division for want of feed and water, and the country is practically abandoned except on the river frontages, and I would ask, is this to continue? We may expect to experience droughts equally as disastrous as the one under which the Western Division now labours, and are we to remain as unprepared as we were simply for the purpose of maintaining continuous or intermittent navigation for the conveying of (taking the whole river's commerce) 80,000 tons per annum? In America many streams are absorbed for irrigation purposes, and it is stated by some scientists that the artesian wells of Dacota are actually absorbing the waters of the Upper Missisouri River. It is beyond question, that by the utilisation of water for purposes of irrigation that land-values increase from 100 to 500-fold, and that its practise develops a country's resources and increases the wealth of the population to a much greater extent than is possible by any system of internal water carriage. It is, therefore, to be hoped that the Darling waters may soon be put to that beneficial use. The total capital invested in the independent canals of England and Wales is stated to be £27,700,000, and the net profits £580,000, a not very satisfactory return to the investors. The actual income of the whole of the canal companies from the carriage of freight is small, amounting in England and Wales to only £447,000, whilst £764,000 is earned from tolls, and £211,000 from other sources. The freight cost varies very much, from 4½d. to 1·119d. per ton per mile. The famous Bridgewater Canal Company charging 7s. 6d. per ton for transport over their 20 miles of canal; whilst the Aire and Calder Canal Company in Yorkshire charge only 1·119d. per ton for the mineral traffic on their canal, and ⅜ per ton for ordinary or general traffic; these are the lowest rates known and yet it is the most successful of all the canal companies of England. The canal is 93 miles long, and has thirty locks. The subscribed capital is £2,371,000, and the gross revenue £250,000. The other canal companies' charges vary from 0·52d. to 0·17d. per ton mile. But, presuming that one wished to send goods from London to Liverpool by canal, no less than six canal companies would have to be dealt with who charge tolls varying from 2d. to 1s. 6d. per ton between the Thames and Preston Brook, within 20 miles of Liverpool, and then over the Bridgewater Canal, who charge 7s. 6d. per ton for their 20 miles, or more than the other six companies have charged for conveying the traffic about eleven times that distance. There are four or five different water routes between London and Liverpool, yet the cost of conveying a ton of ironwork between those cities by canal amounts to 20s., being over 1d. per ton mile. Naturally, the London and North-western and Midland Railways absorb almost the whole of the traffic, and, according to the Board of Trade returns, over 90 per cent. of the internal commerce of the United Kingdom is carried by rail. The canals struggle along, earning an uncertain and precarious livelihood, excepting one or two companies which are successfully and well managed. So much for the advocates of inland water carriage. The canals in France give no return for the amount invested or spent in their construction (being free). In Germany the cost of canal carriage on the Elbe system is officially stated to be 0·37d. per ton mile. On the canals from the Belgian coal-fields to Paris the rate is given at 0·30d. per ton mile in the spring, and 0·36d. in autumn, not taking into consideration the interest on capital cost which is defrayed by the Government. The figures quoted show that the cost of canal transport may be, and actually is, any figure from 4½d. to ⅛ths of a penny per ton mile. But the cases are rare in which canal or river rates have any influence on rates by rail. In England the heads of the railway companies regard canal competition with something like contempt, and it is not generally reckoned with as a factor in fixing railway rates. Even the best of the canals are, to a certain extent, under railway control. For instance, the Birmingham Canal Navigations have an agreement with the London and North-western Railway Company, whereby upon the latter paying the former 4 per cent. they cannot alter their rates without consent of the railway authorities, and they have the right to nominate a certain number of directors on the Canal Companies' Board. Approximately, the railways in England carry about 38,000,000 tons, including the canals, which belong to the railway companies. The rates on the Spanish canals, viz., Canal del Castella, Canal des San, Canal del Compos, and Canal del Nord, are very high, amounting to over 1d. per ton mile, but they are not opposed by the railways

J. Wright, C.E. 15 Oct., 1902.

If floods conserved ample water for all.

Storages.

Proposed Mexican arrangement.

Position in America.

Western Division of New South Wales.

Area.

Stock.

Droughts will recur.

Irrigation increases land values.

Canals of England and Wales.

French, German, and Belgian canals.

Spanish canals.

J. Wright, C.E.
15 Oct., 1902.

railways to any great extent, and their tonnage is much larger than the railways. In Germany the canals carry about one-seventh of the internal commerce; France about one-fifth; Holland and Belgium about the same. The length of the Erie Canal is 381 miles; depth of water, 7 feet; cost of construction £10,500,000; interest on cost, £420,000; cost of maintenance, £150,000 per annum; number of boats, 4,000; time occupied in journey, seven days; number of locks, seventy-two. The canal belongs to New York State; no tolls or dues are charged, yet it only carries one-sixth of the grain grown in the Western States, as the following figures, compiled from the New York Board of Trade returns, show:—

Proportion of trade carried by railway and canals in various countries.

	Grain by Canal. Buffalo to New York.	Grain by Rail. Buffalo to New York.
1884	35,339,000	75,076,000
1886	44,613,000	84,740,000
1888	33,733,000	68,556,000
1890	30,554,000	90,219,000
1892	24,904,000	140,750,000
1896	52,146,000	157,363,000
1898	20,804,000	161,131,000
1900	20,176,000	137,219,000

Rail and canal charges.

The railway rates during the whole period quoted were double the canal rates, and some years even more. In 1900, the Chairman of the Chicago Board of Trade stated, "that there would probably be 500,000,000 bushels of grain sent on the lakes and canal and railways from west to east, and a saving of 1 cent. per per bushel meant £1,000,000 to the grower, yet the railways carried six times more than the canals. In 1862 the canal carried nine-tenths of the west-grown wheat; in 1883, one-third; and from 1892 onwards only about one-sixth." Even the Mississippi as a carrier of heavy freights cannot compete with the railways. In 1879 the new jetties at the mouth of that river were completed, and of the 370,000,000 bushels of wheat grown in the States tributary to the Mississippi River only 6,000,000 bushels were shipped from St. Louis; in 1880 and in 1885 only 50,000 bushels were sent, notwithstanding the fact that the oversea route rates from St. Louis to Liverpool were and are now only two-thirds of that *via* New York. This is not due to the want of facilities, for the Mississippi Valley Transport Companies Barge Line has a capacity of moving 2½ million bushels monthly, yet the average movements seldom exceed 1,000,000 bushels per month, while on the eastern route, with rates one-half greater, freight blockages often occur, showing conclusively that something more than facilities and cheap rates are necessary to control routes of a country's produce. The Upper Missouri River traffic more nearly applies to our Darling traffic than any within my scope of inquiry. The Missouri River runs through a deep alluvial soil carried down from the mountains, and its gnawing currents constantly eat from the banks great trees, lodging them in all parts of the stream. From 1810 to 1870, 151 steamers and boats were wrecked through snags; from 1870 to 1880 thirty-eight wrecks, twenty-one by snags; from 1880 to 1890 there were forty wrecks, seventeen by snags; from 1890 to 1901 eight wrecks, four by snags. This is due to the continuous snagging operations carried on by the Government, and indicates the impossibility of Missouri commerce without snagging. Millions of dollars have been spent in maintaining this river as a carrier of commerce, but it is of no use: the Government evidently want to give it up. Captain H. M. Chittenden, Chief of the United States Engineers for the entire Missouri River since the abolition of the Missouri River Commission, believes the career of the Missouri River as a means of transportation is at an end. This is foreshadowed in his annual report (1902) when he says:—"The discontinuance of the Missouri River Commission, and the greatly reduced appropriations as compared with former years for both upper and lower river, indicates an intention on the part of Congress to abandon the river altogether in the near future. Before the rendition of the annual report for 1903, the officer in charge will be prepared to submit a comprehensive statement of the condition of the entire river, and the advisability or non-advisability of further work upon it. Since 1890, 376,144 (£55,000) dollars have been spent in keeping the channel clear. The traffic for the year amounted to 24,000 tons, 11,219 cattle, and 756 passengers—somewhat larger than the Darling traffic at its best. In 1878, Lieutenant Maguire, of the United States Engineers, of St. Paul's, said, in his annual report,—"The Missouri River will always be an important line for traffic, no matter how many railways are built into Montana," indicating the condition upon which he based his prophecy by continuing,—"For a time the shippers and merchants sent this freight by the Union Pacific Railway, that railway having reduced the rates during high water to compete with the river; but time proved the superiority of the river, and the shippers returned to it." Commenting on this, the *New York Times* says: "Maguire thought the Missouri River must endure as the cheapest line of communication for its territory, because the railways could not give competition." But they have, and the freight goes by rail. So it happens that the eleven steamboats now plying upon the Upper Missouri are engaged solely in hauling freights to the nearest railway. There are stretches of 50 and 75 miles between railroads on the upper river, and to carry the freight to these roads the boats are maintained. The territory and railroads have developed wonderfully, so the traffic for these stretches of isolated country alone exceeds the entire upper river business of a quarter of a century ago. "It is not like the early river traffic," said a steamboat captain who had been on the river from 1865. "In those first days there were sixty-five boats on the Missouri, big fellows ranging to 500 tons capacity." Now in America, as in England, canal or river rates are not reckoned with as factors in fixing rates by rail, and although the rates by lake and canal from Chicago to New York are much lower than by all rail, the latter carries the bulk of the traffic. Vast sums of money have been spent on the Texas coasts in the futile attempt to establish deep-water harbours through which it was expected that the surplus grain and other productions of the west and north-west would pass to foreign markets, but it has not done so though the Mississipi rates are lower even than the canal rates. In connection with this matter I may point out that for the last thirty to forty years there has been no advance made by the canal proprietors either in methods of transporation or in means of securing traffic, whereas in everything pertaining to railways the improvements are simply phenomenal. And I venture to say, in conclusion, that when the Darling River is tapped as proposed at three points by railways it will be but very little used as a carrier for either wool or merchandise.

Upper Missouri River traffic

Reduction of Missouri traffic.

Steamers on Missouri engaged as feeders to railway.

Have known Murray dry from Tocumwal to Moama.

6021. *President.*] I believe that in the fifties you know the district in the vicinity of Tuppal Creek? Yes
6022. Do you know the condition of things in those years, so far as the Murray was concerned? In September of that year (1850) the Murray was practically dry from Tocumwal to Moama; there was no stream flowing at all.

6023.

J. Wright, C.E.
15 Oct., 1902.

6023. Has the river been dry since then? Not to my knowledge.
6024. Have you known pretty well all the floods which have occurred in the river since that date? Only the 1852 flood and the 1860-61. I have a particular recollection of the flood in 1852, as we climbed some trees near what is now Echuca, the only dry ground in the neighbourhood, and looking out from those trees we could see that the water extended to the Terricks Terricks and down to Rochester, and it remained so for five or six weeks—that was in July.

Flood of 1852.

6025. *I understand that you were professionally engaged in connection with the diversion of water from the Murray into Tuppal Creek?* Yes; in 1889 I submitted a proposal to the manager of Tuppal station, and an estimate of the cost of letting the water down from the Murray and allowing it to flow right through the creek to Tuppal station.

Tuppal Creek.

6026. Did any water at all find its way from the Murray to Tuppal Creek in those days? Yes; when the river was in flood.
6027. Was that the case with all the creeks down the river, from Tuppal Creek to Moama? Yes.
6028. Did you have anything to do with the Tuppal Creek cutting? Yes; I suggested it, in 1855.
6029. Did water find its way into Yanko Creek, except in flood-time, from the Murrumbidgee River? Only very little.

Yanko Creek.

6030. Was there a depression there at that time? Yes.
6031. How much was it deepened? Between 4 and 5 feet.
6032. You are also acquainted with the Darling, are you not? Yes, off and on, since 1859.
6033. What is your opinion as to the possibility of irrigation on the Darling? I am of opinion that if a broad and comprehensive policy of water conservation obtained, and the water were held up to flood-level throughout the whole of the depressions on the Darling, sufficient water could be obtained to irrigate a very large quantity of land, the area, of course, depending upon the number of depressions availed of. Some of the depressions are very large, and would hold water up to 10 feet in depth. It has been stated that we should adopt the American principle of irrigation, but we could not do that, because the land is of so different a character. A jet of water there would moisten an area of 16 feet in diameter; it is like an ash-heap compared to our ground. Their soil is very porous, and, therefore, very much easier to irrigate. In America the seepage is enormous, and the first application of water means a cubic foot per second over 50 or 60 acres, whereas in Spain, the same quantity of water will irrigate 250 acres; on account, however, of the seepage in America being so great, and the ground consequently well saturated, it is found that less water is required year by year. It is very difficult to determine what quantity of water will produce a crop in particular soil and climate; the Americans have failed to keep records, nor can any definite duty be given. I find that in this country about five waterings per year will grow lucerne.

Possibilities of irrigation on the Darling.

Duty of water.

6034. *Mr. Murray.*] You say that the Murray ceased flowing in September, 1850;—how old were you then? About 12 years.
6035. Do you think your recollection would be reliable? Yes; I have often discussed it with others; Mr. G. Maiden, of Goldsborough, Mort & Co., would corroborate what I say.

Murray ceased flowing in 1850.

6036. Did I understand you to say that the duty of water was less in America than here, owing to the porosity of the soil? Yes.
6037. Do you know anything of the quantity of water used for irrigation in Australia? Only from my own experience of the irrigation of 18 acres. I think about 8 inches will grow a crop of lucerne.
6038. Would not the quantity vary according to the quality of the soil? Yes, it would.
6039. It will also vary a good deal, according to the care with which it is used? Yes.
6040. *Mr. Burchell.*] Did I understand you to say that rail carriage is cheaper than water carriage? No, it is not cheaper, but water carriage cannot compete with the railways, owing to the delays which occur, time being an important factor in the despatch of produce.

Delay by water carriage.

6041. Do you know that in France irrigation canals are being made navigable? Yes.
6042. *Why is that being done? The French Government have done away with all tolls and dues;* the canals are declared free.
6043. What is the difference in cost between rail and water carriage in America? From 3 to 5 per cent. per bushel.

Rail and water carriage in America.

6044. Over what distance? 3800 miles.
6045. What is the cost of carrying a ton of goods 100 miles over the railways of America? I could not say.
6046. Would you be surprised to know that the lowest price is 36d. per ton, while the cost of water is less than 9d.? No, I should not be surprised to know it, but the carriage by water is a mere nothing when compared with the railways. The proportion is *about six to one in favour of the railways.*
6047. Do you know that the average rate throughout the world for carrying goods by sea is 5s. per 1,000 miles per ton, by canal 20s., by rail 100s., and by road 300s.? I know that over-sea carriage is very low, but do not think you can fairly compare it with carriage by river or canal.
6048. How does river carriage compare with road carriage from Wentworth to Morgan? I do not think you can make a comparison. I suppose it would be £10 or £15 to as many shillings; but if a railway were constructed, producers would use the speediest method of getting their produce to market.
6049. Wheat is carried on the river now for 400 miles for 5s. per ton;—can you tell me of any railway which could do that and make a profit by it? No; but if it became a question of quick delivery, the bulk would go by railway, in spite of the extra cost.

The Honorable Joseph Hector Carruthers, M.L.A., of Sydney, further examined:—

J. H. Carruthers, M.L.A.
15 Oct., 1902.

6050. *President.*] Will you continue what you were saying when you were previously examined? The American doctrine of appropriation is practically a reversion to the old civil law, and we must not forget that the civil law has been handed down to us from countries which might be described as tropical and sub-tropical climates. It is from the Mediterranean shores and the Latin races that the old civil law was derived; and of course the climate of the countries adjoining the Mediterranean is vastly different from that of a country like England, and the civil law would be derived just as the common law of England is derived from the necessities of the people on the Mediterranean littoral, especially the southern side. The powers of sustaining life to a large population would be absolutely gone it there were not paramount rights

Origin of old civil law.

J. H. Carruthers, M.L.A.
15 Oct., 1902.

rights of using water for irrigation there; and, to a large extent, that would apply to the northern littoral of the Mediterranean also, especially countries like Spain, which resemble, in a great many respects, a large portion of Australia. In "Kenney on Irrigation," page 22, it is stated that under the civil law water was *publica juris*, and by that law the first person who chooses to appropriate a natural stream to a useful purpose has title against the owner of the land below, and may deprive him of the benefit of the natural flow of the water, per Denman in "Mason *v.* Hill, 5 Barn and Adol. 1." Thus we see that this is the oldest method of skilled husbandry, and probably a large number of the human race have ever depended upon artificial irrigation for their food products. The riparian rights of the common law could not exist under such a system; and a higher antiquity, a better reason, and more beneficient results have flowed from the doctrine that all rights in water in non-navigable streams must be subservient to its use in tilling the soil. Of course, that remark of a high jurist (Judge Denman) applies with force to other countries than the country in which he was speaking. It applies to countries which are remarkably similar to the interior of New South Wales; countries where, at periods, there is an abundant flow of water, and where local droughts are a normal occurrence, but where there is a river which periodically overflows its banks, providing an abundance of water, if it were conserved and utilised for purposes of irrigation. The civil law applies to most of these tropical regions, and it was certainly under the civil law that both Egypt and India were developed. I suppose the Commission know very well the extent of the works which have been done in India and the enormous population there sustained owing to the great irrigation works in those countries, also in Egypt and Algeria, where millions are supported by reason of the irrigation works carried on. Major-General Hutton, who has served in India and Egypt, occupying in both those countries high military positions, in his ride through the interior of New South Wales from Broken Hill to Hay, has placed on record that that country is remarkably similar to the country in Egypt and India which is now utilised for irrigation. If the common law doctrine is applied to New South Wales, Queensland, and South Australia you must abandon three-fifths of the continent almost as a perpetual waste. What I want to emphasise is that the United States of America have thrown off the thraldom of a law which was utterly inapplicable to a large portion of its territory and reverted to a nearer approach to the civil law, basing its action upon the natural interest of the country and people, also that by reason of that reversion it has produced the American doctrine of appropriation. I decline to admit as a citizen of this country, and as one who has studied jurisprudence from as broad a standpoint as it can be studied, that we should be cribbed, cabined, and confined by the slavish adoption of a doctrine of common law which has grown up in accordance with the English climate, and which if adopted here will be destructive of the occupation of a large portion of the country. It is, therefore, a matter for legislation, which is the quickest method of dealing with it, to declare a code of law with regard to the use of its waters. The same writer from whom I have quoted, speaking of America, which is less subject to droughts than Australia is—we have no great range of mountains like the Rockies which causes the rainfall and accumulates vast quantities of snow to be melted in the summer season—says: "All the people of this country could exist and live in a prosperous condition if the art (irrigation) was not practised in the United States. The question of warding off famine has never yet been considered as a national issue. The part of this country within the rain-belt is large enough and productive enough to support our present population, and more besides. From this fact it follows that up to the present time irrigation has never in this country taken a part in the life and death struggle for existence as it has in the more densely populated countries of the old world; but as the country becomes more thickly populated it remains for future generations to say what part irrigation will take in the struggle of humanity. So far its employment in the United States has been more from a speculative standpoint than through a great national interest. To be sure it is practised to make barren lands bring forth crops, and also to make other lands more productive, but the person who cultivates these lands might have selected others within the rain-belt of the country. And so there has never arisen in this country any question as to whether the people of the United States can exist upon the products of their own soil without the aid of irrigation. Is it an absolute necessity to this nation? Almost silently, without the knowledge of the other 56,000,000, a population of 7,000,000 has gone upon that portion of the United States lying outside of that portion of what is known as the rain-belt, west of the 100th meridian. In that part of the country the artificial application of water to the soil for irrigation is in a greater or less degree, according to the locality, a necessity for agriculture or horticulture. Thus an irrigation empire has grown up before us without its magnitude and its vast possibilities being known until within the last five years." What is said there is not true here where the population is leaving our arid districts. People have gone there and tried to live, but failed on account of the great aridity of the climate. This writer has a great deal to say on the question of the rights of navigation in respect to the conflicting rights of irrigation, and he gives the best definition of a river for a practical man that can be adopted: "A river is a running stream of water bound in on either side by banks, shores, or walls, usually flowing in a particular direction in a definite or defined channel, and discharging into some other stream or body of water. Every river consists of a bed, shores, or banks, the water, and also the current." There may be private property in water, but none in the flow of the river. I said that the law with regard to tidal rivers differs from the law with regard to non-tidal rivers; that is certainly true in England, and in America the law has been advanced by numerous cases in respect to that distinction. "Above the ebb and flow of the tide no rivers are by common law deemed navigable." That is American as well as English law. "But in this country (America) the fact that rivers are or are not subject to the ebb and flow of the tide is no longer a test of navigability. Rivers must be regarded as navigable in law which are navigable in fact." I want to point out that here is a departure from the common law with regard to navigability in America. Why? Because in America the means of transport largely depended upon the navigability of the rivers. Lumber men preceded the agriculturist, consequently the common law had to give way to the requirements of the country and its development. That will be the aspect which will bind the Commonwealth. All the authorities quoted in the Convention were American authorities, and we shall have to look to American decisions largely to guide us as to what view the High Court is likely to take rather than go to common law doctrines or the strict reading of English law as it applies to England. I wish to emphasise that, because if we are going to adopt the American law in regard to navigability, we should equally adopt the American law with regard to water conservation and irrigation, which has been adapted to meet the necessities of people in a new country and in new conditions of life. "It has been settled by a long line of decisions that the navigable rivers of the United States are such as are actually navigable in fact, and

Irrigation the oldest method of skilled industry.

Egypt and India developed under civil law.

Interior of New South Wales similar to India and Egypt.

Australia should not be bound by English common law.

Definition of a river.

No private property in flow of river.

Rivers navigable in fact are navigable in law.

American decisions a guide to Australia.

J. H. Carruthers, M.L.A.
15 Oct., 1902.

and which, by themselves or in connection with other waters, form a continuous channel for commerce with foreign countries or among the States." "By the civil law, waters navigable in fact are such in law, a navigable river being defined as '*Statio internere navigo*' (a place or way for navigation)." The writer then defines rights of navigation in what are termed "public rivers" in America. But it is very hard to see what cases would be analogous here. Non-tidal streams have been decided to be public streams in America, but "Whether a river can be called public or not, the public have a paramount right of passage upon all streams which afford capacity for that purpose. This right includes not only the navigation of vessels and boats, but also floatage. So also as to the smaller rivers, which are not navigable for large boats, it is held that where a stream is naturally of sufficient size to float small boats, mill logs, and timber, the public have a right to its free use to those purposes; nor is it essential that such capacity continue throughout the year—it may only last a few weeks in the spring or at times of especially high water." Paramount right of passage must be taken to mean that no person would have the right to obstruct the passage. Supposing some one wilfully and wantonly diverted the stream, that would be held to be an obstruction; but supposing it were diverted for purposes of irrigation, I think authorities could be quoted to show that such use of the water would not be an obstruction of the rights of navigation, which would be illegal owing to any paramount right of navigation. I need not take up the time of the Commission in going over what, I am sure, plenty of other witnesses have dealt with—*i.e.*, the common law rights of diversion and the common law rights to the natural flow of water. Speaking of the appropriation of water under common law rights, Mr. Justice Storey, in the case of Tyler *v.* Willkinson, says: "I do not mean to be understood as holding the doctrine that there can be no diminution whatever, and no obstruction or impediment whatever, 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 of that which is common 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. . . . The law here, as in many other cases, acts with reasonable reference to the public convenience and public good, and is not betrayed into a narrow strictness subversive of common use, nor into an extravagant looseness which would destroy private rights. The reasonableness of detention by a riparian proprietor above, causing injury to a riparian proprietor below, depends upon all the circumstances of each particular case, including the size of the stream, the time the water was detained, and the use that was made of it by all interested." The language he has used there would be almost sufficient to satisfy every demand that could be made for the use of water without pushing to any extreme the American doctrine of appropriation. He lays it down that the question of the reasonableness of the detention by a riparian proprietor depends upon all the circumstances of the case, so that it would be much more reasonable for a person in a dry and arid district to take away a large quantity of water for the purpose of producing an effective supply than it would be for a person in a comparatively well-favoured locality to take away that water in order to carry on some business in competition with some persons for purposes of mere commercial speculation. In regard to the question of the right to the use of water, it is laid down that "Water used to supply man's natural wants is 'an ordinary use,' and to supply man's artificial wants is 'an extraordinary use.' The real difference pointed out by the authorities between two classes of use is that water may be used for ordinary purposes without regard to the effects of such use in case of a deficiency to those below on the stream; while in reference to the extraordinary uses, the effect upon those below must always be considered in determining its reasonableness." "According to the great weight of common law authorities, where the supply of water is very small for those natural uses the upper riparian proprietor may, if necessary, consume all the water of the stream to supply his natural wants, but not for any other purpose." I have tried to address to the Commission the gradual process of reasoning by which the American has evolved the "arid region doctrine." If we follow out the reasoning here, working upon the basis of tested cases on the old common law, and apply it to this State, the great weight of authority goes to show that where a supply of water is small for natural uses, the upper proprietor on the stream may use the whole of the water for his natural requirements. The natural uses of the proprietors on the Darling and its tributaries, or certainly along the river itself, are such that in order to supply them at certain periods it would be absolutely necessary to take almost every drop of water in the river. It is a choice between doing that and abandoning all hope of the profitable development of the enormous area of country abutting on the Darling and its watershed, not for mere artificial uses or purposes of luxury, but for the ordinary purposes of civilisation.

Public right of passage on streams.

Reasonable use.

"Ordinary and extraordinary uses."

"Arid region doctrine."

6051. *Mr. Burchell.*] Would that include irrigation? Unless you irrigate there would be no vegetation. You could not grow a vegetable in that district during the past four or five years without artificial irrigation. The natural rainfall is not sufficient, and I need not state that without vegetable food man cannot live. If he has to buy it in the tinned state he is certainly not living upon the product of the land in his neighbourhood, but is having his common wants supplied by trade when he has all the requirements for supplying these natural wants near to hand, if only he is permitted to use them. Fruit culture in that district is impossible without water, the few fruit orchards there are either supplied by windmills or otherwise with the necessary quantity of water to keep them alive. Where there is artesian water there is a little fruit-growing, but the settlements are difficult to manage either on account of the quality of the water or its scarceness, so that it appears to me that water for stock and for the cultivation of vegetable food, without which man cannot exist, is an absolute necessity and, therefore, a natural want, while at periods of the year the natural supply of water is so small that the whole of it would be required for that purpose. That would not, however, be the case if water were conserved. Abundance would thus be secured, and still leave something to spare to maintain the flow of the river.

Necessity of irrigation on the Darling.

6052. Would that apply to irrigation for export? I think that would be beyond the natural wants of the people who are there, but as the population increases the natural wants will increase also. It would be an indefensible thing supposing the territory were occupied by, say, three owners who went into an enormous system of irrigation for profit; but if you have 3,000 then you can understand that the natural wants of the locality is multiplied by a thousand. The natural requirements are, of course, governed by the population; when settlers begin to use water for purposes of trade and commerce they must regulate their use of it by the equal use of people lower down the stream, but, on the other hand, the people below have no right to say to those above, that in order that we may make money you must allow the water to pass your door and leave your natural wants unsupplied. "In the Supreme Court of Illinois, in the case of Evans *v.* Merriweather, this subject was discussed with great length as to whether water for purposes

Natural requirements governed by population.

J. Wright, C.E. 15 Oct., 1902.

railways to any great extent, and their tonnage is much larger than the railways. In Germany the canals carry about one-seventh of the internal commerce; France about one-fifth; Holland and Belgium about the same. The length of the Erie Canal is 381 miles; depth of water, 7 feet; cost of construction £10,500,000; interest on cost, £420,000; cost of maintenance, £150,000 per annum; number of boats, 4,000; time occupied in journey, seven days; number of locks, seventy-two. The canal belongs to New York State; no tolls or dues are charged, yet it only carries one-sixth of the grain grown in the Western States, as the following figures, compiled from the New York Board of Trade returns, show:—

Proportion of trade carried by railway and canals in various countries.

	Grain by Canal. Buffalo to New York.	Grain by Rail. Buffalo to New York.
1884	35,339,000	75,076,000
1886	44,613,000	84,740,000
1888	33,733,000	68,556,000
1890	30,554,000	90,219,000
1892	24,904,000	140,750,000
1896	52,146,000	157,363,000
1898	20,804,000	161,131,000
1900	20,176,000	137,219,000

Rail and canal charges.

The railway rates during the whole period quoted were double the canal rates, and some years even more. In 1900, the Chairman of the Chicago Board of Trade stated, "that there would probably be 500,000,000 bushels of grain sent on the lakes and canal and railways from west to east, and a saving of 1 cent. per per bushel meant £1,000,000 to the grower, yet the railways carried six times more than the canals. In 1862 the canal carried nine-tenths of the west-grown wheat; in 1883, one-third; and from 1892 onwards only about one-sixth." Even the Mississippi as a carrier of heavy freights cannot compete with the railways. In 1879 the new jetties at the mouth of that river were completed, and of the 370,000,000 bushels of wheat grown in the States tributary to the Mississippi River only 6,000,000 bushels were shipped from St. Louis; in 1880 and in 1885 only 50,000 bushels were sent, notwithstanding the fact that the oversea route rates from St. Louis to Liverpool were and are now only two-thirds of that *via* New York. This is not due to the want of facilities, for the Mississippi Valley Transport Companies Barge Line has a capacity of moving 2½ million bushels monthly, yet the average movements seldom exceed 1,000,000 bushels per month, while on the eastern route, with rates one-half greater, freight blockages often occur, showing conclusively that something more than facilities and cheap rates are necessary to control routes of a country's produce. The Upper Missouri River traffic more nearly applies to our Darling traffic, than any within my scope of inquiry. The Missouri River runs through a deep alluvial soil carried down from the mountains, and its gnawing currents constantly cat from the banks great trees, lodging them in all parts of the stream. From 1810 to 1870, 151 steamers and boats were wrecked through snags; from 1870 to 1880 thirty-eight wrecks, twenty-one by snags; from 1880 to 1890 there were forty wrecks, seventeen by snags; from 1890 to 1901 eight wrecks, four by snags. This is due to the continuous snagging operations carried on by the Government, and indicates the impossibility of Missouri commerce without snagging. Millions of dollars have been spent in maintaining this river as a carrier of commerce, but it is of no use: the Government evidently want to give it up. Captain H. M. Chittenden, Chief of the United States Engineers for the entire Missouri River since the abolition of the Missouri River Commission, believes the career of the Missouri River as a means of transportation is at an end. This is foreshadowed in his annual report (1902) when he says:—"The discontinuance of the Missouri River Commission, and the greatly reduced appropriations as compared with former years for both upper and lower river, indicates an intention on the part of Congress to abandon the river altogether in the near future. Before the rendition of the annual report for 1903, the officer in charge will be prepared to submit a comprehensive statement of the condition of the entire river, and the advisability or non-advisability of further work upon it. Since 1890, 376,144 (£55,000) dollars have been spent in keeping the channel clear. The traffic for the year amounted to 24,000 tons, 11,219 cattle, and 756 passengers—somewhat larger than the Darling traffic at its best. In 1878, Lieutenant Maguire, of the United States Engineers, of St. Paul's, said, in his annual report,—"The Missouri River will always be an important line for traffic, no matter how many railways are built into Montana," indicating the condition upon which he based his prophecy by continuing,—"For a time the shippers and merchants sent this freight by the Union Pacific Railway, that railway having reduced the rates during high water to compete with the river; but time proved the superiority of the river, and the shippers returned to it." Commenting on this, the *New York Times* says: "Maguire thought the Missouri River must endure as the cheapest line of communication for its territory, because the railways could not give competition." But they have, and the freight goes by rail. So it happens that the eleven steamboats now plying upon the Upper Missouri are engaged solely in hauling freights to the nearest railway. There are stretches of 50 and 75 miles between railroads on the upper river, and to carry the freight to these roads the boats are maintained. The territory and railroads have developed wonderfully, so the traffic for these stretches of isolated country alone exceeds the entire upper river business of a quarter of a century ago. "It is not like the early river traffic," said a steamboat captain who had been on the river from 1865. "In those first days there were sixty-five boats on the Missouri, big fellows ranging to 500 tons capacity." Now in America, as in England, canal or river rates are not reckoned with as factors in fixing rates by rail, and although the rates by lake and canal from Chicago to New York are much lower than by all rail, the latter carries the bulk of the traffic. Vast sums of money have been spent on the Texas coasts in the futile attempt to establish deep-water harbours through which it was expected that the surplus grain and other productions of the west and north-west would pass to foreign markets, but it has not done so though the Mississipi rates are lower even than the canal rates. In connection with this matter I may point out that for the last thirty to forty years there has been no advance made by the canal proprietors either in methods of transporation or in means of securing traffic, whereas in everything pertaining to railways the improvements are simply phenomenal. And I venture to say, in conclusion, that when the Darling River is tapped as proposed at three points by railways it will be but very little used as a carrier for either wool or merchandise.

Upper Missouri River traffic.

Reduction of Missouri traffic.

Steamers on Missouri engaged as feeders to railway.

Have known Murray dry from Tocumwal to Moama.

6021. *President*.] I believe that in the fifties you know the district in the vicinity of Tuppal Creek? Yes
6022. Do you know the condition of things *in those years, so far as the Murray was concerned*? In September of that year (1850) the Murray was practically dry from Tocumwal to Moama; there was no stream flowing at all.

J. Wright, C.E. 15 Oct., 1902.

6023. Has the river been dry since then? Not to my knowledge.
6024. Have you known pretty well all the floods which have occurred in the river since that date? Only the 1852 flood and the 1860-61. I have a particular recollection of the flood in 1852, as we climbed some trees near what is now Echuca, the only dry ground in the neighbourhood, and looking out from those trees we could see that the water extended to the Terricks Terricks and down to Rochester, and it remained so for five or six weeks—that was in July.

Flood of 1852.

6025. I understand that you were *professionally engaged in connection with the diversion of water from* the Murray into Tuppal Creek? Yes; in 1889 I submitted a proposal to the manager of Tuppal station, and an estimate of the cost of letting the water down from the Murray and allowing it to flow right through the creek to Tuppal station.

Tuppal Creek.

6026. Did any water at all find its way from the Murray to Tuppal Creek in those days? Yes; when the river was in flood.
6027. Was that the case with all the creeks down the river, from Tuppal Creek to Moama? Yes.
6028. Did you have anything to do with the Tuppal Creek cutting? Yes; I suggested it, in 1855.
6029. Did water find its way into Yanko Creek, except in flood-time, from the Murrumbidgee River? Only very little.

Yanko Creek.

6030. Was there a depression there at that time? Yes.
6031. How much was it deepened? Between 4 and 5 feet.
6032. You are also acquainted with the Darling, are you not? Yes, off and on, since 1859.
6033. What is your opinion as to the possibility of irrigation on the Darling? I am of opinion that if a broad and comprehensive policy of water conservation obtained, and the water were held up to flood-level throughout the whole of the depressions on the Darling, sufficient water could be obtained to irrigate a very large quantity of land, the area, of course, depending upon the number of depressions availed of. Some of the depressions are very large, and would hold water up to 10 feet in depth. It has been stated that we should adopt the American principle of irrigation, but we could not do that, because the land is of so different a character. A jet of water there would moisten an area of 16 feet in diameter; it is like an ash-heap compared to our ground. Their soil is very porous, and, therefore, very much easier to irrigate. In America the seepage is enormous, and the first application of water means a cubic foot per second over 50 or 60 acres, whereas in Spain, the same quantity of water will irrigate 250 acres; on account, however, of the seepage in America being so great, and the ground consequently well saturated, it is found that less water is required year by year. It is very difficult to determine what quantity of water will produce a crop in particular soil and climate; the Americans have failed to keep records, nor can any definite duty be given. I find that in this country about five waterings per year will grow lucerne.

Possibilities of irrigation on the Darling.

Duty of water.

6034. *Mr. Murray.*] You say that the Murray ceased flowing in September, 1850;—how old were you then? About 12 years.

Murray ceased flowing in 1850.

6035. Do you think your recollection would be reliable? Yes; I have often discussed it with others; Mr. G. Maiden, of Goldsborough, Mort & Co., would corroborate what I say.
6036. Did I understand you to say that the duty of water was less in America than here, owing to the porosity of the soil? Yes.
6037. Do you know anything of the quantity of water used for irrigation in Australia? Only from my own experience of the irrigation of 18 acres. I think about 8 inches will grow a crop of lucerne.
6038. Would not the quantity vary according to the quality of the soil? Yes, it would.
6039. It will also vary a good deal, according to the care with which it is used? Yes.
6040. *Mr. Burchell.*] Did I understand you to say that rail carriage is cheaper than water carriage? No, it is not cheaper, but water carriage cannot compete with the railways, owing to the delays which occur, time being an important factor in the despatch of produce.

Delay by water carriage.

6041. Do you know that in France irrigation canals are being made navigable? Yes.
6042. Why is that being done? The French Government have done away with all tolls and dues; the canals are declared free.
6043. What is the difference in cost between rail and water carriage in America? From 3 to 5 per cent. per bushel.

Rail and water carriage in America.

6044. Over what distance? 380 miles.
6045. What is the cost of carrying a ton of goods 100 miles over the railways of America? I could not say.
6046. Would you be surprised to know that the lowest price is 36d. per ton, while the cost of water is less than 9d.? No, I should not be surprised to know it, but the carriage by water is a mere nothing when compared with the railways. The proportion is about six to one in favour of the railways.
6047. Do you know that the average rate throughout the world for carrying goods by sea is 5s. per 1,000 miles per ton, by canal 20s., by rail 100s., and by road 300s.? I know that over-sea carriage is very low, but do not think you can fairly compare it with carriage by river or canal.
6048. How does river carriage compare with road carriage from Wentworth to Morgan? I do not think you can make a comparison. I suppose it would be £10 or £15 to as many shillings; but if a railway were constructed, producers would use the speediest method of getting their produce to market.
6049. Wheat is carried on the river now for 400 miles for 5s. per ton;—can you tell me of any railway which could do that and make a profit by it? No; but if it became a question of quick delivery, the bulk would go by railway, in spite of the extra cost.

The Honorable Joseph Hector Carruthers, M.L.A., of Sydney, further examined:—

J. H. Carruthers, M.L.A. 15 Oct., 1902.

6050. *President.*] Will you continue what you were saying when you were previously examined? The American doctrine of appropriation is practically a reversion to the old civil law, and we must not forget that the civil law has been handed down to us from countries which might be described as tropical and sub-tropical climates. It is from the Mediterranean shores and the Latin races that the old civil law was derived; and of course the climate of the countries adjoining the Mediterranean is vastly different from that of a country like England, and the civil law would be derived just as the common law of England is derived from the necessities of the people on the Mediterranean littoral, especially the southern side. The powers of sustaining life to a large population would be absolutely gone it there were not paramount rights

Origin of old civil law.

J. H. Carruthers, M.L.A.

15 Oct., 1902.

rights of using water for irrigation there; and, to a large extent, that would apply to the northern littoral of the Mediterranean also, especially countries like Spain, which resemble, in a great many respects, a large portion of Australia. In "Kenney on Irrigation," page 22, it is stated that under the civil law water was *publica juris*, and by that law the first person who chooses to appropriate a natural stream to a useful purpose has title against the owner of the land below, and may deprive him of the benefit of the natural flow of the water, per Denman in "Mason *v.* Hill, 5 Barn and Adol. 1." Thus we see that this

Irrigation the oldest method of skilled industry.

is the oldest method of skilled husbandry, and probably a large number of the human race have ever depended upon artificial irrigation for their food products. The riparian rights of the common law could not exist under such a system; and a higher antiquity, a better reason, and more beneficient results have flowed from the doctrine that all rights in water in non-navigable streams must be subservient to its use in tilling the soil. Of course, that remark of a high jurist (Judge Denman) applies with force to other countries than the country in which he was speaking. It applies to countries which are remarkably similar to the interior of New South Wales; countries where, at periods, there is an abundant flow of water, and where local droughts are a normal occurrence, but where there is a river which periodically overflows its banks, providing an abundance of water, if it were conserved and utilised for purposes of

Egypt and India developed under civil law.

irrigation. The civil law applies to most of these tropical regions, and it was certainly under the civil law that both Egypt and India were developed. I suppose the Commission know very well the extent of the works which have been done in India and the enormous population there sustained owing to the great irrigation works in those countries, also in Egypt and Algeria, where millions are supported by reason of the irrigation works carried on. Major-General Hutton, who has served in India and Egypt, occupying in

Interior of New South Wales similar to India and Egypt.

both those countries high military positions, in his ride through the interior of New South Wales from Broken Hill to Hay, has placed on record that that country is remarkably similar to the country in Egypt and India which is now utilised for irrigation. If the common law doctrine is applied to New South Wales, Queensland, and South Australia you must abandon three-fifths of the continent almost as a perpetual waste. What I want to emphasise is that the United States of America have thrown off the thraldom of a law which was utterly inapplicable to a large portion of its territory and reverted to a nearer approach to the civil law, basing its action upon the natural interest of the country and people, also that by reason of that reversion it has produced the American doctrine of appropriation. I decline

Australia should not be bound by English common law.

to admit as a citizen of this country, and as one who has studied jurisprudence from as broad a standpoint as it can be studied, that we should be cribbed, cabined, and confined by the slavish adoption of a doctrine of common law which has grown up in accordance with the English climate, and which if adopted here will be destructive of the occupation of a large portion of the country. It is, therefore, a matter for legislation, which is the quickest method of dealing with it, to declare a code of law with regard to the use of its waters. The same writer from whom I have quoted, speaking of America, which is less subject to droughts than Australia is—we have no great range of mountains like the Rockies which causes the rainfall and accumulates vast quantities of snow to be melted in the summer season—says: "All the people of this country could exist and live in a prosperous condition if the art (irrigation) was not practised in the United States. The question of warding off famine has never yet been considered as a national issue. The part of this country within the rain-belt is large enough and productive enough to support our present population, and more besides. From this fact it follows that up to the present time irrigation has never in this country taken a part in the life and death struggle for existence as it has in the more densely populated countries of the old world; but as the country becomes more thickly populated it remains for future generations to say what part irrigation will take in the struggle of humanity. So far its employment in the United States has been more from a speculative standpoint than through a great national interest. To be sure it is practised to make barren lands bring forth crops, and also to make other lands more productive, but the person who cultivates these lands might have selected others within the rain-belt of the country. And so there has never arisen in this country any question as to whether the people of the United States can exist upon the products of their own soil without the aid of irrigation. Is it an absolute necessity to this nation? Almost silently, without the knowledge of the other 56,000,000, a population of 7,000,000 has gone upon that portion of the United States lying outside of that portion of what is known as the rain-belt, west of the 100th meridian. In that part of the country the artificial application of water to the soil for irrigation is in a greater or less degree, according to the locality, a necessity for agriculture or horticulture. Thus an irrigation empire has grown up before us without its magnitude and its vast possibilities being known until within the last five years." What is said there is not true here where the population is leaving our arid districts. People have gone there and tried to live, but failed on account of the great aridity of the climate. This writer has a great deal to say on the question of the rights of navigation in respect to the conflicting rights of irrigation, and he gives the best definition

Definition of a river.

of a river for a practical man that can be adopted: "A river is a running stream of water bound in on either side by banks, shores, or walls, usually flowing in a particular direction in a definite or defined channel, and discharging into some other stream or body of water. Every river consists of a bed, shores, or banks, the water, and also the current." There may be private property in water, but none in the

No private property in flow of river.

flow of the river. I said that the law with regard to tidal rivers differs from the law with regard to non-tidal rivers; that is certainly true in England, and in America the law has been advanced by numerous cases in respect to that distinction. "Above the ebb and flow of the tide no rivers are by common law deemed navigable." That is American as well as English law. "But in this country (America) the fact that rivers are or are not subject to the ebb and flow of the tide is no longer a test

Rivers navigable in fact are navigable in law.

of navigability. Rivers must be regarded as navigable in law which are navigable in fact." I want to point out that here is a departure from the common law with regard to navigability in America. Why? Because in America the means of transport largely depended upon the navigability of the rivers. Lumber men preceded the agriculturist, consequently the common law had to give way to the requirements of the country and its development. That will be the aspect which will bind the Commonwealth. All the authorities quoted in the Convention were American authorities, and we shall have to look to

American decisions a guide to Australia.

American decisions largely to guide us as to what view the High Court is likely to take rather than go to common law doctrines or the strict reading of English law as it applies to England. I wish to emphasise that, because if we are going to adopt the American law in regard to navigability, we should equally adopt the American law with regard to water conservation and irrigation, which has been adapted to meet the necessities of people in a new country and in new conditions of life. "It has been settled by a long line of decisions that the navigable rivers of the United States are such as are actually navigable in fact, and

J. H. Carruthers, M.L.A.

15 Oct., 1902.

and which, by themselves or in connection with other waters, form a continuous channel for commerce with foreign countries or among the States." "By the civil law, waters navigable in fact are such in law, a navigable river being defined as '*Statio internere navigo*' (a place or way for navigation)." The writer then defines rights of navigation in what are termed "public rivers" in America. But it is very hard to see what cases would be analogous here. Non-tidal streams have been decided to be public streams in America, but "Whether a river can be called public or not, the public have a paramount right of passage upon all streams which afford capacity for that purpose. This right includes not only the navigation of vessels and boats, but also floatage. So also as to the smaller rivers, which are not navigable for large boats, it is held that where a stream is naturally of sufficient size to float small boats, mill logs, and timber, the public have a right to its free use to those purposes; nor is it essential that such capacity continue throughout the year—it may only last a few weeks in the spring or at times of especially high water." Paramount right of passage must be taken to mean that no person would have the right to obstruct the passage. Supposing some one wilfully and wantonly diverted the stream, that would be held to be an obstruction; but supposing it were diverted for purposes of irrigation, I think authorities could be quoted to show that such use of the water would not be an obstruction of the rights of navigation, which would be illegal owing to any paramount right of navigation. I need not take up the time of the Commission in going over what, I am sure, plenty of other witnesses have dealt with—*i.e.*, the common law rights of diversion and the common law rights to the natural flow of water. Speaking of the appropriation of water under common law rights, Mr. Justice Storey, in the case of Tyler *v.* Willkinson, says: "I do not mean to be understood as holding the doctrine that there can be no diminution whatever, and no obstruction or impediment whatever, 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 of that which is common 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. . . . The law here, as in many other cases, acts with reasonable reference to the public convenience and public good, and is not betrayed into a narrow strictness subversive of common use, nor into an extravagant looseness which would destroy private rights. The reasonableness of detention by a riparian proprietor above, causing injury to a riparian proprietor below, depends upon all the circumstances of each particular case, including the size of the stream, the time the water was detained, and the use that was made of it by all interested." The language he has used there would be almost sufficient to satisfy every demand that could be made for the use of water without pushing to any extreme the American doctrine of appropriation. He lays it down that the question of the reasonableness of the detention by a riparian proprietor depends upon all the circumstances of the case, so that it would be much more reasonable for a person in a dry and arid district to take away a large quantity of water for the purpose of producing an effective supply than it would be for a person in a comparatively well-favoured locality to take away that water in order to carry on some business in competition with some persons for purposes of mere commercial speculation. In regard to the question of the right to the use of water, it is laid down that "Water used to supply man's natural wants is 'an ordinary use,' and to supply man's artificial wants is 'an extraordinary use.' The real difference pointed out by the authorities between two classes of use is that water may be used for ordinary purposes without regard to the effects of such use in case of a deficiency to those below on the stream; while in reference to the extraordinary uses, the effect upon those below must always be considered in determining its reasonableness." "According to the great weight of common law authorities, where the supply of water is very small for those natural uses the upper riparian proprietor may, if necessary, consume all the water of the stream to supply his natural wants, but not for any other purpose." I have tried to address to the Commission the gradual process of reasoning by which the American has evolved the "arid region doctrine." If we follow out the reasoning here, working upon the basis of tested cases on the old common law, and apply it to this State, the great weight of authority goes to show that where a supply of water is small for natural uses, the upper proprietor on the stream may use the whole of the water for his natural requirements. The natural uses of the proprietors on the Darling and its tributaries, or certainly along the river itself, are such that in order to supply them at certain periods it would be absolutely necessary to take almost every drop of water in the river. It is a choice between doing that and abandoning all hope of the profitable development of the enormous area of country abutting on the Darling and its watershed, not for mere artificial uses or purposes of luxury, but for the ordinary purposes of civilisation.

Public right of passage on streams.

Reasonable use.

"Ordinary and extraordinary uses."

"Arid region doctrine."

6051. *Mr. Burchell.*] Would that include irrigation? Unless you irrigate there would be no vegetation. You could not grow a vegetable in that district during the past four or five years without artificial irrigation. The natural rainfall is not sufficient, and I need not state that without vegetable food man cannot live. If he has to buy it in the tinned state he is certainly not living upon the product of the land in his neighbourhood, but is having his common wants supplied by trade when he has all the requirements for supplying these natural wants near to hand, if only he is permitted to use them. Fruit culture in that district is impossible without water, the few fruit orchards there are either supplied by windmills or otherwise with the necessary quantity of water to keep them alive. Where there is artesian water there is a little fruit-growing, but the settlements are difficult to manage either on account of the quality of the water or its scarceness, so that it appears to me that water for stock and for the cultivation of vegetable food, without which man cannot exist, is an absolute necessity and, therefore, a natural want, while at periods of the year the natural supply of water is so small that the whole of it would be required for that purpose. That would not, however, be the case if water were conserved. Abundance would thus be secured, and still leave something to spare to maintain the flow of the river.

Necessity of irrigation on the Darling.

6052. Would that apply to irrigation for export? I think that would be beyond the natural wants of the people who are there, but as the population increases the natural wants will increase also. It would be an indefensible thing supposing the territory were occupied by, say, three owners who went into an enormous system of irrigation for profit; but if you have 3,000 then you can understand that the natural wants of the locality is multiplied by a thousand. The natural requirements are, of course, governed by the population; when settlers begin to use water for purposes of trade and commerce they must regulate their use of it by the equal use of people lower down the stream, but, on the other hand, the people below have no right to say to those above, that in order that we may make money you must allow the water to pass your door and leave your natural wants unsupplied. "In the Supreme Court of Illinois, in the case of Evans *v.* Merriweather, this subject was discussed with great length as to whether water for purposes

Natural requirements governed by population.

J. H. Carruthers, M.L.A. 15 Oct., 1902.

purposes of irrigation is a natural or an artificial want, and it was there held to be dependent upon the circumstances, locality, &c.; it was also held that in reference to the State of Illinois, because that State was within the rain-belt it was an artificial want; for it was a want that had for its object simply the comfort, convenience, or prosperity of the riparian proprietor; but upon the other hand the Court held that in a country differently situated from that State, with a hot arid climate, water for irrigation would be a natural want from the fact that its application was absolutely indispensable to the cultivation of the soil."

Reasonable use dependent on circumstances.

6053. *President*] Would that not modify your answer to Mr. Burchell? No, it rather emphasises it. What is the reasonable use depends upon the circumstances of each particular case; and you have not such a variety of circumstances in England as would cause a great distinction to be drawn between the riparian rights of an individual on one river from those of a person on another river. All agree that a person has the right to supply his ordinary natural wants, and, if necessary, to use every drop of water in a stream for the purpose, but for extraordinary wants he has no right to use any water which would damage his neighbour in a similar use. The English law has never had to consider the question of irrigation, while in America they have, because the variety of climate is so great. The American courts say that in the rain-belt, where the rainfall is comparatively good, what was an extraordinary use of the water would not be so in the hot, arid districts, but would become a natural want, because the application of water was absolutely necessary to the cultivation of the soil; and under similar circumstances the same decisions would no doubt be given in England. Here we have similar conditions, and must, therefore, go to the American decisions for guidance. So, also, in all the decisions of England, although the term, "natural and artificial wants," does not seem to be used, the Courts hold that the use of water for the purpose of irrigation, if permitted to be exercised at all, could only be exercised by one riparian proprietor, so that the rights of any other proprietor will not be prejudiced or infringed upon. However, the use of water for purposes of irrigation is practically unknown in England, as compared with its use for that purpose in the arid regions of the United States, or even in some of the English possessions—India and Australia. That country, having small rivers, and a damp, humid climate, with plenty of rainfall, has never found it necessary to use the water in her natural streams for purposes of irrigation, as have certain portions of the United States. But as England is the source from which we obtain the principles of law known in the history of jurisprudence as "common law," we naturally turn to that country to learn what were her ideas upon the subject of irrigation, and her rules governing the same. Owing to the comparatively unknown practice of irrigation in England, we find that the cases decided in that country are few, as compared with the number of decisions in this country, in which the controversy has been in respect of the diversion of water from a watercourse for the purpose of irrigating land, and also that the English law upon this subject is to-day unsettled. Now, from the train of these decisions, and the elasticity with which America has treated the common law, and declined to be hide-bound by precedents from a country whose conditions were entirely different, came the "arid region" doctrine. "Ever since that section of the country located west of the 100th meridian, and known as the 'arid region,' first began to be peopled by the Anglo-Saxon race, following first mining as an occupation, and afterwards, with increasing numbers, settled down to agriculture, a great change from the old common-law theories has been gradually taking place, until to-day, in some of the States and territories in the 'arid region,' the common-law theories upon the subject of waters, were absolutely abolished, in others ignored, and in all modified, particularly with regard to the uses of inland streams and lakes." The writer then gives the causes of the changes: "There were manifest equities which demanded that the common law, hastily adopted from a country so dissimilar in climate and condition to that of the arid region, should not be made applicable when it imperils the most vital interests of some of the richest districts in the world. The rain does not fall alike over all the earth. In some sections of this country, included in the arid west, the annual rainfall amounts to from 30 to 40 inches per annum, while in other sections it amounts only to from 6 to 10 inches per annum." He then describes the character of the country, which is like a large portion of our country from the Dividing Range to Wentworth, and up to the sources of the MacIntyre. "The common law had its origin in Great Britain under conditions of climate peculiar to its position in the path of the great Gulf stream, in an atmosphere laden with moisture which is precipitated with lavish profusion upon that favoured spot." The following remarkable statement was made by Mr. Justice Matthews in Hurtado *v.* California:—"The Constitution of the United States was ordained, it is true, by descendants of Englishmen, who inherited the traditions of English law and history; but it was made for an undefined and expanding future, and for a people gathered and to be gathered from many nations and many tongues. And while we take just pride in the principles and institutions of the common law, we are not to forget that in lands where other systems of jurdisprudence prevail the ideas and processes of civil justice are also not unknown. Due process of law, in spite of the absolutism of Continental Governments, is not alien to the code which survived the Roman Empire as the foundation of modern civilisation in Europe, and which has given us that fundamental maxim of distributive justice, *suum cuique tribuere*. There is nothing in Magna Charta, rightly construed as a broad charter of public right and law, which ought to exclude the best ideas of all systems and of every age; and as it was the characteristic principle of the common law to draw its inspiration from every fountain of justice, we are not to assume that the forces of its supply have been exhausted. On the contrary, we should expect that the new and various experiences of our own situation will mould and shape it into new and not less useful forms." That is a remarkably eloquent testimony to the fact that the common law of the Empire is not yet dried up in its sources, but is elastic enough always to take advantage of every inspiration from every fountain of justice, and apply itself to the various conditions and experiences of all portions of the Empire. I quoted in my previous evidence words very similar to the above. That American doctrine has been applied in the arid region by the greatest of judicial decisions explaining common law, and, as Mr. Justice Matthew lays it down, not in the view of some jurists, but using the elasticity of the common law and adopting it to common justice. America has, however, put it largely beyond the pale of controversy by passing legislation which has given statutory recognition to the doctrine, and almost all arid States have now an application of the principle by statutory law. I have gone through my evidence in order to lead the Commission to this conclusion—that a mere recommendation from them on the ordinary principles of the common law, according to English jurists, will afford no true light for administration or legislation in the future in regard to either the waters of the Murray or the Darling, treating them as the waters of one great river system, and moreover the experience

Whole volume of water may be used to supply natural requirements.

Irrigation practically unknown in England.

Origin of "arid region doctrine."

Elasticity of common law.

Recommendation of Commission should not be based merely on principles of common law.

J. H. Carruthers, M.L.A. 15 Oct., 1902.

experience of America, and of other countries with similar climates to that of Australia, should be accepted as a guide to us, rather than the experience of countries in Europe which are utterly dissimilar, both geographically and climatically, to the States which form the Commonwealth of Australia.

6054. *President.*] I understand you advocate that a code of law should be passed in regard to the question, rather than that it should be left to the High Court to decide matters in accordance with the principles of common law? Yes, for the sake of certainty, and to avoid any application by mere jurists or lawyers of principles of law which would be destructive of the development of Australia.

6055. Would you tell us what authority should pass the code of law;—would it be necessary for the States concerned to legislate, or the Commonwealth alone? In order to have the matter dealt with quickly and effectively it may be necessary for the States to remit that question to the Federal Parliament, and thus afford it powers of legislation. The Federal Government has power of legislation on questions referred to it by the States Parliaments, but I do not think the States will agree to do that unless they know what the legislation would be; that is to say, it would be necessary to have a commission of representatives of the States and of the Federal Government to decide the principles of the Bill, and the Bill having been approved in that way, power would be given by the various States to pass it. It would then become legislation passed by the Federal Government, and would govern the whole of Australia; and it would have this benefit, that it could not be amended except by the Federal Parliament, whereas, if each of the States passed a similar law, each State would have power to amend the law, and whilst you might have the same law in force for a period, it would only remain so until one of the States chose to amend it; if, however, power were given to the Federal Government to pass one law governing this question, then it could only be amended by that Parliament, and it is a great desideratum that we should have uniformity of law in regard to the question.

Power of Commonwealth to legislate.

6056. Does the common law which applies to individuals apply as between States? It would not apply between sovereign States, but as between dependencies—as we are here—common law, to a certain extent, does apply. The common law doctrine with regard to accretion of land, the ownership of land the boundaries of which have shifted owing to the river altering its course, has been held to apply by the Privy Council decision with regard to Pental Island, but there may be facts which would over-ride such an application. Common law is, after all, simply the recognition of the natural rights of persons, which has been handed down to us from undefined ages, all founded upon natural justice; but you can break away from it by showing circumstances in which it would not apply. For instance, I think it is quite possible that the waters of the Murray and Darling might be used in such a way as to do injustice to South Australia, but I doubt if she has any common law rights which could be established in a court, but she has the right of appeal to the fountain head, and as this right was derived, not from a judicial, but a legislative authority, it appears to me any appeal must be to that Legislative body, and could not be brought down to a level of the rights which one citizen has against another on common law principles. I think the question of common law, as between the States, is petty, and brings down a question of empire building to a level with the rights of Dick, Tom, and Harry, and cannot be done.

Applicability of common law as between States.

South Australia has no common law right, but has right of appeal.

Hugh Giffen McKinney, M.Inst.C.E, of Sydney, sworn and examined:—

6057. *President.*] What is your name? Hugh Giffen McKinney.

6058. You are at present a Civil Engineer in private practice, formerly and for some years in charge of the Water Conservation Branch of the Public Works Department of this State? Yes.

6059. Have you prepared a statement dealing with the past history of the River Question in New South Wales? Yes.

6060. Will you read it please?

H. G. McKinney, M.Inst.C.E. 15 Oct., 1902.

As the Murray River Royal Commission is investigating the whole question as to how matters now stand in regard to the utilization of the Murray River and its tributaries, and as I held the position of Engineer for Water Conservation in New South Wales from the time when this was constituted a separate charge till about two years ago, the following statement in outline of the action taken, so far as I was concerned, will, I trust, be of some service to the Commission.

History of river question in New South Wales.

Dealing first with the question of legislation, which was obviously necessary before any comprehensive action could be taken by the Government, I submitted a non-official memorandum to Mr. Moriarty, Engineer-in-Chief for Harbours and Rivers, in 1883, calling attention to the necessity for legislation as evidenced by disputes regarding dams on the Billabong Creek. In that memorandum I suggested that the course adopted in the Northern India Canal and Drainage Act of proclaiming the right of the Government to the control and management of the rivers should be followed in this country. Mr. Moriarty did not, however, think that the time was ripe for raising the question.

Experience in India.

After my appointment as Engineer to the Royal Commission on the Conservation of Water in 1884, the Commission having in view the fact that during my period of service in the Irrigation Department of India, I had been for several years a Canal Magistrate in addition to my other duties, instructed me to submit a report on the nature of the legislation relating to water rights which would be likely to prove suitable to this country. My report, which was in considerable detail, was favourably received by the Commissioners, and they then instructed me to put it in the form of a Bill, and to embody with it the principle of administration by trusts, which was then being adopted in Victoria. The result was the Draft Bill, which was published in the first report of the Commission, in 1886. Although this Bill received very little of either attention or comment in New South Wales, Mr. Deakin, who was then Chief Secretary and Minister for Water Supply in Victoria, referred to it in complimentary terms when introducing his Irrigation Bill in July of that year, and adopted in that Bill some of its leading principles. In August of that year a similar Bill was introduced in the Queensland Parliament. It is necessary to add that the Draft Bill of the Commission was put into proper form by the present President of the Land Court, Mr. Oliver, who was then Parliamentary Draftsman, and that he also spoke in complimentary terms of the principles proposed.

Question of legislation brought under notice of New South Wales Government.

After the expiration of the Commission, I deemed it my duty to bring the question of legislation before the notice of every successive Government. Between 1887 and 1895 four different Bills were introduced in Parliament, three of them being of an elaborate character, but none of them went beyond the first reading. The general impression seemed to be that, as compared with other matters, the question of dealing with water conservation in a comprehensive manner was not one of pressing importance. In 1886 the Water Rights Act was passed, after considerable opposition, and this Act, though very limited in its scope, has had an excellent effect, as over 700 works—chiefly dams on creeks and rivers—which formerly existed on sufferance only, or which awaited authority for construction, have been licensed after public inquiry in every case.

With regard to schemes for utilising the rivers, I found on entering on my duties that there was no information of any considerable value on the subject. The river gauge records maintained by the Government Astronomer were of much value so far as related to navigation and to heights of floods; but in many cases they took no account of the low supplies of water, so that the information available from this source, though valuable for other purposes, was not of much use in throwing light on the quantity of water which could be used for irrigation. As regards levels, the only information available, in addition to that obtainable from a survey of part of the course of the river Murray, was that supplied by the railway surveys, and the extent to which these could be used was necessarily very limited.

These

H. G. McKinney, M.Inst.C.E.
15 Oct., 1902.

These were the circumstances under which I commenced the examination of the western rivers early in 1885. The first river inspected was the Murray, and the extensive scheme which I then sketched in outline for diverting water at Bungowannah has stood the test of subsequent inquiries and surveys, and is admittedly the best for distributing water through the higher parts of the plains between the Murray River and the Billabong Creek. This scheme attracted scarcely any attention in New South Wales, and I was informed by leading public men then, and many times since—even within the last three years—that it is fifty years too soon to think of such a work. But directly after the scheme was announced Mr. Deakin sent three experts who were members of the Victorian Water Commission to inquire into it. The schemes for utilising the Murrumbidgee were received in New South Wales in the same manner as those in connection with the Murray; but in the final report of the Royal Commission, the further investigation of these and other schemes by surveys and levels was recommended.

Water Conservation Branch formed in 1890.

After the expiration of the Royal Commission in 1887, I was authorised to proceed with a survey for determining the practicability, or otherwise, of constructing a canal from the Murrumbidgee through the Brookong Plain to Urana, and subsequently the sanction was extended so as to include the plains further west between the Murrumbidgee River and the Billabong Creek. The work had to be undertaken by contract, and no field staff was sanctioned till the beginning of 1890. The Water Conservation Branch was then formed, and sanction was granted for carrying out a system of surveys connecting the western rivers and embracing the country throughout which works for water conservation and distribution were practicable and necessary. Although these surveys were indispensible preliminary to the construction of works on any considerable scale, their prosecution met with much opposition. The work was, however, done with such completeness that scarcely any fresh information had to be obtained for Colonel Home to enable him to submit his report within the period for which he was brought to New South Wales. The importance of river gauging, like that of preliminary surveys, was not recognised, and as the staff at my disposal was kept very small the only possible way to obtain discharges was to have such work done whenever an officer was required by other duties to be near a suitable place for taking observations. Notwithstanding these disadvantages, a fairly satisfactory record of discharges of the Murray and the Murrumbidgee for medium and low levels was obtained, while occasional observations were taken on the other western rivers. No exception to these records was taken by Colonel Home when he had the schemes for canals from the Murray and the Murrumbidgee under his consideration.

Report on rivers question to Sir Henry Parkes.

After the expiration of the Royal Commission on the Conservation of Water it became my duty on several occasions to call attention to the progress of irrigation in Victoria and South Australia, and to the wholesale appropriation of the waters of the river Murray and its tributaries by these States. In 1889, I was instructed to prepare a report on the whole question for the information of Sir Henry Parkes, who was then Colonial Secretary, and this report I submitted on 3rd September, of that year. In March, 1890, Sir Henry Parkes announced to the Governments of Victoria and South Australia, that as the river Murray, as far as the eastern boundary of the latter State, is within the territory of New South Wales he had decided to constitute the care of the river as a special charge under the Government of this State. This communication evoked strong protests from the States to which it was addressed, and these protests were supported generally by the Press and public of New South Wales. Under these circumstances the subject was practically allowed to drop, and little exception, so far as the general public was concerned, appeared to be taken to the position as put forward then in the adjoining States—namely, that they should take whatever water they want, and that the question as to what New South Wales may have should be referred to arbitration. The general impression in this State appeared to be that there was no danger of any interference with its rights in the river Murray; but that, on the other hand, the action proposed to be taken was in the direction of limiting the rights of Victoria and South Australia. I called attention, officially, to the fact that there was a general misconception of the actual position, but no further action was taken in the matter.

6061. Have you also prepared a statement with regard to the questions remitted to this Commission? Yes.

Preliminary.

In order to lead to a clear conception of the value of the evidence taken by the Commission, and to indicate the nature of the questions which the Commission has to decide, it is well to consider in the first place what are the natural conditions of the river Murray and its tributaries, and in the second place, how these conditions have been affected by the progress of settlement and by the works which have been carried out.

Natural conditions on the Upper Murray.

In the Act 18 and 19 Vict., chap. 54, the northern boundary of Victoria was defined as a straight line from Cape Howe to the nearest source of the River Murray, and thence a line following the southern bank of that river to the eastern boundary of South Australia. The point at which the straight part of the boundary strikes the nearest source of the river Murray is on the Snowy Range, and the branch of the Murray which it meets here is commonly known as the Indi. This river flows northerly along the base of the Snowy Range, the highest range in New South Wales, or in Australia, and receives the drainage and the snow water from the western side of this range. At slightly over 40 miles in a direct line from the point where the straight boundary line meets the Indi, this river joins the Swampy Plain River, or Murray River, at Bringenbrong. While the Indi is supplied partly from New South Wales and partly from Victoria, the Swampy Plain River derives its supply from the highest parts of the Snowy Range in New South Wales. When I was at Bringenbrong with Colonel Home, in June, 1897, there was no time for taking discharge observations; but to all appearances the quantity of water flowing in these two main sources of the Murray was about equal, and this was the view taken by the local residents as to the proportion generally.

Upper Murray—Bringenbrong to Jingellic.

Between Bringenbrong and Jingellic the principal tributary to the Murray is the Tooma River, which is fed partly from the snow and surface waters of the Dargal and Munyang Ranges, and partly from a series of creeks which flow from the mountains dividing the catchment of the Murray from that of the Tumut and the Murrumbidgee. There are several creeks which flow into this part of the Murray from the Victorian side, but these do not approach the Tooma River in the value of their supply.

Upper Murray—Jingellic to Albury.

Between Jingellic and Albury, the Mitta Mitta and the Kiewa flow in from the Victorian side, and constitute the most important of the higher tributaries on that side of the Murray, while in this length the creeks flowing in from the New South Wales side are comparatively small and unimportant.

Extent of defined valley.

Near Bungowannah, about 6 miles below Albury, the Murray ceases to flow in a defined valley, the hills receding and disappearing first on the north side of the river, while in the country to the west and north-west the undulations, which are perceptible for some distance west of the hills, gradually disappear. Thenceforward the plains are continuous throughout the district between the Murray River and the Billabong Creek. The hills which constitute the southern side of the Murray Valley continue for some distance further than on the northern side, but they eventually disappear below Corowa, and the alluvial plains are then continuous.

Conditions from Albury to Echuca.

Between Albury and Echuca, the Ovens, the Broken River, the Goulburn, and the Campaspe flow into the Murray from the south, while in this length not only are there no tributaries from New South Wales, but, on the contrary, the fall of the plains on this side is in a direction away from the river. The conditions in the two States throughout this part of river are thus totally different, nature being favourable to the diversion of the Murray waters into New South Wales, and, on the whole, unfavourable to their diversion into Victoria.

Conditions below Echuca.

Below Echuca, the only tributary which flows, or rather flowed, into the Murray on the south side is the Loddon, while from New South Wales the Murray receives the waters of the Murrumbidgee and the Darling. From South Australia the Murray receives practically nothing. Between Echuca and the Murrumbidgee Junction, nature, to a certain extent, favours the diversion of the Murray waters by gravitation on both sides; but below that point, and including the whole length in South Australia, gravitation schemes for utilising the waters of the Murray are not practicable on any considerable scale. The river throughout this part flows, as a rule, between high banks, with only occasional narrow strips of low land between. An important feature in connection with the lower part of the river Murray in South Australia is the great extent of shallow lakes through which the flood waters have to pass before they reach the ocean.

Summary of natural conditions as regards diversions from the Murray.

To summarise the position as regards the utilisation of the waters of the Murray, nature favours the irrigation of the whole extent of the plains in New South Wales between that river on the south and the Billabong Creek and Edward River on the north. It is not favourable to the utilisation of those waters in Victoria above Echuca; but between this place and Swan Hill there are considerable natural facilities for diverting the waters of the Murray into both States. Along the lower part of the river, in New South Wales and Victoria, and throughout South Australia, with trifling exceptions, irrigation is practicable only by pumping.

With

H. G. McKinney M.Inst.C.E.
15 Oct., 1902.

With regard to the extent to which the natural conditions have been altered, it may be mentioned at the outset that the settlement and stocking of the land and clearing off timber, must have had the effect of increasing the volume of the rivers after heavy rains, and of diminishing the duration of floods. This effect would be less noticeable as settlement progressed, and is probably not traceable in the records, as these did not, in most cases, commence till the country was fairly settled.

Murray tributaries not affected by works in New South Wales.

In New South Wales no works have been carried out which appreciably affect either the river Murray or any of its tributaries. In South Australia the total quantity diverted in connection with authorised schemes is given as only about 77 cubic feet per second, but it is stated that there is a large number of small private works. However, it seems probable, judging from the official return and the evidence, that the quantity of water used for irrigation in South Australia is little if anything over 100 cubic feet per second. The lowest mean discharge at Morgan shown in the South Australian records for any single month was 69,000 cubic feet per minute, or 1,150 cubic feet per second, in April of the present year. As the lowest on this occasion is quite unprecedented, it is evident that in this State also the quantity of water taken for irrigation cannot have made any considerable difference in the river Murray. Still, it has to be borne in mind that, although the extent to which the Murray waters are drawn on for irrigation in South Australia is comparatively small, rights have been granted at Renmark to take water up to a maximum of 60,000 cubic feet per minute.

Extent of diversions from the Murray in South Australia.

Appendix 18.

As regards the diversion of the waters of the Murray and its tributaries for irrigation, Victoria has reached a far more advanced stage than either of the other States. Following the river Murray upward from South Australia, the first tributary in Victoria is the Loddon, and not only has the whole available supply from this source been intercepted, but in addition there is a strong demand for a supplementary supply from the Murray. The next tributary is the Campaspe, and here the state of affairs is similar to that in regard to the Loddon. With regard to the Goulburn, which is next in order, and which is by far the most important of the Victorian tributaries, a canal has already been constructed from it capable of carrying 103,400 cubic feet per minute. As the entire discharge of the river is much under this as a rule, except in the winter and early spring months, and as an agitation has been for some time in progress for supplementing the supply from the river Murray, it is clear that no flow from the Goulburn into the Murray can be expected except during floods. The Broken River is next in order, and it also has been intercepted and utilised, so that the only Victorian tributary below Albury which is not already utilised is the Ovens, and this is a river of comparatively minor importance. Not only so, but the diversions from the Murray itself are on a most extensive scale. It was stated by Mr. Kenyon, an engineer of the Victorian Water Supply Department, that in that State there are from 200 to 300 unauthorised pumping-plants, capable of delivering on an average about 250 cubic feet per minute each, or a total of about 62,500 cubic feet per minute. In addition, the pumps for the Cohuna, Koondrook and Myall, Swan Hill, and Mildura Trusts are capable of delivering a further aggregate supply of 13,895 cubic feet per minute. The pumping power actually provided is thus capable of diverting an aggregate supply of 76,300 cubic feet per minute. Further, in addition to this, there are the gravitation channels at Deep Creek and Gunbower Creek, and of these the former commences to flow at summer level in the river. Even without taking this gravitation channel into account, there is thus provision in existence in Victoria for taking a supply of 76,300 cubic feet per minute from the river Murray in summer, or at any time, this quantity being just over the maximum supply which Colonel Home recommended for diversion from the river Murray at Bungowannah. The actual quantity provided for at Mildura is here taken—namely, 5,400 cubic feet per minute—but the maximum authorised is 60,000 cubic feet per minute. Also, no account is taken of the 5,000 cubic feet per minute recommended for the Benjeroop and Murrabit Trust. In short, the pumping schemes alone in Victoria, which are in existence or are authorised, provide for the diversion of 130,900 cubic feet of water per minute from the river Murray, and, in addition to the pumping schemes, the outflow channels at Gunbower Creek and Deep Creek provide for a maximum flow of 39,400 cubic feet per minute. I may here remark, by way of comparison, that the maximum flow which I originally suggested might be diverted from the Murray into New South Wales at Bungowannah during the spring and early summer months was 120,000 cubic feet per minute.

Extent of diversions from the Murray and tributaries in Victoria.

Q. 3803 and 3805.

Appendix 117

Q. 3824.

Q. 3604.

Q. 3826.

It may be urged that the pumps are not all used at the same time, and it is even stated that they are worked only about twenty days in the year. This information is given only as approximate. Where the enterprising landowners on the south side of the Murray have provided themselves with expensive pumping-plants, it is only natural to expect that they will pump water whenever they require it; and as the rainfall is moderate in quantity in average years and is precarious in its occurrence, the periods during which water is required for irrigation and other purposes must amount to more than twenty days per annum. The great mass of evidence showing the demand for water and the appreciation of its value, leads to only one conclusion on that point. However, the point which I desire to make clear in this connection is that the works already in existence in Victoria, or authorised there, provide for the diversion of more water from the river Murray than would be required in New South Wales by the schemes which I proposed from Bungowannah and Tocumwal.

Q. 3804.

Explanations regarding pumping-plant on the river Murray, in Victoria:

The evidence taken by the Commission in the three States which are directly interested in the river Murray is clear and emphatic on an important point which has been the subject of frequent controversy. This is the question of the relative importance of irrigation and navigation. In both New South Wales and Victoria the witnesses were almost unanimous in the opinion that the interests of irrigation are of much more importance than the interests of navigation. Even in South Australia witnesses who had studied the question from a broad point of view—such as the Honorable Alfred Catt, Chairman of Committees in the House of Assembly, and formerly Commissioner for Works, and Mr. S. McIntosh, Inspector of Settlements—were equally decided in this opinion. The position of the Renmark Irrigation Settlement may be summed up in the statement that, while navigation is important, irrigation is indispensable. On the whole, the evidence that the interests of irrigation should take precedence over those of navigation is overwhelming. As a consequence of this conclusion, while these separate interests should, as far as practicable, be provided for in common, the interests of irrigation should have first consideration where there is conflict.

Evidence on relative importance of irrigation and navigation.

Relative values of irrigation and navigation.

Q. 3637.

Q. 1172.

Q. 1245.

The soundness of this conclusion is amply shown by the evidence. Mr. Kenyon, of the Victorian Department of Water Supply, stated that the quantity of water required to maintain navigation at Mildura is 270,000 cubic feet per minute. As regards the area of land which a flow of a cubic foot per second irrigates in Victoria and South Australia, the evidence is very conflicting. Mr. D. J. McClelland, M.C.E., estimated that thirty pumping plants of average capacity of 600 cubic feet per minute irrigate only 8,000 acres, or less than half an acre for every cubic foot per minute. At Renmark, the area irrigated is stated to be 3,000 acres, and the quantity of water pumped about 700,000 gallons per hour, or 1,866 cubic feet per minute, for 3,000 hours. This is equal to about four acres for every cubic foot per minute. Assuming that a cubic foot per minute will irrigate four acres—a very reasonable assumption—the quantity of water stated to be required for navigation at Mildura would be sufficient for the irrigation of slightly over 1,000,000 acres. Now it has been shown that in 1901 the value of the produce sold from the 3,000 acres irrigated at Renmark was £29,474. Reckoning at this rate of production, the annual value of the produce arising from the use, for irrigation, of the water stated to be necessary to secure navigation, would be about £9,825,000. This remarkable result is not based on any mere theory, but on the actual figures given in evidence by competent witnesses. On the other hand, with reference to the improvement of navigation by cutting a canal from Goolwa to Victor Harbour and thus connecting the river Murray with the ocean trade, witnesses interested in navigation would not commit themselves to an opinion that the traffic would ever be sufficient to give a return of £20,000 per annum to pay interest on the outlay which would have to be incurred. These facts are sufficient to indicate that the value of the waters of the Murray for irrigation is out of all proportion to their value for navigation. In short, both the opinions of witnesses and the facts placed before the Commission show that, as regards the values of irrigation and navigation, the States directly interested in the river Murray are on common ground.

Q. 218, 219, 319, and 320.

South Australian interests in navigation.

Q. 118, 241, 387, 891 to 894, &c.

The State in which these interests come most in conflict is undoubtedly South Australia; but even here the extent to which this conflict arises, or will arise is generally much over-estimated. In fact, the evidence tends to show that in that State there is less apprehension in regard to the interests of navigation than there is regarding the interests of the holders of the land fronting on lakes Alexandrina and Albert, and on the Lower Murray generally. The evidence shows that the extension of railways has greatly reduced the value of navigation, and that this reduction is likely to continue further. On the other hand, the information furnished to the Commission shows that there is a large extent of high-class land adjoining the lakes, which would be prejudicially affected by the diminution of the supply of fresh water. The area of this land is estimated at 1,000 square miles, with a total water frontage of 250 miles.

Requirements of land around Lake Alexandrina.

The

H. G. McKinney, M.Inst.C.E.

15 Oct., 1902.

The conclusions to which the foregoing facts lead up are ;—

1. That in the three States directly interested in the River Murray, the most important use to which the waters o that river can be put is irrigation.
2. That, where the interests of navigation can be promoted in conjunction with the interests of irrigation, this should be done as far as practicable.
3. That the requirements of the land on the Lower Murray and around the lakes near the mouth of the river, as regards the permanent maintenance of fresh water, are of great importance, and must be kept in view.

Summary of interests of the three States.

The legal aspect of the River Murray question.

With regard to the legal aspect of the question, the opinions of a number of high authorities on the subject, including Mr. Oliver, and several others in New South Wales, and Mr. Glynn and Professor Salmonds, in South Australia, are in evidence. It is sufficient for me to state here that, to the lay mind, the fact that the whole channel of the river Murray is within New South Wales ought to give this State at least a prior claim to the waters of that river. As a matter of fact, notwithstanding this, each of the adjoining States has hitherto acted as if it had a prior claim. Both have appropriated the waters of the river Murray wherever and whenever they thought fit, while even proposals or suggestions that a portion of these waters should be diverted into New South Wales have given rise to protests.

Possibility of forecasting the future of the river Murray.

Basis of a permanent understanding.

In the foregoing, I have endeavoured to sketch in outline the natural conditions originally existing on the river Murray, the extent to which, and the manner in which, these conditions have been altered, and the general position o. interests in the river as they now stand. By consideration of the facts here stated, and of the whole evidence taken by the Commission, it is possible, I believe, to forecast the future of the river Murray with a fair degree of accuracy. This is a matter of vital importance to the objects of the Commission, as any understanding arrived at, in order to be permanent and satisfactory, must be on the lines of natural progress in all the States. The evidence shows clearly the direction in which these lines run. If anything has been wanted to show the energy and earnestness of the people of Victoria in pushing on the construction of irrigation works, the evidence taken by the Commission would amply fulfil this object. Notwithstanding some false starts and some failures in the rush for irrigation in that State, not only has there been no falling-off in the demand for works to supply water, but, on the contrary, the ideas of the people are expanding, and the demand for water is increasing. Schemes for utilising the entire available supply of water in northern Victoria have been seriously discussed ; so that, on this ground alone, the Commission was not appointed a day too soon. In South Australia the question of irrigation has been steadily increasing in importance, and so also has been the question of maintaining fresh water in Lake Alexandrina and the lower part of the Murray generally, while the evidence shows that, owing largely to the extension of railways, navigation has been falling off. Even in New South Wales, the landholders have at last come to the conclusion that, as a means of insurance against the effect of droughts, irrigation, wherever practicable, would be most valuable. These facts point to only one conclusion, namely, that the time will come when no part of the waters of the river Murray will be allowed to reach the ocean, except during very high floods.

Ordinary supply of water in the Murray will all be utilised.

The question of the South Australian lakes.

Q. 5220.

In the evidence of Mr. J. W. Jones, Secretary to the Commissioner for Public Works in South Australia, it is stated that the area of water surface in Lakes Alexandrina and Albert, and the adjoining channels and creeks, is 192,000 acres, or 300 square miles. The net loss by evaporation over this area, regard being had to the rainfall, is taken at 5 feet per annum ; and this gives the loss by evaporation as 42,000,000,000 cubic feet, which is equal to an average flow of 79,930 cubic feet per minute, or 1,332 cubic feet per second throughout the year. The maximum monthly evaporation is that given for January, and amounts to 150,089 cubic feet per minute, while the minimum—that for June—is given as 21,991 cubic feet per minute. Comparing these figures with the South Australian records of discharges, we find that the smallest quantity of water which flowed past Morgan in a year was that recorded in 1884, and the amount was nearly 225,000,000,000 cubic feet, or nearly five and a half times the quantity required to balance the evaporation in the lakes. To put the case in another way, supposing that New South Wales and Victoria together had diverted such quantities of water as would have been represented at Morgan by 8,333 cubic feet per second, or 500,000 cubic feet per minute, from the river Murray and its tributaries from 1884 up till the present, during the spring and early summer months, they could have done so every year except 1884, without interfering with the irrigation interests of South Australia ; while, assuming that the mouth of the Murray was closed, the surface of the fresh water in the lakes would not, during that period, have fallen to its present level, Lake Victoria alone would, in an important degree, afford protection to South Australian irrigation. It is in evidence that there would be no difficulty in storing a depth of 8 feet of water there, over an area of 40,000 acres, and this would give a flow of 1,000 cubic feet per second, or 60,000 cubic feet per minute, for 161 days, or, say, 110 days after allowing for evaporation. It was also pointed out by Mr. Moncrieff, Engineer-in-Chief for South Australia, that a still greater storage of water can be effected at Overland Corner by means of a dam on the Murray, which would back the water up to Renmark. In addition to these works, by the construction of locks and weirs, which, while providing for navigation, would afford improved facilities for pumping, the interests of both irrigation and navigation would be on a much more satisfactory footing than they are at present, even after all the requirements of New South Wales and Victoria have been satisfactorily met.

Practicability of meeting requirements of all three States.

Q. 1326.

Q. 5214.

Q. 5215.

Coming to the relative claims of New South Wales and Victoria, it is necessary at the outset to point out that the great value of the river Murray as a source of supply of water for irrigation arises from the fact that its main sources are in the Snowy Range, in New South Wales. The melting of the snow in the spring and early summer months affords a large supply of water at the time when it is most useful, while the great height of the mountains, and the high average rainfall upon them, contribute to the steadiness of the flow. Under these circumstances, although the catchment area of the Murray on its Victorian side, above Albury, has nearly twice the extent of that in New South Wales, there is no such disproportion in either the quantity or value of the water flowing off. In questions relating to irrigation, statements of the total quantity of water discharged in a year are likely to prove both mystifying and misleading, and, at best, such statements can be accepted only as approximations. The question as to what is the minimum number of cubic feet of water per second which can be relied on for use in particular periods is much more important than the number of thousands of millions of cubic feet which flow past any particular place in twelve months, or even in one month. In short, the important point to know is the minimum flow available when water is most wanted. The value of a river for irrigation is thus to be estimated mainly on its minimum flow during the months when water is most required, and on its maintenance of a good average. Referring to the Victorian official records of the river Murray and its tributaries above Albury, it is shown that the discharge of the river Murray at Jingellic has not been known to fall below 15,600 cubic feet per minute, this minimum having been reached in February, 1900. On the other hand, regarding the two main tributaries on the Victorian side, the discharge of the Mitta Mitta has fallen to 5,400 cubic feet per minute in February, 1898, and the Kiewa went as low as 200 cubic feet per minute in February, 1900. Again, on the same authority it is shown that during the months of August, September, October, and November, the discharge of the Murray at Jingellic has not been known to fall so low as 60,000 cubic feet per minute. In the case of the Mitta the minimum for three of these months is below this quantity—for August the minimum was 41,000, as compared to a minimum of 65,290 at Jingellic ; for October 57,000, as compared to 101,060 ; and for November 29,000, as compared to 60,820. The Kiewa, in two of the same months, has fallen below 11,000 cubic feet per minute. Taking the average of the minima in each case it proves that, while the average minimum at Jingellic for the four months named is 82,000 cubic feet per minute, the corresponding average for the Mitta and the Kiewa is 62,600 cubic feet per minute. Further examination of these minimum discharges tends to show that if, during the months of January and February, when the lowest figures are reached, the proportion of the discharge at Jingellic from the Victorian side be taken at one-fourth, New South Wales supplies more than half the discharge at Albury for these months in years of minimum flow.

Relative claims of New South Wales and Victoria.

Importance of the minimum supplies in rivers.

Relative values of the tributaries of the Upper Murray.

Grounds for conclusions regarding the values of the sources of the Murray.

In regard to the assumption here made that in periods of low river three-fourths of the discharge at Jingellic comes from New South Wales, it is necessary to state that I arrived at this conclusion many years ago from my own inspection of the higher sources of the Murray. I judged that the Swampy Plain River, which is in New South Wales, gives about the same supply as the Indi, and that the States contribute equally to the latter river. I estimated further that the Tooma River in New South Wales balances the various small streams which flow in from Victoria below Bringenbrong. This estimate gives three-fourths of the supply at Jingellic to New South Wales and one-fourth to Victoria. A recent careful inspection of the Upper Murray by Mr. Smail, an engineer of the New South Wales Water Supply Department, shows that my estimate was within the mark. It proves that, of the higher tributaries of the Murray, the Swampy Plain River ranks above the Tooma, and much above the Indi in importance, and that the Tooma also is considerably larger than the Indi. The heavy deposits of snow which feed the Murray in the spring and early summer months are confined almost entirely to the catchments of the Swampy Plain River and the Tooma. Hence it is beyond doubt that the proportion of the discharge at Jingellic, which comes from New South Wales, is often much above what I have assumed.

In

H. G. McKinney, M.Inst.C.E.

15 Oct., 1902.

In dealing with this part of the question, I have used the returns of the Victorian Department of Water Supply, because, in the first place, they include observations on the Mitta and the Kiewa, which are Victorian tributaries, and regarding which there is no record in New South Wales ; in the second place, a record of the discharge of the Murray above these rivers has not been kept in the latter State ; and, in the third place, I wished to show on the authority of our neighbours, as far as possible, that there is no warrant for the extraordinary statements often made regarding the high proportion of the Murray waters which comes from Victoria.

Under ordinary conditions of the Murray, several creeks flow in between Jingellic and Albury, so that the combined discharges at Jingellic and of the Mitta and the Kiewa should be slightly less than that of the Murray at Albury. To test the agreement of the discharge observations, I have had a diagram prepared [*Exhibit* 125], showing the quantity of water passing Albury, in the form of a series of squares with rectangles marked off to scale, showing the corresponding discharges of the Upper Murray, the Mitta, and the Kiewa. The upper side of the rectangle, representing the discharge of the latter, should fall slightly below the upper side of the square ; but as a matter of fact, in the great majority of cases, it is quite outside the square. In other words, the discharge at Albury is shown as considerably less than the combined discharges of the Upper Murray, the Mitta, and the Kiewa, and not only so, but the inflow from creeks below Jingellic disappears altogether, although Mr. Kenyon estimates that on the New South Wales side alone these represented, in 1896, 2,000,000,000 of cubic feet of water. There is nothing in the nature of the river channel above Albury to indicate that there is likely to be any great loss of water, and the differences shown in the diagram do not appear to follow any rule, so that the results shown must be due to discrepancies in the discharge observations. While pointing out this fact, I wish it to be clearly understood that I have no reason to doubt that all due care was taken by the officers of the Victorian Water Supply Department when gauging the discharges. On rivers such as the Murray and its tributaries, from Albury upwards there are many difficulties in the way of obtaining fairly accurate gaugings when there is only a moderate flow, and these difficulties are greatly increased when the rivers are in flood. On page 8 of the Victorian official report on "River Gaugings," it is mentioned that the results obtained with the current meter were "at times obviously faulty," and that with strong currents and considerable depths of water the defects of the instrument were serious. In calling attention to this matter, I merely wish to indicate in the first place that the annual, or even monthly returns expressed in thousands of millions of cubic feet have to be accepted with considerable reserve, and, in the second place, that the low and moderate discharges, which require the first notice in any scheme for permanent irrigation, are the most likely to be recorded with a fair degree of accuracy.

Discrepancies observed.

Diagrams comparing discharges of Upper Murray.

Q. 3774.

Q. 3853.

Taking now the contributions to the river Murray below Albury, the Victorian official returns as submitted by Mr. Checchi show that during the years from 1887 till 1901 inclusive, the Ovens contributed 671,000,000,000 of cubic feet ; the Goulburn, 1,477 ; the Campaspe, 127 ; and the Loddon, 114 ; making a total in these years from Victoria below Albury of 2,390,000,000,000 of cubic feet. On the other hand, from the same returns, the Murrumbidgee is credited with a total contribution, for the same period, of 2,924,000,000,000 of cubic feet, or 544,000,000,000 in excess of the combined contributions from Victoria below Albury. In addition to this, during the same period, the river Darling is credited with the contribution of 3,837,000,000 of cubic feet.

Water contributed to the Murray below Albury—a comparison.

Summing up the positions of New South Wales and Victoria as regards their contributions to the supply of water in the river Murray, we find :—

1. That the large deposits of snow which constitute the most valuable source of supply in the spring and early summer months are situated almost entirely in New South Wales.
2. That during periods of low supply in the river, the proportion contributed by New South Wales is at least half that flowing past Albury.
3. That the regularity of the flow at Albury is mainly due to two tributaries which draw all their supplies from New South Wales—namely, the Swampy Plain River and the Tooma River.
4. That the Murrumbidgee alone contributes considerably more to the Murray than all the Victorian tributaries west of Albury combined.
5. That the Murrumbidgee and the Darling together contribute considerably more than treble the supply obtained from these Victorian tributaries.

Conclusions regarding the relative contributions of New South Wales and Victoria to the river Murray.

Having outlined the positions of the three States, taking first the interests of South Australia and their relation to the combined interests of New South Wales and Victoria, and having next compared the relative positions of the latter two States, the question has to be considered as to what settlement can be arrived at which will promote the interests of all three. In doing so, while I see no reason to doubt that any layman would consider that, under the terms of Act 18 and 19 Vic., New South Wales has a prior claim to the waters of the river Murray as far as the eastern boundary of South Australia, I have to recognise that the legal aspect of the case is one which presents many difficulties, and which is quite outside my province. Setting aside the legal aspect of the question for the time, and supposing that the three States directly interested in the river Murray were under one Government, and subject to the same code of laws, it is interesting, and may be useful, to consider how the question of the utilisation of the river Murray and its tributaries would be dealt with. The fundamental principle of the Water Rights Act of New South Wales is that the charge of the waters of all rivers is vested in the Government, and that it is the duty of the Government to promote the equitable distribution and beneficial use of the available supply of these waters. In pursuance of this duty, the interests of the general public, as well as the interests of individuals, have to be kept in view, and among points which require special consideration in distributing the water are the superior facilities afforded by some districts, and the greater necessity existing in others. On the whole, in treating the Murray River question as if the entire river and its tributaries lay within one State, it appears to me that the principles on which the Water Rights Act of New South Wales are based afford the best foundation and guide.

Basis assumed for settlement of the river Murray question.

The evidence placed before the Commission shows that all reasonable requirements of the three States can be met to a far greater extent than is generally supposed. It augurs well for the success of the Commission that very few really unreasonable demands were made in the evidence. The most noteworthy was the claim that no water should be diverted from the river Murray or its tributaries, when the discharge at Overland Corner in South Australia is less than 600,000 cubic feet per minute. It is scarcely necessary to state that this is a proposal which neither New South Wales nor Victoria could entertain for a moment. Rather than consent to any such proposal, it would be incomparably better for New South Wales and Victoria to unite in purchasing at a fair valuation the entire navigation rights of South Australia. Judging from the evidence, the value of these rights would not amount to an extravagant sum, and it would certainly be very much within the value of the water which it is proposed to sacrifice. The principle of "the equitable distribution and beneficial use" of the water would, however, be utterly opposed to any such waste. It is not difficult to show that the interests of South Australia can be placed on a more satisfactory footing than they are at present without resort to any such wholesale sacrifice of the interests of New South Wales and Victoria.

Comparative absence of unreasonable claims in evidence.

Q. 5339.

Having regard to the present demands and future requirements of Victoria and New South Wales for water from the river Murray and its tributaries, I am of opinion that the following maximum supplies are warranted under an equitable distribution of the waters, and are or will be required at the places mentioned :—

Possible future requirements of New South Wales and Victoria.

		cusecs.
(A) New South Wales—(1)	Murrumbidgee Southern Canal	1,250
,, (2)	Murrumbidgee Northern Canal	1,000
,, (3)	Murrumbidgee, from Narrandera to the Murray	750
,, (4)	Murray at Bungowannah	2,000
,, (5)	Murray at Tocumwal	500
,, (6)	Murray, from Tocumwal to South Australia	750
	Total	6,525
(B) Victoria—(1)	Murray, at Bungowannah	750
,, (2)	Murray, from Bungowannah to South Australia	1,750
,, (3)	Goulburn	2,250
	Total	4,750
Total maximum from New South Wales and Victoria		11,000

The

H. G. McKinney, M.Inst.C.E.

15 Oct., 1902.

Q. 3864.

Loss of water in the Murray.

Effect in South Australia of the proposed maximum diversions.

The Broken River, the Campaspe, and the Loddon are not here taken into account, and there may be some small supplies diverted from the Murrumbidgee above Narrandera and from the Ovens in Victoria. It will, I believe, amply cover all such diversions if an allowance of 1,000 cubic feet per second be made for them, making the grand total for the maximum diversions from the two States 12,000 cubic feet per second, or 720,000 cubic feet per minute.

In a return prepared by Mr. Checchi, it is shown that the effect of diverting a given quantity of water, on an average of the various points of diversion in Victoria, is equal to the diversion of about half that quantity at Murray Bridge in South Australia; in other words, 1,000 cubic feet per second diverted from the river Murray or its tributaries in Victoria causes a diminution of 500 cubic feet per second at Murray Bridge. The principal points at which water can be advantageously diverted from the Murray and the Murrumbidgee in New South Wales are more distant from South Australia than are the main points of diversion in Victoria. Hence, on the basis of Mr. Checci's return referred to, the total maximum probable requirements of New South Wales and Victoria would cause a diminution of less than 6,000 cubic feet per second, or 360,000 cubic feet per minute in South Australia. Now, I have already shown, from the evidence, that if the diversions made by New South Wales and Victoria caused a diminution of 500,000 cubic feet per minute during the period of high supply, there would be an abundant supply left, not only for all irrigation requirements in South Australia, but for balancing evaporation in the lakes, supposing the mouth of the Murray to be closed. It is to be observed that, in making this calculation, I have assumed the amount of evaporation as given by Mr. Jones. Bearing in mind the immense value which such an extensive reservoir of fresh water would possess, and the development of irrigation and reclamation to which it would give rise, it is evident that, even after all probable requirements of New South Wales and Victoria are met, South Australia can be placed in a much better position in regard to the river Murray than it at present occupies.

Navigation little affected in the near future.

With regard to navigation, while many witnesses gave the opinion that the diversion of water from the Murray and its tributaries has materially affected the navigation, the evidence on this subject is vague and indefinite. A little consideration shows that all the water diverted in the past, or likely to be diverted for years to come, would affect the navigation of the Murray for only very brief periods, when the river is rising above or falling below navigation level.

As matters at present stand, the evidence shows that in periods of low river, the land around the lakes in South Australia is prejudicially affected by the sea water. There is nothing definite to show that this has been to any appreciable extent due to the diversion of the river waters. Still, as irrigation progresses, it must have this effect to some extent.

Suggestions that New South Wales and Victoria should contribute to cost of closing the mouth of the Murray.

This being so, and assuming, as before, that no separate legal rights existed, but that all three States were subject to the Water Rights Act of New South Wales, I should recommend that this State and Victoria should each contribute one-third of the cost of the works for excluding the sea water from Lake Alexandrina. Further, as irrigation progresses, and as the demands of South Australia increase, I should recommend that, when the necessity arises, the conversion of Lake Victoria into a storage reservoir for keeping up the supply in the Lower Murray should be carried out at the joint cost of New South Wales and Victoria. Subject to these conditions, New South Wales and Victoria should have full liberty to divert the various quantities of water named during the periods of high supply in the rivers.

Diversion during periods of low river.

As regards the quantities of water which may be diverted when the rivers are low, the supplies which will be required by the residents on the lower parts of the rivers in New South Wales and Victoria will alone afford a large measure of protection to the interests of South Australia. The series of towns on the Murray below Bungowannah, and the number of private interests which have to be provided for will necessitate leaving a substantial minimum in the river at that place, and a similar remark applies to the Murrumbidgee. The conditions along the river Darling do not favour irrigation on any considerable scale, so that no works likely to be carried out in connection with it will have any material effect in diminishing the quantity of water which flows to South Australia. On the other hand, should a system of locks and weirs be constructed throughout that river, the tendency of this—even without reckoning on the probable storage of water in lakes—will be to increase the flow to the Murray by diminishing the loss of water which occurs periodically under existing circumstances through long stretches of the river becoming dry and parched in times of extreme drought

South Australia in the end in a better position.

While the works—to the construction of which I propose that New South Wales and Victoria should contribute—will place the country around Lake Alexandrina in a much better position than it is in at present, and will protect the interests of irrigation in South Australia, the locks and weirs which it is proposed to construct in this State will place navigation on a permanent and satisfactory footing. It is natural to expect also that in view of the abundant supply of fresh water much will be done in the way of land reclamation in and around Lakes Alexandrina and Albert.

Recommendations.

It appears to me, then, that if none of the States concerned had any special legal rights in the river Murray, and if its waters had simply to be utilised in the most equitable manner, and to the best advantage of all, the following should be the basis of a permanent understanding:—

(1.) That New South Wales and Victoria should each contribute one-third of the cost of excluding the sea-water from Lake Alexandrina.

(2.) That New South Wales and Victoria should, at their joint cost, when occasion requires, convert Lake Victoria into a storage reservoir for maintaining the flow in the Lower Murray.

(3.) That New South Wales and Victoria should have the right to utilise the waters of the tributaries of the river Murray, and of the river Murray itself, up to the maximum limits mentioned.

(4.) That New South Wales and Victoria should allow sufficient water to pass into South Australia to balance the evaporation in Lakes Alexandrina and Albert, to meet the requirements of irrigation, and to afford an ample supply for working the locks which it is proposed to construct.

(5.) That South Australia should have the right to construct locks and weirs in the river Murray as far up as Wentworth, and that New South Wales and Victoria should contribute to the cost of these works in proportion to the benefits, if any, which these States will receive from the works.

(6.) That the proposed storage reservoirs on the Upper Murray should be constructed at the joint cost of New South Wales and Victoria, each State contributing half.

(7.) That New South Wales and Victoria should mutually concede the right to abut dams on the banks of the river Murray, and that the cost of such dams should be borne by these States in proportion to the benefits arising from the dams.

Recommendation intended to cover all probable requirements of future.

I have no doubt that many persons, especially in New South Wales, will consider that these proposals anticipate the events of a distant future, and apply to remote contingencies. I intend them to do so, as no settlement of the question can be of any material value which omits to include ample provisions for future developments. The Commission is in a position to judge whether the developments contemplated in my proposals are likely to be so remote as may be generally imagined.

Stephen Mills, Barrister-at-law, and Engineer and Secretary to the City Improvement Advisory Board, further examined:—

S. Mills.

15 Oct., 1902.

6062. *President.*] You have prepared a further statement with regard to the legal aspect of the question which has been remitted to the Commission, have you not? Yes.

6063. Will you read it? I may say that the statement is partly in reply to some of the evidence given by Mr. Glynn, on the 10th September last.

Mr. Glynn refers again to the letter of Sir Henry Parkes of 6th March, 1890, which claimed for New South Wales the control of the waters of the Murray from the source to the eastern boundary of South Australia, and which also, in another paragraph, stated that it would be a breach of international obligations for South Australia to use the waters of the river to such an unreasonable extent as to interfere with the normal level of the river. With regard to this second part of Sir Henry Parkes' letter, I should like to say that in my evidence I made no reference whatever to it. Mr. Glynn then goes on in this way, as if to imply, without actually saying so, that my opinion on the matter was merely based upon Sir Henry Parkes' letter—"but as Mr. Mills at all events still thinks it seems perfectly clear that the waters of the Murray River, from the South Australian boundary to the right line boundary, run from Cape Howe, pass wholly over New South Wales territory, and consequently are the property of New South Wales," &c. What I did say was; "Taking Angell's definition of 'watercourse,' and Bouvier's definition of 'a bank' as authoritative, and reading them in conjunction with the judgment in 'Lyon *v.* Fishmongers' Company,' where it is laid down that contact with the flow of the stream is necessary for the existence of a riparian right, it seems clear that the waters of the Murray River, from the South Australian boundary to the right line boundary, run from Cape Howe, pass wholly over New South Wales territory, and consequently are the property of New South Wales."

Waters o Murray the property of New South Wales

I

S. Mills.

15 Oct., 1902.

I think, also, it is clear from several passages in my former evidence that throughout I was emphasising what may be called the international view—that is to say, I regarded the States as independent political communities; and although, being subject to the supremacy of the British Parliament, they had not the full status of "persons," in international law they were as against one another bound by no other obligations than those of comity. As independent communities, their rights over their own territory, except so far as those rights might be modified by any enactment of the British Parliament, were absolute. The decisions of Common Law Courts had no application to those independent communities as represented by their Executive Governments as regards Acts dealing with their own territory, including, of course, the waters of and rivers within such territory. It may also be mentioned that the Colonial Laws Validating Act of 1865 repealed the old common law doctrine that Colonial Legislatures could not pass any law repugnant to the law of England, and enacted that no colonial law shall be void or inoperative on the ground of repugnancy to the law of England, unless the same be repugnant to some Act of the British Parliament applicable to the colonies. I think the above considerations render pointless Mr. Glynn's statements that I adopted a certain position from Angell and abandoned it in a sentence which noted the effect of the decision in "Lyon *v.* Fishmongers' Company." Angell's statement *re* property in water as derived from ownership of the bed of a stream, whatever may be thought of it as a statement of the law of private property, is, I think, absolutely correct as applied to the ownership of the bed of a stream by an independent political community; and the decision in "Lyon *v.* Fishmongers' Company," while authoritatively stating the common law affecting individual proprietors in England, has, I think, no application to independent communities as political entities. It may be objected that I have referred to this very case in partial support of a particular proposition. In reply, I would say that certain conditions are laid down in that case as necessary to the acquisition of riparian rights as against other proprietors, and it cannot be supposed that less stringent conditions would suffice to enable any State, or a resident in any State, to acquire riparian rights as against the Government of another self-governing State.

Decisions of Common Law Courts inapplicable to independent communities.

As to the definitions of "watercourse" which I quoted in my former evidence, one by Angell the other by Stephen, Mr. Glynn says they do not agree, and therefore weaken each other for the purpose quoted. In passing, I may say that one purpose for which they were quoted was to rebut a definition by Mr. Glynn, and that purpose is served by the fact that they are both opposed to what Mr. Glynn had laid down. The definitions, no doubt, differ, but they differ because they represent different aspects of the same subject matter. Angell's definition is a physical description of the real and corporeal things, land and water, which he thinks are conveyed by the term "watercourse." Stephen, looking at the subject from another point of view, and dealing with it in a less complete way, describes the incorporeal hereditament or common law right to the use of water, which he thinks is conveyed by the term "watercourse," omitting mention of the real right, which in most cases is equally an incident of the grant.

Angell's and Stephen's definition of "watercourse."

Mr. Glynn says the river question can easily be settled if the Commonwealth and the States would agree to accept Stephen's definition "and all that it involves." Seeing that the Commonwealth and the States comprise all "the parties to the suit," if I may put it in that way, it would be equally true to say that if the Commonwealth and the States would only accept Angell's definition the matter might soon be settled. As an astute lawyer and an experienced legislator, Mr. Glynn did not, of course, mean merely to enunciate a truism, and it may be worth while to look at the definition referred to in order to discover, if possible, the ground of his preference for it. It is a definition of the common law right to the use of flowing water possessed by a private riparian proprietor, and as applied to a private proprietor is, of course, subject to all the restrictions which the common law imposes. It appears, then, that in Mr. Glynn's opinion, it involves the determination of the riparian rights of all the States within the Murray Basin according to the rules which in England restrict private riparian owners. One of the results of this control of the common law would be, according to the statement made before the Commission by Mr. Carruthers, that a large part of New South Wales would remain a waste for all time. Perhaps the same remark would apply to parts of Victoria also.

Effect of accepting common law control.

Apart altogether from any question of the applicability of the common law of riparian rights to the continental areas of the Australian States, I think there are good reasons for doubting whether any Court having Federal jurisdiction would consider itself free to enforce the common law in its strictness.

As to "reasonable use," Professor Salmonds says, "As to the question of what is meant by "a reasonable use," I believe that the law here is exactly what it is in England. The riparian law of England is that a riparian owner may make a "reasonable use" of water, but not an "unreasonable" use. The unreasonable use in England means a use which inflicts substantial injury upon other owners—*i.e.*, no use is reasonable which materially diminishes the advantages which other riparian owners have been in the habit of deriving from the natural flow of the water. That rule and definition as to "reasonable use" is laid down in numerous English authorities, and exactly the same words are used in section 100 of the Commonwealth Act. I consider, therefore, the section in question is simply declaratory of the English riparian law, and confers or takes away no rights, but simply declares what they are." *Professor Salmonds quotes a number of English cases* to show what is "reasonable use" of streams, and he says: "That is the English law, and it is applicable here until altered by the Federal Parliament."

These cases all lay down the common law on the subject, and in my opinion the common law has been modified in an important respect, so far as Australia is concerned, by the Imperial Parliament itself. Section 100 of the Commonwealth Constitution enacts that "the Commonwealth shall not by any law or regulation of trade or commerce abridge the right of any State, or of the residents therein, to the reasonable use of the waters of rivers for the purposes of water conservation or irrigation."

Common law has been modified by Commonwealth Constitution.

If the section had merely provided that the "reasonable use" of waters of rivers should not be restricted, there would have been considerable force in the argument that the English decisions would control the interpretation of the words "reasonable use"; but the section goes further—it enacts that the reasonable use for certain defined purposes shall not be restricted. These purposes are conservation and irrigation. In one of the English cases cited by Professor Salmonds, "Embrey *v.* Owen," 6 Exc. 369, Baron Parke "chose irrigation as a striking example of an impermissible and unreasonable use; but in Australia the wholesale appropriation of the water may be not only reasonable but essential to pastoral and agricultural settlement." (Annotated Constitution, p. 892.)

Wholesale appropriation of water may be reasonable in Australia.

It appears to me, then, that there is good ground for the opinion that not only are the English canons of interpretation of the phrase "reasonable use" inapplicable here, but that, so far as water conservation and irrigation are concerned, they have been expressly excluded by the words of section 100.

English canons of interpretation inapplicable.

A further consideration is that the Interstate Commission will most likely be the tribunal charged with determination of any disputes as to "reasonable use." What is "reasonable use" in any particular case will probably be a question of fact only; and, on questions of fact, no appeal will lie from the decision of the Interstate Commission to the High Court.

Status of Inter-State Commission.

It is not easy to define the exact status of the Commission. It will have some judicial powers, but will not be, in the ordinary sense, a court of law; and, in dealing with questions of fact, is unlikely to consider itself bound by principles of interpretation laid down by the English Law Courts.

With regard to the case of Holyoke Water Power Company *v.* Connecticut River Company (22 Blatchford, 131), cited both by Mr. Glynn and Professor Salmonds, this is no doubt a strong case; but I think I am right in saying that in Connecticut and Massachusetts the common law prevails without modification, and this case might, therefore, be regarded as practically an English case. But, with regard to this and other American cases which may be cited, it may be remarked—

Common law modified in America, also in Australia.

(1.) That, while the common law is adhered to in some of the American States, it has been modified in others.

(2.) The American Constitution does not contain a section similar to section 100 of the Commonwealth Constitution, which, as I have pointed out, seems to modify the common law for certain purposes.

American decisions not binding.

(3.) American decisions, though they are sure to be referred to in our Federal Courts, and in some instances may possibly be followed, are not binding upon our Courts.

I think, therefore, it is going too far to say, as Professor Salmonds does as to one case, that a legal doctrine is settled for us because an American Court has ruled in a particular way. (*See* Professor Salmond's answer to question 6, sub-section (*b*).] The learned editors of the "Annotated Constitution of the Australian Commonwealth," after citing the case given by Professor Salmonds, viz., "United States *v.* Rio Grande Dam and Irrigation Company," make the following comment:—"This Constitution, however, gives explicitly what Congress and the Courts of the United States have only partially conceded—the right of the States and their residents to the reasonable use of the water for certain purposes, notwithstanding that navigability may be interfered with."

Right by reasonable use to interfere with navigability.

And again, in another passage on the same case:—"Under this Constitution the mere fact that navigability is substantially affected, or even destroyed, does not enable the Commonwealth to restrain the use of the water by a State or its residents unless such use is unreasonable.

The

S. Mills. 15 Oct., 1902.

The case of Pental Island has been referred to several times, and some of the legal witnesses, for whose opinions I have the greatest respect, have mentioned the case as influencing their views as to the interpretation of section 5 of the Constitution Statute. I have carefully gone through all the official papers I could obtain on the subject, and have extracted some information which may be useful:—

Port Phillip district part of New South Wales.

It appears from a letter dated 22nd November, 1866, written by the Chief Secretary of Victoria to the Colonial Secretary of New South Wales, setting out the Victorian case as to Pental Island, that this island ever since its first occupation for pastoral purposes (about 1845) had been part of the run known as Swan Hill in the Port Phillip district.

Particulars re Pental Island and grounds for Privy Council decision.

In the Imperial Act, 5 and 6 Vic., c. 76, it is provided that "the boundary of the district of Port Phillip on the north and north-east, shall be a straight line drawn from Cape Howe to the nearest source of the river Murray; and thence by the course of that river to the eastern boundary of the province of South Australia." At the date of the passing of this Act, the Port Phillip district therein defined was part of New South Wales.

The Act 13 and 14 Vic., c. 59, which constituted the colony of Victoria, after reciting that "it is expedient that the district of Port Phillip, now part of the colony of New South Wales, should be erected into a separate colony," defined the boundary in practically the same words as the Act 5 and 6 Vic., c. 76.

The Chief Secretary of Victoria urged that this showed the intention of the Imperial Government to be that the whole of the territories then known as the district of Port Phillip, and of which, as he further urged, New South Wales recognised Pental Island to be an integral part, should constitute the colony of Victoria.

In October, 1859, the Government of New South Wales had claimed the island as a portion of its territory, the then Attorney-General, Mr. (afterwards Sir) James Martin, expressing the opinion that under the Imperial Act 18 and 19 Vic., c. 54, sec. 5, the island formed a portion of New South Wales, and that the mode in which the island had been dealt with while the present colony of Victoria formed a portion of this Colony under the name of the district of Port Phillip, had no bearing upon the question.

It was urged in the letter of the Victorian Chief Secretary above referred to, that the southern branch of the Murray bounding Pental Island was insignificant, whereas the northern branch was the important and only navigable one, and it was contended that the "watercourse" named in the 18 and 19 Vic., c. 54, "must be taken to apply solely to the northern and only permanently navigable channel of the river, and that under such terms the jurisdiction of the New South Wales Government may not be stretched over the comparatively insignificant channels that for short recurring periods of the year act as auxiliary channels for the passage of the flood waters of the main stream."

It is interesting to note that this letter of the Victorian Chief Secretary contains the view of the Victorian Government as to the meaning of the much-debated word "watercourse" in the Constitution Statute.

The Victorian Chief Secretary says, "It is also submitted that the Act does not warrant the construction put upon it by the Government of New South Wales in claiming this island; for the term 'whole watercourse' can only mean the entire body of water in the course of the Murray mentioned in previous Acts, and not distributed into two or more insignificant channels, and at wide distances apart."

In 1870, Commissioners were appointed by New South Wales and Victoria, who took evidence in the Colonies, and the matter was, by agreement, referred to the Privy Council for their decision. The award, as given in the Parliamentary papers for 1872, is very brief, and gives no reasons for the finding, which was that the island was adjudged to Victoria. Possibly the facts that led to the decision were principally that the island had been recognised by New South Wales as forming part of the Port Phillip district before that district was erected into a separate Colony, and the view urged on behalf of the Victorian Government that the stream on the southern side of Pental Island was comparatively insignificant.

It had been stated by the Attorney-General of New South Wales that "If the southern branch is only an insignificant watercourse, not in any way possessing any of the characteristics of a river, then the island will belong to Victoria"; and there was conflicting evidence as to the importance of this southern branch. Some witnesses, for instance, said it was not known as the Murray at all, but as the Murrabit, and that the south channel owed what importance it had to, and was, in fact, the continuation of, the Victorian river Loddon.

The Chief Mining Surveyor of Victoria, after gauging the southern branch at a time when there was more than the ordinary flow in the river, swore that a fall of the waters to the summer level would limit the flow in this channel to a very insignificant quantity, and would cause the main stream, practically, to carry nearly the whole of the river drainage. It was also pointed out, in correspondence, that in the New South Wales *Government Gazette* of 1884 (p. 1079), the Reedy Lake run, which included Pental Island, was described as bounded on the north by the Murray, "whilst the Marabout, or ana-branch, is clearly shown by the description to intersect the run, and to be in the Port Phillip district."

Unless it can be shown that, as a matter of fact, the question was decided on other grounds, it seems reasonable to suppose such evidence, and the fact of the island having been so long recognised as forming part of the Port Phillip district—which district was, by the 13 and 14 Vic., c. 59, erected into the Colony of Victoria—may have been the controlling factors in the decision of the Privy Council. If this supposition is correct, the result of the arbitration does not seem to have much direct bearing upon the interpretation of section 5 of the Constitution Statute.

THURSDAY, 16 OCTOBER, 1902.

[*The Commission met at the Board Room, Public Works Department, Sydney.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Hugh Giffen McKinney, M Inst.C.E., of Sydney, further examined:—

H. G. McKinney, M.Inst.C.E. 16 Oct., 1902.

6064. *President.*] In the statement read yesterday you made certain suggestions as to the quantity of water which should be diverted from the Murray and its tributaries, and stated it was your opinion that after these quantities had been taken South Australia would be amply provided for, both in respect of irrigation, navigation, and the maintenance of the lakes? Yes.

South Australian requirements could be provided for without storages.

6065. I notice that you did not say anything about storage;—are we to understand that these diversions could be made without storage? Yes; since yesterday I have gone further into the matter; in Question 3,845 there is a list of proposed storages in Victoria, the estimated quantities to be stored are all given, and adding the quantity proposed to be stored at Barrenjack, on the Murrumbidgee, the total capacity of the storages in that list would amount to 59,640,000 cubic feet. The proportion of diminution in South Australia due to such storages would be at least half the quantity proposed to be stored, but even the half would be 30,000,000 cubic feet. In my report I first took up the effect of the diversion of a quantity of water equal to 500,000 cubic feet per minute in South Australia, but the total of the proposals which I actually made as the maximum diversion really amounts to 360,000 cubic feet per minute, so that there is a balance of 140,000 cubic feet per minute left in addition to the quantity actually necessary for the purpose stated. It is mentioned in my report that if New South Wales and Victoria together had diverted such quantities of water as would have been represented at Morgan by 8,333 cubic feet per second, or 500,000 cubic feet per minute, from the river Murray and its tributaries from 1884 up to the present time, during the Spring and early Summer months, they could have done so every year except 1884, without interfering with the irrigation interests of South Australia; while assuming that the mouth of the Murray were closed the surface of the fresh water in the lakes would not during that period have fallen to its present level. The sum of the maximum diversions proposed is 360,000 cubic feet per minute. I took the New South Wales gaugings, and found that if such an arrangement had been in existence during the years mentioned, the lakes in South Australia would have been full in January of this year.

Diversions by New South Wales and Victoria without interfering with interests of South Australia.

6066.

6066. *Mr. Burchell.*] Have you taken the present year into consideration? No, I referred to January of the present year.

H. G. McKinney, M.Inst.C.E. 16 Oct., 1902.

6067. Have you taken account of the years of low discharge? Yes, so far as the facts were before me.

6068. But the present year is a lower year than 1884, would not that upset your calculations? The months which have passed are not the months during which the main supply would have come down.

Lakes.

6069. But the amount in any month of 1884 is more than double many of the months in 1892? Even so, the lakes would not at the present time be empty, and when you have fresh water there it does not appear to me a very great matter if the level does fall slightly, the lakes are still there.

Evaporation.

6070. Do you know what the evaporation is? I have taken Mr. Jones' figures, but the maximum was in January, and was, I think, 150,000 cubic feet per minute.

6071. Do you know that less than half that quantity has been passing down the river of late? That would not have affected the position; the quantity coming down was so much more than the quantity taken up by evaporation that the lakes would have been full. Taking the maximum supply allowed to New South Wales and Victoria, viz., 480,000 cubic feet per minute, the quantity flowing down during the spring and early summer months would be perhaps ten times that quantity. The diagram referred to in my report [*Exhibit* 126] shows that during the spring and early summer months there is an ample supply.

6072. Do you know that the 480,000 cubic feet per minute allowed to New South Wales and Victoria, taking the whole year round, totals more than the whole volume for 1884? But you are taking as an average what I mentioned as a maximum when it could be allowed. In such a year as 1884 that quantity would not be taken.

Low discharge o Murray in 1884.

6073. Have you ever known the river so low as it is this year? I think this is the lowest year on record; I believe it is lower than 1884, but have not been on the river myself.

6074. Taking that into consideration, do you not think it worth while to revise your figures? No; I prefer to leave them as they are. You cannot be guided by extreme years, either of flood or drought.

6075. Do you not think that all schemes of irrigation should be based on the minimum flow? It would not be practicable.

Irrigation would have to be limited in years of minimum supply.

6076. What would happen in times of minimum supply? The areas would have to be limited in such times, but in providing for a general division of the waters it is necessary to put a limit on what should be taken as a maximum.

Proposed diversions based on future requirements.

6077. *President.*] You were saying that there would be a balance of 140,000 cubic feet per minute left after allowing for all proposed diversions in New South Wales and Victoria? Yes; and in addition to the security thus afforded the fact remains that in very high floods no amount of storage ever likely to be attempted will prevent a certain amount of surplus water going over the proposed weir at the Murray mouth. Perhaps I should state further, in regard to the matter of maximum diversions, that in making these suggestions I am really looking very much into the future, simply to arrive at a basis on which an understanding can be come to by the Commission. I know the places where water is most likely to be diverted in New South Wales, and, judging from the probable requirements of the people, I have put the maximum at what seems ultimately probable.

Storages on river frontages.

6078. In reference to the natural storages along the river frontages, what is your opinion as to the possibilities of making use of such for the purpose of conserving flood waters? In New South Wales there are very few places on the rivers where any great quantity of water could be stored, except on the Darling, though something might also be done on the Murrumbidgee and Murray. Where they can be utilised with advantage, it should, of course, be done.

Lake Victoria.

6079. Do you know Lake Victoria? I have seen the lake, and know that an immense quantity of water could be stored there.

6080. Do you think it would be better to store the water there or in the channel itself? I think, generally speaking, it could be stored more cheaply in such places as Lake Victoria, where it is simply a matter of having a dam and flood-gates, and there is less risk than in the river itself.

Risk in river storages.

6081. *Mr. Murray.*] What risk is there in the river? Risk from floods. A weir in a river is right in the floodway, but in a place like Lake Victoria it is off the floodway. I refer, of course, to risk of damage to the work itself. If you have a river of 40,000 or 50,000 cubic feet per second passing over a weir, there must be more risk than if you have a weir situated where none of that flood-water passes over it.

Shallow storages wastefu

6082. *President.*] Have you considered the question of evaporation in those shallow lakes? I did in some cases, specially in connection with the Narran Lake, on the Upper Darling. Speaking generally, it would be a great waste of water to store it in shallow lakes.

6083. Would you, therefore, advocate that storage in shallow lakes should be confined to water from high floods? Yes; and in all cases should give preference to situations where a considerable depth could be obtained.

Upper Murray and Murrumbidgee storages.

6084. I understood you to say that, in connection with the diversions you suggest, it would be essential that there should be at least one storage reservoir on the Upper Murray, and one on the Murrumbidgee at Barrenjack? Yes.

Cost of works—How apportioned.

6085. You also suggest that New South Wales and Victoria should bear equally the cost of the storage reservoir on the Upper Murray? Yes.

6086. On what grounds? Both would largely benefit from it.

6087. Why leave South Australia out of it? I should say that in making these suggestions, I began by assuming what is really unfair to New South Wales: that she has no special rights in the Murray waters. As a matter of fact, I am of opinion that she has such rights, but this, of course, is a matter for the legal authorities to settle. For the purpose of my argument, however, it was necessary to assume she had none; so that what is suggested is unfavourable to New South Wales. It appears to me that, as New South Wales and Victoria would use a very large quantity of water from the Murray, which otherwise would flow down to South Australia, they might make this joint concession to that State, and pay the cost of the storage between them.

6088. Are we to understand that your further suggestions that New South Wales and Victoria should bear one-half of the cost of the Lake Victoria storage, and one-third each of the cost of excluding the sea water from the lakes, are based on the same considerations? They are, of course, merely suggestions. I looked upon it as a joint concession made to South Australia on account of the fact that no development that can take place will ever put South Australia on the same footing as Victoria and New South Wales in regard to the extent of irrigation possible.

H. G. McKinney, M.Inst.C.E.
16 Oct., 1902.

6089. I notice, too, that in your report you appear to assume that South Australia is the only State concerned in navigation;—I would like to call your attention to the fact that now we have a Federal Constitution, navigation has been taken out of the control of the States altogether, and is now a matter for the Commonwealth to deal with;—would that fact modify your view with regard to the storage reservoirs, seeing that portion of the water from such reservoirs would have to be used for maintaining the navigation of the river? Yes; because the construction of the locks and weirs in the Murray, for instance, would be matter of very much more advantage to South Australia than to Victoria and New South Wales; and if the Federal Government should decide to construct such works, it would really mean that Victoria and New South Wales would contribute more to their cost than South Australia; that would materially alter any concession which should be made to South Australia in regard to either irrigation or the requirements of the land around the lakes.

Locking Murray concerns South Australia.

6090. In giving your opinion as above, did you take into consideration the fact that South Australia gets pretty well all the benefits, so far as the waters of the Darling are concerned, and that she is likely to keep them? I do not think I did, fully. I must say that I think the conditions would be very liberal to South Australia.

6091. You have studied the returns of gaugings, have you not? Yes.

6092. And you have noticed the effect that the Darling has on the Murray below its junction with that river? Yes.

6093. Do you not think that effect should be taken into account? I think it would be perfectly fair that it should be.

6094. You have noticed that from 1890 to 1900 the summer flow at Morgan has been double that at Mildura? I knew it had been much larger, but did not know the exact proportion.

Nothing to show that South Australia has suffered from existing diversions.

6095. Is it your opinion that South Australia has suffered as the result of the diversions which have taken place from the Murray and its tributaries? There is nothing to show that she has suffered to any appreciable extent.

6096. You suggested that locks and weirs should be constructed as far as Wentworth, presumably from Murray Bridge or Blanchetown;—had you any reason for mentioning Wentworth particularly? I know that in South Australia a good deal of stress has been laid on keeping the river navigable as far as that place, it being regarded as a town with which there should be a large South Australian trade.

6097. Do you think that locks and weirs should go beyond Wentworth? I think it would be to the benefit of the country if the whole of the Darling were locked; but I would not like to say that, under existing circumstances, there would be a return for the outlay.

Victorian and New South Wales share of cost of locking.

6098. Having regard to the fact that the question of navigation is vested in the Commonwealth, do you still think that New South Wales, Victoria, and South Australia should share equally in the cost of locking the river? I look upon that as a matter in which South Australia is specially interested, and I think my words were that Victoria and New South Wales should contribute in proportion to the benefits, if any, received from such works.

6099. Would it not be a matter for the Commonwealth to inaugurate such a system of locks? Doubtless it properly belongs to the Commonwealth; but I think it would be a more equitable way of doing the work if the States contributed in proportion to the benefits received.

Works should be carried out by Commonwealth.

6100. *Mr. Murray.*] Did you mean that the carrying out of the works properly belongs to the Commonwealth? Yes, I think so.

6101. Where is their power? I understand they have such power.

6102. Can you show it to us in the Act? I think sub-section xxxix of section 51 is wide enough to cover it. I simply understood that the Commonwealth Government had such power; I did not go into details.

Construction of channel through lakes.

6103. *President.*] Would you care to express an opinion as to the propriety of constructing a channel (in addition to the weir you have referred to, in order to keep out the salt water) so as to minimise the quantity of water required for evaporation and the maintenance of the lakes? I think such a work would be advisable if it were practicable, but expect that in the course of time, in view of the large amount of shallow water near the present shores of the lake, reclamation works will be carried on, and the area of the lakes materially diminished.

Proportion of New South Wales and Victorian contributions to Murray.

6104. Referring to your remark that "Further examination of these minimum discharges tends to show that if, during the months of January and February, when the lowest figures are reached, the proportion of the discharge at Jingellic from the Victorian side be taken at one-fourth, New South Wales supplies more than half the discharge at Albury for these months in years of minimum flow";—are you quite sure of your ground? Yes, for low discharges; I have no doubt whatever about it. After reading my report yesterday I had an opportunity of going into the question with Mr. Smail, who has made a careful inspection of these tributaries, and the information he obtained more than corroborated the conclusion I had arrived at.

6105. You are aware of what is proposed on the New South Wales side in the way of diverting water at Bungowannah? Yes.

Advantages of Bungowannah site.

6106. Do you consider that place a suitable one at which to divert water? The advantages of the proposed site at Bungowannah are that the hills cease there on the New South Wales side, so there is a good abutment on the west side of the work, and the level land commences immediately below. The amount of cutting can be considerably minimised by following the edge of that low-lying land, until the side of the high plains is reached at Howlong; besides which, there is the advantage of having rock to abut one end of the work against. There is also the fact that good stone is at hand for construction purposes. In addition, the valley below widens out, so that a weir to effect the same result would be more expensive, and the cutting that would be involved in the canal would be deeper—that is, assuming the same height of weir, because you would be taking water off at a lower level. Above Bungowannah, you have hilly country more or less on both sides of the river, with considerable areas of swamp, in which there is coarse drift and boulders; so that I have no hesitation in saying that the work would be more expensive if a site were selected above Bungowannah. I therefore consider that the best site for the construction of a weir is limited to 200 or 300 yards of the length of the river at Bungowannah. The site at Tocumwal has advantages also, but would serve a different part of the country altogether. It would not serve the high plains which would be benefited by a storage at Bungowannah, nor would it serve the parts about Berrigan and Finley; but there is a good position for an offtake, and a natural outflow at that place.

6107.

H. G. McKinney, M.Inst.C.E.
16 Oct., 1902.

6107. Apart from the engineering possibilities, do you not think that the quantity of water available and the character of the ground, together with the rainfall, should be taken into consideration, so that the water should be applied under the best conditions and to the best advantage in New South Wales? Yes.

6108. Having regard to those conditions, do you think Bungowannah the best place? Yes.

6109. You know the rainfall at Howlong and Corowa? Yes; but the water can be taken from Bungowannah to Moulamein, and across the Edwards River, to the very dry districts there.

6110. While you were in the Department, you controlled the administration of the Water Rights Act, did you not? Yes.

6111. You therefore know what licenses have been issued under that Act? Yes.

Licenses under Water Rights Act.

6112. What kind of licenses have they been, principally? In the vast majority of cases, they have been for dams on creeks—the Billabong and Yanko Creeks, for instance; but there were also some pumping licenses.

6113. Knowing all the conditions of the case, will you tell the Commission just what the sum total, in your opinion, of the diversions would be? So far as the Murrumbidgee is concerned, I think the number of pumps licensed is, say, twenty-four or twenty-five; but of that number very few are used for irrigation—not more than a quarter of them. There is one orchard above Narrandera, and Messrs. McCaughey, Waugh, and Watt also irrigate; but even in the best of seasons—that is, when the greatest area is irrigated—there would not be more than 1,000 acres at the outside. There is no irrigation to any extent on the other rivers. The greatest extent is near Gunnedah, on the Namoi, and the last time I was there the area was 300 acres; but there was a proposal to extend it to 500 acres. On the Murray, there are no licenses granted, and, so far as I am aware, very little irrigation is done on the New South Wales side. At Borooga, water is pumped up; but I am not aware that irrigation is practised there now. They commenced irrigating a piece of very unsuitable land, and, I think, dropped it altogether. At the present time, I believe, they only pump water for tanks situated a good way back in the country.

6114. Apart from the places you have mentioned, the water is used for stock purposes only? Yes; it involves only occasional pumping, and is a very small thing.

New South Wales diversions from Murray.

6115. While you were in the Department, you initiated certain works on the Murray for diverting water from that river into several creeks;—will you tell us about those works? The only two cases I remember were the diversions into the Tuppal and Eagle Creeks; in both cases it was simply a matter of improving the natural course of the creeks in order to give a better flow when there is a large discharge from the river. The Tuppal cutting does not begin to flow until the height of the river on the gauge at Tocumwal is 5 or 6 feet, and at Eagle Creek I think it is about the same, but there must be a greater volume in the river before it begins to act.

Flood diverted not return to Murray.

6116. What becomes of the flood waters which pass down those creeks? In the case of Tuppal Creek, it reaches the Edwards River and passes back to the Murray through the Wakool; in the case of Eagle Creek, it goes back again also, but I forget whether it is by means of the Wakool or the Merrang. In the case of the Yanko Creek cutting, the natural creek has been greatly improved in order to give a better flow than formerly, but so far as the quantity of water carried in high flood is concerned, there is very little difference, and it merely increases the flow to the Murray through the Edwards River. The water comes through Yanko Creek to the Billabong Creek, and from there to the Edwards River back again into the Murray.

Tributaries of Murrumbidgee.

6117. You have had the rivers of the State under observation for a number of years;—will you tell us your experience of the tributaries of the Murrumbidge, say, the Lachlan, for instance? In regard to that river, it scarcely deserves the name of a tributary of the Murrumbidgee; so far as my recollection goes, it has not reached that river more than three or four times during the past twenty years. It reached the Murrumbidgee in 1870 and in 1890, also, I think, in 1891, but it is an uncommon thing for it to do so.

Tributaries of Darling.

6118. What about the tributaries of the Darling? The Macquarie River reaches the Darling only in high floods, but more frequently than the Lachlan reaches the Murrumbidgee. It divides into a number of creeks, some of which have pretty fair channels to the Darling; the result is that when there is a large flow a certain quantity of water reaches the Darling, but the larger proportion is lost on the marshes. The Namoi has a fair channel; when it is bank high there is a good flow into the Darling, but a great deal of the water spreads out over the country. The Gwydir reaches the Darling only in very high floods. It reached that river in the 1890 flood, and I think may have done so once or twice since, but it is quite an uncommon occurrence; the water spreads out over a very large area. The MacIntyre, the most northerly of the New South Wales tributaries, is in some respects the most regular of them all, but that again overflows, and a good deal goes on to the Queensland side; so that all the tributaries of the Darling are only very partly effectual in contributing to the flow of the river.

Protests Victoria and South Australia.

6119. In your report you say, speaking of Victoria and South Australia, "Both have appropriated the waters of the Murray wherever and whenever they thought fit, while even proposals or suggestions that a portion of these waters should be diverted into New South Wales have given rise to protests";—what do you mean by that? I refer, not to official protests, but to objections raised in the public press, and at meetings in both Victoria and South Australia.

6120. We have had it in evidence that certain resolutions were agreed upon between the Water Supply Commissions of New South Wales and Victoria in 1886;—what operated in the minds of the New South Wales Commission when it agreed to those resolutions? That is not a matter on which I could give satisfactory evidence; the Commission seemed to have thought that some understanding should be come to on the subject, and apparently thought those resolutions the best that could be arrived at, but beyond that I cannot say anything; I had nothing to do with preparing the resolutions, but only with getting out some areas of catchments for the Commission. I know Mr. Deakin was very prominent in the matter

6121. *Mr. Murray.*] You were Chief Engineer of Water Supply for this State, for a number of years were you not? Yes.

6122. Did you, in that capacity, have any river gaugings taken? Yes.

6123. Have they been tabulated and published? Yes.

6124. Has the Victorian Water Supply Department had copies of those gaugings? I think so. The last time any considerable number of them were published was in 1891; they have not been published in recent years.

6125. Did you keep tabulations similar to those kept in Victoria? No; they are kept in the form diagrams.

6126.

H. G. McKinney, M.Inst.C.E. 16 Oct., 1902.

6126. What method of gauging did you adopt? Whenever there was a sufficient depth of water we used floating rods, after the method used by Major Cunningham in his Roorkee experiments.
6127. Do you know the method now adopted in America? I am not sure that I do.
6128. You are not then aware that it is the method used in Victoria? No. I know that they used the system that Professor Cawthorne Unwin used on the Thames, in England.

Current meters found unreliable.

6129. Are you aware that the method of Humphrey and Abbot is not now used? Yes; but in my time current meters were so unreliable that I did not care to go on using them; I came to the conclusion that the method I used was the better one. I tried a Rèvy meter in still water and found that it recorded so unsatisfactorily that I decided that there was more objection to it than to the rods.
6130. Did you gauge the Upper Murray with the floating rods? No; I used that system at Albury, but not on the Upper Murray.
6131. I mean the part of the river you referred to yesterday? I did not make gaugings there; I used your returns.

Gaugings more likely to be accurate in low than high river.

6132. You questioned our returns? I compared them with one another. I think them more likely to be accurate when the river is low than when it is in flood, and I think your opinion, as given in the book of gaugings, confirms that judgment.
6133. Did you submit the diagram exhibited here yesterday to the Victorian Water Supply Department? No.
6134. Would it not have been advisable to do so before submitting it here and questioning our accuracy? There was no time; it was only prepared yesterday.
6135. But you founded an elaborate argument on it? I did not consider it a very weighty matter; I simply used it in support of my statement. It is notorious that even in the Sydney press statements have been made that by far the greater proportion of the water in the Murray comes from Victoria.
6136. And you based your estimate upon our figures without submitting the apparent discrepancy to us for explanation? What I said pointed to the opinion that your low discharges are quite reliable.
6137. But the diagram you put in is prepared with a view of showing that our gaugings in the Upper Murray were inconsistent with one another? That is in reference to the large quantities shown in times of flood.
6138. Would it not have been fair, before making that statement, to have referred the matter to us for an explanation of the apparent discrepancies? Well, in the first place, the time did not admit of it, and in the second place I simply made use of your figures, but put them in the form of a diagram in order to show the figures by scale.

Victo New S Wale of c lock

6139. In your report you say, "I should recommend that this State and Victoria should each contribute one-third of the cost of the works for excluding the sea waters from Lake Alexandrina," then again, "That the proposed reservoirs on the Upper Murray should be constructed at the joint cost of New South Wales and Victoria—each State contributing half"? Yes; I have explained that I look on that as a concession to South Australia.

torian ntributions o, and share of flow of Murray.

6140. Will you explain why those States should contribute equal shares of the cost, when you suggest that Victoria should get 4,750 cubic feet per second against 6,250 cubic feet per second to New South Wales? Even then the share proposed for Victoria is out of all proportion to what she contributes; I think, considering all things, the balance of favour rests with Victoria. She contributes very much less to the waters of the Murray than New South Wales does.
6141. Can you quote the figures on which you base that statement? From your own gaugings. Assuming that South Australia has rights we must treat the river as a whole.
6142. What rights has South Australia? I am assuming for the purposes of my argument that she has the same rights as she would have if all the States were under the Water Rights Act of New South Wales.

Victorian share of cost of works.

6143. You think it fair that Victoria and New South Wales should contribute equal proportions of the cost of those works, although New South Wales gets a larger share of the water? Yes, I do.
6144. *President.*] Your proposal regarding Victoria and New South Wales bearing half the cost refers to the Murray only, not to the Murrimbidgee? Yes.
6145. I take it that you assume New South Wales would bear the whole cost of storages on the Murrumbidgee? Yes.

Existing Victorian diversions

6146. *Mr. Murray.*] In your report you say, "With regard to the Goulburn, ... a canal has already been constructed from it capable of carrying 103,400 cubic feet per minute? I understand that is so.
6147. Do you mean to imply that that volume is diverted from the Goulburn? It is to be supposed that if you construct a large weir and channel capable of carrying that quantity of water the intention is to take it.
6148. The statement is that such a canal has already been constructed? Well, I can give you my authority for stating that such is the case.
6149. You say again, "The pumping power actually provided is thus capable of diverting an aggregate supply of 76,300 cubic feet per minute;" then lower down, "In short, the pumping schemes alone in Victoria which are in existence or are authorised, provide for the diversion of 130,900 cubic feet per minute from the Murray";—are those words intended to imply that such quantities are now being taken? The meaning is that the pumps referred to are either in existence or are authorised; those not specially authorised are allowed to exist on suffrance.
6150. What power have we to prevent that? I do not know the laws there on the subject, but I do know that Victoria is well advanced in regard to legislation on the subject.
6151. With reference to your remark, "It is sufficient for me to state here, that to the lay mind the fact that the whole channel of the river Murray is within New South Wales, ought to give this State at least a prior claim to the waters of that river";—what does that prior claim amount to? It would be beyond my province to define it.

New South Wales first claim to Murray waters.

6152. Why put it in then? One must often refer to matters which one could not define. All that I meant was that it seems natural if a State has a river wholly within its own territory that State should have first claim on the waters of such river.
6153. Are you aware that the right to the waters of a river depends not upon the ownership of the bed, but upon whether the land owned by a proprietor is washed by the waters of the stream? The property of a State consists of water as well as land,

6154.

H. G. McKinney, M.Inst.C.E. 16 Oct., 1902.

6154. The law does not recognise such a right in water? I rather fancy that a man who has a channel running entirely in his own property could make out a pretty good claim.
6155. Referring to your remark, "In addition to these works, by the construction of locks and weirs which, while providing for navigation, would afford improved facilities for pumping, the interests of both irrigation and navigation would be on a much more satisfactory footing than they are at present";—in what way would the construction of locks and weirs, while providing for navigation, afford improved facilities for pumping? It would reduce the lift and make it more uniform also.

Locks and weirs would assist pumping.

6156. You mean locks and weirs in conjunction? Yes.
6157. But supposing you pump the water out, what use would the locks be? That is supposing a thing not at all likely to occur.
6158. Suppose you have a small stream only coming down the Murray, insufficient for irrigation, in what way would locks contribute to the facilities for pumping? I did not say they would, I said the weirs would; what is meant is that both combined would afford facilities for navigation and irrigation.
6159. Do you mean they would conserve water? There would be a certain amount of water conserved, and the level would be raised.
6160. Do you propose to conserve water in the river bed? I did not say so; if you have to carry navigation on you must have locks and weirs.
6161. But if you pump the water out of the weirs for irrigation what becomes of the lock? I think that is supposing a contingency which will not occur in the Murray.

Flow of Murray sufficient for navigation.

6162. What I want to call your attention to is that these works would be useful in conjunction with storage, but without it they would be useless? That is not so; there has never been a time when there has not been more water coming down the Murray than would be sufficient to provide for navigation.
6163. But what about the diversions? I was reckoning on storages above, but so far as locks and weirs are concerned, there is ample water to provide for navigation, and allow of a certain proportion being pumped for irrigation, and I think my statement is perfectly plain.
6164. I think it is incomplete? It is impossible to make a paper absolutely complete; if I had gone into the matter in detail it would have required a large book.
6164. You must have seen in the newspapers in Victoria a great deal of wild talk about utilising the waters of the Murray for irrigation and navigation by means of locks and weirs; your report appears to me to be calculated to foster that wild idea—unwittingly no doubt—I wanted you to fill it out so as to set aside any such misconception;—do you not admit that locks and weirs alone would not provide for navigation? No.

Losses not greatly increased by locks and weirs.

6166. Would not the construction of locks and weirs greatly increase the loss by percolation and evaporation? I do not think so.
6167. Is not percolation in proportion to the wetted surface? Yes. Still, I do not think it would be such a very large item; besides, as a matter of fact, if you let the river fall very low, and the banks get dry, the loss of water when a high river comes down is enormous, on account of the parched banks, and the percolation is thus increased. Therefore, I think that if the river is kept standing pretty full, the increased loss by percolation would be a very small thing.

As navigation increases, storages will be necessary.

6168. Do you adhere to your contention that locks and weirs, without storage, would, while providing for navigation, afford improved facilities for pumping and irrigation? They would; but as irrigation develops, and more water is taken, there will have to be storages to maintain the supply.

Manner in which weirs would assist irrigation.

6169. In other words, the amount provided for irrigation would be infinitesimal without storage? I cannot see the difficulty. Supposing you have a river running 18 inches deep, by the construction of weirs you head it up to 6 feet for navigation. You then make a 6-feet river, and carry your navigation. You can also pump to the extent of that 18 inches discharge; when you get beyond that amount, you, of course, have to supplement the supply. I do not think that all the pumping which has been done yet has made any very great difference in the flow, judging by the gaugings in South Australia. They show that they are still getting a pretty good quantity; the lowest record was 69,000 cubic feet per minute at Morgan. That shows there is still a large margin left.
6170. How much water is the Darling contributing to the Murray at the present time? I do not think the river is running below Bourke.
6171. Are we to assume, then, that the locks and weirs would be of great value for navigation and irrigation, without storage? In the present state of the river, locks and weirs would undoubtedly be advantageous; but as irrigation develops, storage will be necessary.

South Australian interests not yet damaged.

6172. The only inference possible, then, is that the amount of water taken from the river by pumping, even in Victoria, does not materially affect the volume at all? It means that all you have taken up to the present time leaves ample to maintain both irrigation and navigation—that, so far as we can see, there is no proof that the interests of South Australia have been damaged yet.

Apart from locks and weirs, navigation impossible.

6173. *Mr. Burchell.*] You are aware that the volume of water passing down the river at Renmark, Mildura, and Morgan is of little or no use for navigation without locks and weirs? I believe that is so.
6174. You know, also, that it is difficult to pump when the river is as low as it is at present, but that, by the addition of a weir to raise the level of the water at Mildura, one pumping station could be done away with, and the whole expense—£2,500 per annum—could be saved? I believe that.
6175. The present flow would be sufficient to fill the weirs, and also facilitate irrigation? I think so.
6176. Would not that be a clear illustration of the value of locks and weirs? That is what I intended to convey—that with an ordinary moderate supply we could, by the construction of weirs, maintain navigation constantly, and at the same time allow of pumping under improved conditions.

Navigation, Wentworth to Echuca.

6177. In your remarks on the navigation of the river, you do not seem to have allowed for the navigability of the Murray from Wentworth to Echuca? I assumed it was not likely they would go to the expense of locking all that distance.
6178. Have you noticed the opinions of witnesses who have expressed their views of the value of the navigation over that part of the river? I did notice that those interested in navigation laid stress on that subject; but it was simply the opinions of persons who are practically interested in navigation.
6179. But one man at Kerang said that it cost him more to cart wheat 18 miles than to send it 140 miles by the river, and other witnesses agreed with that? As far as I recollect, there was comparatively little stress laid on the value of navigation in Victoria. In my opinion, it is a matter which can be left in its present state. In times of flood the rivers will always be navigable up to as far as Balranald.

6180.

H. G. McKinney, M.Inst.C.E. 16 Oct., 1902.

6180. With regard to your scheme, reported on by Colonel Home, I understand that you provided for a large storage at Talmalmo? Yes; I did so to keep up the minimum supply as far as possible in the dry time.
6181. Did you state that Victoria had constructed a weir from which it was possible to divert the whole of the water of the Goulburn in a low season? There is such a weir.
6182. In addition to that, I believe you have stated in some reports that Mildura expects 60,000 cubic feet per minute when the settlement is in full swing? That is only in times of high supply.
6183. How are the settlements lower down the river to be provided with water in seasons such as the present one? It would simply mean that everybody would have to take a diminished supply.

Frederick Augustus Franklin, M.Inst.C.E., of Wollongong, New South Wales, sworn and examined:—

F. A. Franklin, M.Inst.C.E. 16 Oct., 1902.

6184. *President.*] What is your name? Frederick Augustus Franklin.
6185. You are a civil engineer in private practice? Yes.
6186. You have had considerable experience in questions similar to that engaging our attention? Yes.
6187. You were a member of the Royal Commission appointed in the year 1884? Yes.
6188. You are aware that during the deliberations of your Commission certain conferences were held with a similar Commission in Victoria, and that, as a result of those conferences, certain resolutions were passed by the Joint Commission? Yes.
6189. Could you help us to understand how those resolutions were reached, *i.e.*, the road the Commission travelled in coming to such conclusions? I do not remember exactly, but I have made a *precis* of my recollections on the subject.
6190. Will you read it?

First report.

The Royal Commission on the Conservation of Water, New South Wales, was appointed on 10th May, 1884. At the outset of its investigations it was found that Victoria had made considerable progress in surveys of the Murray and its tributaries in that Colony, and considerable works were in progress and others contemplated; but little beyond an imperfect register of rainfall and flood heights had been done in New South Wales. Early attention was, therefore, given to this river, which, taking its rise in the highest mountains, 7,000 feet over sea level, was augmented by the melting snow, through its tributaries, the Snowy and Murrumbidgee Rivers. Provision was made to obtain sections and fix gauges at various points of the river, periodical observations were made and recorded, all subsequent examinations of the drainage area within New South Wales were based on these gauging and contingent levels. It was found that water taken from near Albury would command a large area of country towards the Edwards and Billabong Creek; closer investigation was made and recommendation submitted to the Government to enter upon a comprehensive survey of the whole area. As the question arose as to the quantity of water required to maintain navigation, special examination was made of sites suitable for storing basins at the head of the Murray for the supply of water to compensate the quantity used or distributed, for the purposes of stock, agriculture, mining, &c. As future proposals of schemes would require extensive head works attached to the banks of the river in both Colonies, it was resolved at an early stage that the Governments of New South Wales and Victoria should take joint action in a thorough examination of the Murray River and its tributaries; a minute of this resolution was forwarded to the Honorable the Colonial Secretary on 24th February, 1886. At same time an urgent request was made for the sum of £12,000 in order to equip survey parties, who were required to fix the position of works already reported upon, and so establish a basis for future operations on the same scale already attained by Victoria. Owing to the smallness of the amounts appropriated by Parliament, this work was retarded, and the fund was never available for the Commission, consequently much time was lost in connecting railway levels, sometimes at a great distance, with points of observation. Notwithstanding this difficulty, a series of comprehensive schemes were formulated, embracing the greater portion of Eastern Riverina, which subsequent instrumental examination has proved to be quite practicable, presenting no engineering difficulties, and of light construction throughout.

As the Commission considered the practical dealing with this extensive project required the joint action of Victoria, a proposal for a conference was made. The Commissions of the the two Colonies met in Melbourne on 22nd January, 1886, and again in Sydney on 5th May of same year, when the question of dealing with the river Murray water was discussed. In the meantime the New South Wales Commission had drafted an "Act for the Conservation and utilisation of water in New South Wales," and submitted the same for legislative consideration as a matter of urgency. From various causes this action was delayed, and opinions, based on the proposals of such Bill, were not available at time of the conference, in either New South Wales or Victoria. The deliberations of the New South Wales Commission, in regard to the river Murray, were influenced by the term of the Act, 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." It was considered that if the legal position were insisted on works of magnitude could not be undertaken, as, with one exception, the dealing with large rivers for interception of its stream and distribution over adjoining territory required works connected by both banks of the river, and in this case would require the joint action of both Colonies necessitating the placing the Upper Murray, down to point of interception, under dual control.

At the outset of the Commission's inquiries Victoria had five years' start over New South Wales in formulating a large comprehensive series of schemes for dealing with its catchment area, on surveys and plans prepared by Messrs. Gordon and Black, who were commissioned, 1880, by the Government of Victoria to design projects to supply the northern plains of its territory with a supply of water for "domestic, stock, and irrigation"; with considerable energy their advice was acted upon, and up to the time of the first move by New South Wales in 1884 considerable progress had been made in construction under the various trusts, and the general plans then available were adhered to. Their proposal dealt with all the principal tributaries of the river Murray passing through the northern plains of Victoria, excepting only the Mitta Mitta and one comparatively dry creek (Kiewa). Of the larger works at once undertaken, the most advanced and striking was the Wimmera, as the operations on that extensive area practically absorb the whole of the available water from every source, returning nothing to the Murray. The Loddon and Echuca works and others of more recent date must have also materially diminished the volume of water discharging into the Murray, and as the question of retaining a navigable level in that river is more particularly a Victorian one, it is important to know to what extent such level is impaired by the works then and since constructed. This, together with the fact that with the advance of railways

Second report, p. 6.

evidence was obtained that the volume of river traffic cleared at Moama, Swan Hill, and Euston, had fallen off nearly 50 per cent. in the five years preceding the appointment of the New South Wales Commission, and it was believed that, with a further advance of railways, the question of retaining the navigability of the upper portion of the Murray would be in future of minor consideration, and almost wholly in the interest of Victoria. From the earliest period of investigation the Water Conservation Commission urged the necessity of an agreement for utilising the flood-waters of the Murray, but no action was taken by Parliament, although in its second report special reference was made to the proposed recommendations, mutually agreed to by the joint Conference, for the consideration of the respective Governments, and as the reference dealt with the question of riparian rights, many authorities were quoted, and the conditions existing in Victoria and New South Wales in regard to this matter were fully detailed. Finally, the recommendations of the Commission were that river-gauge records be maintained, gauging of the river flow continued systematically, and the legislation on the lines suggested in the first report should receive early consideration.

6191.

F. A. Franklin, M.Inst.C.E. 16 Oct., 1902.

6191. For the purposes of the resolution, the waters of the Murray Basin were divided into what might be termed A, B, and C. A comprised all the waters of the Upper Murray above Howlong; B, all the waters of the Lower Murray between Howlong and the South Australian Border; C, all the tributaries below Howlong, whether in New South Wales or Victoria. It was resolved by the joint Commissions that, so far as A is concerned, the water should be divided, after allowing for compensation-water, between Victoria and New South Wales. So far as B is concerned, that, too, should be divided in equal proportions between Victoria and New South Wales. So far as C is concerned, that the tributaries should be the property of the State in which they were situated:—How did you arrive at those conclusions? I could not say exactly; but it was clear that in Victoria they had in many cases adopted that principle, and already intercepted the water of their tributaries to the Murray, and works were contemplated for doing even more. We therefore urged the Government to place us in the same position, so that we might draw upon the water of the Murray into New South Wales upon the same basis as they were doing in Victoria. It was considered that considerable works would have to be constructed on the Upper Murray in order to impound a large quantity of water, that the cost of such works should be divided equally between Victoria and New South Wales, and that the water should be equally divided between the two States.

Flood-waters above navigation level should be distributed.

6192. What principle guided you in deciding that the whole of the water should be appropriated by the States in which contributing streams were located? It was stated in evidence that a certain level must be maintained in the Murray for navigation purposes; therefore the compensation-water should be of sufficient volume to keep the river running to that height; beyond that level the flood-waters should be equally divided between the two States.

Requirements of settlers down river provided for.

6193. *Mr. Burchell.*] Was it intended to leave the settlers lower down the river without the water which they had previously enjoyed? I think it was shown that the compensation-water in conjunction with the contributions lower down the river would meet their requirements.

South Australian rights recognised.

6194. I understood that you divided the waters entirely between the two States, and left nothing for the settlers lower down the river? We recognised South Australia's rights in the matter, and the final report shows that we made every effort to extend the Conference for the benefit of South Australia; but Mr. Deakin was away at a conference in England at the time, and did not return early enough to allow of it.

Herbert Stuart Inglis Smail, B.E., Assistant Engineer, Water Supply and Sewerage Department, Sydney, sworn and examined:—

H. S. I. Smail, B.E. 16 Oct., 1902.

6195. *President.*] What is your name? Herbert Stuart Inglis Smail.
6196. You are a graduate in engineering of the Sydney University, and assistant engineer in Mr. Wade's branch of the Works Department? Yes.
6197. You have had some experience in river gauging, have you not? Yes; about two years continuously, and two or three years previously I was engaged in connection with the calculations on the same work in the office.
6198. Some five or six weeks ago you were instructed to make an examination of the Murray above Jingellic? Yes. I have a written statement of the actual results.
6199. Will you read it?

With reference to the quantity of water discharged into the river Murray above Jingellic by the two States of New South Wales and Victoria, also the extent and characteristic of watersheds of same, I beg to submit the result of my examination.

At the time of my observations the river was in a very low state, and the time at my disposal did not admit of extending the gaugings for greater heights.

During the whole of the investigation the river remained practically constant, the readings on the gauge at Jingellic only varying 1 inch from the commencement to the completion of the gaugings, and this only on the last day.

New South Wales and Victorian contributions.

The results of these gaugings show that the rivers and creeks in the State of New South Wales above Jingellic discharge 733 cusecs, whilst those from the State of Victoria discharge 193 cusecs when the gauge at Jingellic reads 1 foot 2 inches.

Thus Victoria supplies only 21 per cent. of the total quantity.

Jingellic and Horse Creeks disregarded.

This is neglecting the water discharged by Jingellic Creek and the Horse Creek in the State of New South Wales, as they discharge into the Murray a little below the gauge at Jingellic; the discharge from these creeks at time of observation was 5½ cusecs.

Seepage into river.

In addition to the amount of water supplied by the watercourses, a fair amount of seepage takes place from the lagoons and swampy flats on either side of the river, the water level in the lagoons being higher than the water level of the river.

The detailed results of gaugings will be found in the appended tables.

In Indi River.

It will be noticed that the amount of water discharged by the Indi River is equally divided between the two States. In apportioning a moiety of the discharge to each State, I have done so for the reason that, although the Victorian catchment of the Indi is nearly double that of the New South Wales catchment, yet, on the other hand, by far the greater area of snow land is within the State of New South Wales.

Swampy Plain and Tooma Rivers.

Time did not permit of my making discharge observations of the small creeks on both sides of the Indi.

It will be noticed from the tables that both the Swampy Plain and Tooma Rivers—two rivers wholly in New South Wales—have greater discharges than the Indi.

Catchment areas.

Total catchment of the Upper Murray, above Jingellic, 2,613 square miles.

Total New South Wales catchment, 1,430 square miles, including 360 square miles heavily snowed for several months in the year, and 170 square miles lightly snowed.

Total Victorian catchment, 1,183 square miles.

From information obtained from several sources, the only heavily snowed land on the Victorian catchment is on the Bowen mountains, and lightly snowed over the ranges comprising Mount Gibbo and Mount Pinnabar.

The

H. S. I. Smail, B.E. 16 Oct., 1902.

The following Table deals with creeks and rivers in their order, from Jingellic upwards :—

TABLE 1.

Name.	Discharge in cusecs.	Water-shed. sq. miles.	Geological Formation, &c.
Ournee Creek	·52	35	River flats, swampy black soil, and lagoons; mostly high ridges, granite and schistose formation; thickly timbered; fed by spring water and rain.
Spring Creek and small creeks now dry between Ournee Creek and Greg Greg River.	·35	40	River flats, about 9 square miles; swampy black soil, with lagoons; back country similar to above; fed by rain and springs.
Greg Greg or Tooma River.	298·67	750 150 heavy snow, 170 light snow.	Black soil; swampy flats, averaging half a mile in width from junction with Murray to Possum Point, then gradually narrowing till it becomes a gorge at Black Jack. *Tributaries:* Mannus Creek; draining at its head; some cleared farming land; spring and rain fed. Tumbarumba Creek, with its tributaries (Burra Creek and Paddy's River). These creeks flow through precipitous country; granite, basalt, and slate formation; thickly timbered with stringybark, mountain ash, white gum, and turpentine. These take their rise in the table-land of Nurenmerenmong, and are to some extent snow fed, but mostly by springs and rain. To the Tumbarumba Creek is due all the pollution of the Murray contributed by New South Wales. The Maragle and Maragle Back Creeks rise below the trigonometrical station of Nurenmerenmong, and are to a great extent snow fed as well as by springs. The Tooma, or Greg Greg, takes its rise in the heavily snow-clad ranges of Jagungal, Greymare's Bogong, Inkbottle, and Dargal, with numerous creeks flowing in from the slightly lesser snow-capped Black Jack. The whole of the country east of the Dargals is heavily snowed for several months in the year, and is extremely rugged and precipitous; granite, slate, and schist formation, thickly timbered with stunted eucalyptus, with mosses, &c. Yellow Bog Creek rises in the Big Dargal, and is fed principally by snow. Wolumba Creek, principally spring fed, and to a lesser degree by snow. Both these creeks pass through very rugged country; granite, slate, and schistose formation; heavily timbered.
Swampy Plain River..	328·82	320 130 heavy snow.	Takes its rise in the heavily snowed country of Greymare's Bogong, Jagungal, the Munyang, and Kosciusko. The country is greatly broken and precipitous. Small swampy flats open out in places, and about 6 miles above Khancoban are about a quarter of a mile wide, and gradually extend to junction with Indi. Khancoban and Swampy Plain Creeks take their rise—the former in the snow-clad Inkbottle, and the latter in the heavily snow-clad Dargal. A great many small creeks and springs fed by snow run into the Swampy plain on either side; granite, schist, limestone formation.
Indi	213·12	N.S.W. Catchment 180; Victoria, 340	Most of the New South Wales catchment is heavily snowed for some months in the year, and is extremely precipitous. The only heavily snowed lands in Victoria are at the eastern boundary on the Cobberas and Bowen Mountains, but this is only a small part; Mount Pinnibar and Mount Gibbo are lightly-snowed ranges; granite, slate, schist, limestone formation; heavily timbered.
Walwa and Sandy Creeks.	·53	83	No snow; rain, and spring feed; granite formation; densely timbered with messmate, blue gum, apple-tree, stringybark, red gum, and peppermint.
Cudgewa Creek	29·70	410	From junction with Murray to Wabba Creek, black soil, swampy flats, extend from a quarter to three quarters of a mile wide; above this, simply gorges, opening out in places into very narrow flats; *granite and slate formation*; heavily timbered with stringybark, woollybutt, kurrajong, peppermint, and blue gum. Spring and rain fed.
Jeremel, or Corryong.	55·73	350	Swampy, black-soil flats, half a mile to a mile in width, from junction with the Murray to Nariel, thence drawing in to rocky gorges; mostly spring fed; a little snow from Gibbo and Pinnibar; heavily timbered with blue gum, peppermint, and stringybark.

TABLE 2.

New South Wales.	cusecs.	Victoria.	cusecs.
Spring Flat Creek	0·32	Cudgewa	29·7
Spring Creek	0·35	Jeremel	55·73
Ournee Creek	0·52	Indi	106·56
Tooma	298·67	Walwa	0·25
Swampy Plain	326·82	Sandy	0·28
Indi	106·56	Tintaldra	0·39
Total	733·24	Total	192·91
Jingellic and Horse Creek	5·50		
	738·74		

Check-gauging of the Murray River, at Tintaldra :—Discharge, 947 cusecs.

Gaugings of stream above this site, viz. :—Indi, Swampy Plain, Tooma, Jeremel Creek, Spring Flat Creek, and Tintaldra Creek, 895·21 cusecs, or the check-gauging shows an increase of 5½ per cent. Part of this increase is, without doubt, due to seepage from the lagoons along the banks of the river, between the junction of the Swampy Plain with the Indi and the gauging site at Tintaldra, a distance of about 60 miles by river, as the water level in these lagoons was higher than that of the river.

Gauging at Tintaldra, with gaugings of streams below Tintaldra, viz. :—Cudgewa Creek, Walwa Creek, Sandy Creek, Ournee Creek, Spring Creek, Horse Creek, and Jingellic Creek = discharge, 984 cusecs. Discharge at Jingellic from Victoran gaugings for height on gauge of 1′ 2″ = 1,040 cusecs, or an increase of about 5½ per cent. This difference, also, may be partly accounted for by seepage from lagoons and swampy land on the river flats between Tintaldra and Jingellic, a distance of about 56 miles by river.

6200.

H. S. I. Smail, B.E. 16 Oct., 1902.

6200. How did you take those gaugings? I took them by Amsler-Laffon current-meter, except the small ones, which I took over a V-notch. Both surface and sub-surface velocities were taken.
6201. You had, I presume, an opportunity of observing the flood-levels;—do you think the relative measurements you took of the two sides would be affected to any great extent in times of flood? I do think so. I believe if the river rises at all at Jingellic most of the rise is due to New South Wales.
6202. What leads you to that conclusion? When leaving Jingellic there was a rise in the river of 3 feet; there had been no rise in the Indi, Corryong, or Cudgewa, therefore the rise must have been due to the Swampy Plain River and the Tooma in New South Wales.
6203. *Mr. Murray.*] Would you base, upon a rise of 3 feet, a conclusion as to the general cause of a rise in the Murray? No; but New South Wales has practically the whole of the heavily-snowed land which contributes to the flow of that river.
6204. What gaugings have you of the snow which falls? I saw the country in rather a lightly snowed year, so can only give an opinion based on information received from people living in the district.
6205. The conclusions given in your statement are arrived at from one set of gaugings? Yes.
6206. Do you think they are entitled to more credence than the gaugings carried on for, say, twenty years? I did not know that such gaugings had been taken.
6207. How do your gaugings compare with the Victorian gaugings? I have had no opportunity of testing them. I thought Jingellic was the highest point to which they went. These are all higher than that.
6208. *President.*] Where does the pollution of the Murray mostly come from? From the Tumbarumba Creek, so far as New South Wales is concerned; it is pollution from mineral soil. Pollution of Murray.
6209. What character of mining is carried on there? Sluicing.
6210. To any great extent? On the Burra Creek they sluice about an acre per month 30 feet deep, and on the Union Jack claim about half that amount.
6211. How far does that affect the water? Right down to Cumberoona.
6212. Has it affected the Tooma Flats? They are complaining of it, but I do not think much real damage is being done.
6213. Do you consider the pollution serious or not? So far as the flats are concerned, I do not think it is, but it may be as far as the water supply is concerned.
6214. *Mr. Murray.*] Do you mean for domestic purposes or as regards agriculture? For domestic purposes.
6215. *Mr. Burchell.*] Are many people depending upon the water for domestic purposes? There are a great number of settlers between where the Tumbarumba enters the Greg Greg and Cumberoona; I could not say how many.

Vincent Harold Turner, Assistant Engineer, Water Supply Department of New South Wales, of Sydney, sworn and examined :—

V. H. Turner. 16 Oct., 1902.

6216. *President.*] What is your name? Vincent Harold Turner.
6217. You are Assistant Engineer in the Water Supply Department? Yes.
6218. How long have you been engaged on water supply questions? More or less for nineteen years.
6219. How long have you been engaged on such matters in this Department? About six years.
6220. You were instructed to make an exploration of the Murray River from Echuca to the South Australian border, with a view to the designing of locks and weirs? Yes.
6221. You have prepared a report on the subject? Yes.
6222. Will you read it?

In accordance with instructions, I have made an examination of the Murray River, from Echuca to the South Australian border, with the object of arriving at an estimate of what works would be required to render the river navigable at all times of the year, and ascertaining the relation of such works to irrigation in various districts.

As the country met with along the course of the river varies considerably in character, it may be well here to give the general variations as affecting the question of weirs for navigation and irrigation. The country may be practically divided thus :— Character of country.

(1.) Red-soil country, varying from chocolate loam to red sand, and situate above high flood-level. In places this class of country extends, at an almost uniform level, for a long distance back from the river, as at Moama. In other parts it varies greatly in level, this being the case lower down the river. It does not form the banks of the river for any great distance continuously, but abuts on the river at points here and there, the margin of the red country between such points being some distance away from the river—several miles in many places—and the intervening country consisting of that classed as (2), (3), and (4).

(2.) Somewhat lower country, not subject to ordinary floods, and consisting mainly of clay and sand in various proportions.

(3.) Low-lying country, subject to floods in ordinarily good seasons, and known as "flooded country." This generally extends a considerable distance back from the river, and the highest land is usually at the banks.

(4.) In those parts where the banks are high, and the ordinary flood-level does not reach up to the general height of the country, the erosive action of the flood-waters confined within the banks has reduced, by several feet, the level of the land lying between the bends of the river, thus providing large additional get-away for flood-waters. In those portions of the river where this class of country exists, its limits may be practically defined by joining the extreme points of the outer curve of the river, as shown on diagram. River bends

The red-soil country (1) abuts on the river in places—mostly from Echuca to near Perricoota, and from near Swan Hill to Mount Hancock; and the height above summer level is at an average of, say, 40 feet at the former part, and varies up to 80 feet and over at the latter portion. Red soil, where met with, and height of banks.

The class of country (2) lies at an average of, say, 30 feet above summer level at the upper end of the river, and from 20 feet to 30 feet at the lower end; whilst the flooded country (3) generally ranges from 16 feet to 10 feet above summer level, the lowest banks being from about 360 miles (Turrumbarry) to about 530 miles.

The part of the country where the greatest difference in level between the river bends and the adjoining high land occurs is that where the banks are highest and the flood-waters confined entirely between them. In the portion of the river where the "flooded country" occurs, the outlet for flood-waters provided by the flooded country has, by diminishing the flow in the river channel, naturally tended to limit the amount of erosion at the river bends

The

V. H. Turner. 16 Oct., 1902.

Grades.

The fall in the river bed varies considerably in different portions as shown below.

Mileage from Albury.		Approximate fall in river bed.	
From—	To—	Grade.	Equivalent to about—
301 miles (Echuca)	400 miles	1 in 18,000	3½ in. per mile.
400 miles	550 miles	1 in 12,000	5¼ in. do
550 miles	963¾ miles South Australian border	1 in 17,000	3¼ in. do
Mean from Echuca to South Australian border		1 in 15,700	4 in. do

Lift and distance apart of blocks.

The abovementioned characteristics and figures are the main factors in determining the lift and distance apart of the locks, assuming suitable foundations can be obtained where required.

The lifts would vary from 5 feet to 15 feet, average 10 feet 6 inches, and the distances apart, from 15 miles to 52 miles, average 31 miles, as shown in detail in list appended.

In the present conditions of the river about 4 feet above summer level is considered a minimum for navigation purposes. It will not be necessary, however, to keep the level of the top end of the pool up to this height above summer level, as by cutting down a few bars sufficient depth of water for navigation purposes—say, a minimum of 8 feet—would be obtained, and the distance from lock to lock might thereby be increased, thus effecting an economy by reducing the number, besides allowing of the location of some of the locks at points specially favourable.

Width of river.

The river varies greatly in width, especially at the lower end, but type cross-sections might be taken as giving a width of about 250 feet at the upper end, and at the lower end about 350 feet on clay or rock beds, or about 400 feet on reefs.

Foundations.

In the upper portions of the river—from Echuca (301) to about 555 miles—there is, with the exception of the Murrumbidgee Reef at 312 miles, no rock available for the foundations for the locks and weirs, the bars being of clay varying much in hardness. In the lower part of the river, from 550 miles to about 900 miles, there are numerous reefs and bars varying from sandstone conglomerate to indurated sand. No borings have been put down, but surface indications point to the suitability of many of them as foundations.

Constructive materials.

No large quantity of hard sandstone suitable for concrete was actually met with in or near the reefs, but borings may prove the existence of such. As, however, the reefs for the most part have had a deep channel eroded through them, this may probably indicate that additional hardness will not be obtained below the surface, in which case the stone would be mostly unsuitable for concrete purposes.

Limestone may be obtained from parts of the high red country, but the cost of stripping and getting, added to cartage, would probably raise the cost of such stone to a higher figure than that of better stone brought by barge from a distance.

Good timber, especially red gum, is abundant on the river, and it may be found economical to use it, particularly on the upper part of the river.

Benefit of locks and weirs (1) for navigation;

In view of the railway facilities between Echuca and Mildura, which already exist or are authorised, and as these facilities will doubtless be increased in a few years time by branch lines of railway or tramways, the benefit to be derived from locking this part of the river is likely to diminish rather than increase, so far as purely local traffic requirements are concerned; but, if it should be decided to lock the Darling or Murrumbidgee, it would be necessary to lock a portion of the Murray in order to derive full advantage from such works.

(2) for irrigation and conservation.

The main benefit to be derived from locking the river is that which will accrue to works of water conservation and irrigation. In the former case (conservation), by affording facilities for charging certain lakes and natural reservoirs at times when the flow in the river would not, under present conditions, raise the water level to the height necessary to command these storages; and in the latter case (irrigation) by supplying water to certain creeks and irrigation channels, all the year round, at a level which can now only be relied on about five or six months in the year, even when the ordinary annual rise in the river occurs. As an example of the saving thereby effected the Mildura settlement may be cited. If lock No. 4 be constructed, the Psyche Bend pumping station could, by putting a slight additional lift on to the Billabong pumps, be entirely dispensed with, and a saving thereby effected which, in itself, would go a long way towards paying the annual cost of the lock concerned.

A large part of the "flooded country" would be commanded by the proposed works, and water could be supplied at all times by gravitation at comparatively small expense for channels.

Water conservation.

As already mentioned, there are several natural reservoirs at present fed by the river when in flood, and discharging their contents as the river falls. These can, for the most part, be made available for permanent storage purposes at small cost, by the construction of regulators and improvements in the channels feeding them. This holds good to some extent irrespective of locking, but to utilise them to full advantage, weirs will be essential, especially if the level of the river is lowered by diversion higher up its course.

Lake Victoria may be taken as a case in point. The lake is fed mainly through Rufus River, but partly by various other channels when the river is high. The level of the water naturally impounded by the bar is at R.L. 73·00, and by the highest flood-marks visible the lake has been filled to about R.L. 90·00, the storage between these levels being equal to about 17,000 millions of cubic feet. To fill the lake, however, to this level, it would be necessary, under present conditions, for the river to rise to over 20 feet above summer level, a height sometimes not reached for years, and to remain at such level for some time, or, if the river rose to only 12 feet above summer level and remained at such level the necessary time, the only storage which would be made available would be 8,000 millions of cubic feet.

A rise such as the latter in ordinarily good seasons is not exceptional, but in case of suggested diversions higher up the river being carried out, it is likely to be a rare occurrence in the future.

Comparing this with what could be secured if the river were locked at the off-take of Frenchman's Creek: By improvements in this creek, making the off-take at about R.L. 86·00, a channel would be obtained which, in conjunction with weir No. 2, would be capable of filling the lake to the 90-ft. contour in about four months with a quantity 1,600 cusecs flowing down the river, which would at present only raise the water level at the mouth of Rufus River to about summer level, or not sufficient to put any water in the lake. The lowest level at which it would be possible at present, without interfering with navigation, to take off water from the river by Frenchman's Creek is R.L. 82·50, or about 3 feet above summer level, and the channel would not be of any great utility until the river rose to several feet above this, and would then only be of use to supplement the supply put into the lake by the Rufus. Practically, therefore, no improvements in Frenchman's Creek would be of much use for filling the lake in the absence of weirs.

Land submerged.

It is hardly necessary to say that a certain amount of land must be submerged, but it will consist almost entirely of river bend land which is specially low, and its area will not probably exceed, say, 2,000 acres. None of the land described under the heads 1, 2, or 3 would be submerged, and the amount of protective works required to secure this end would not be excessive, as seen in the estimate.

Pumping still required.

Although it will in many cases be possible to dispense with pumping-stations now in use, by furnishing a gravitation supply, there is nevertheless much of the country which is considered most profitable under irrigation (red soil country) which it will be impracticable to supply by gravitation except by constructing costly channels, owing to the height of such land above the river, but even in these cases the lift will be decreased.

Location of locks and weirs.

There is considerable latitude in the choice of sites for locks and weirs, and along nearly the whole course of the river there are sites which on being tested by borings will probably be found equal to those here proposed, and the location may be to a large extent modified to suit any extensive irrigation works which detail surveys may show to be desirable. The cost, however, of such modified scheme may be taken as not differing materially from that proposed.

Information available.

The levels taken for the proposed works have been mostly based on the bench marks established in 1870 by the Harbours and River Department, but as these were not always available, interpolation had to be resorted to in places as the best approximation.

At some of the points indicated as lock sites no survey has been made, but there is in such cases a sufficient choice of sites within a moderate distance of the mileages indicated to render any modification of the levels unnecessary on that account.

Until

V. H. Turner. 16 Oct., 1902.

Revenue returns.

Until it is known what amount of water would, in view of proposed diversions higher up, be available for irrigation along the course of the river, and until a general scheme has been drafted out for the utilisation of the available water, it is impossible to estimate the return which a reasonable charge on such irrigation works would bring in, but as it seems unlikely that river traffic would much increase (on the Murray, at any rate), it is probable that the irrigation works would have to be mainly relied upon so far as financial results are concerned.

A general view of the matter seems to indicate, first, that the benefits of locking the river are mainly those to be derived from works of conservation and irrigation; second, that the diversion of large quantities of water higher up the river, without the simultaneous construction of weirs, would destroy the value of many natural storage basins and lead to a necessity for increased pumping; and, thirdly, that the construction of weirs would increase the amount of available storage, and in many irrigation schemes allow of pumping being dispensed with.

List of Proposed Locks and Weirs on Murray River.

No. of Lock.	Mileage from Albury.	Distances from Lock to Lock.	Height of water above Summer Level.		Lift.	Type Cross Sections.
			Upper Pool.	Lower Pool.		
	miles.		feet.	feet.	feet.	
20	348·50	19·23	17	7	10	
19	367·73	34·27	12	2	10	
18	402·00	21·00	11	0	11	
17	423·00	21·44	10	0	10	"A"
16	444·44	14·56	10	2	8	
15	459·00	20·12	8	0	8	
14	479·12	15·64	7	2	5	
13	494·76	17·34	9	3	6	
12	512·10	17·90	10	2	8	
11	530·00	20·12	11	3	8	"B"
10	550·12	18·22	13	2	11	
9	568·34	48·66	15	3	12	
8	617·00	47·61	17	2	15	
7	664·61	52·67	14	2	12	
6	717·28	47·72	16	2	14	
5	765·00	43·00	16	2	14	"C" & "D"
4	808·00	33·25	16	3	13	
3	841·25	43·75	15	3	12	
2	885·00	45·00	18	4	14	
1	930		12	2	14	
			13	2·1	10·8	

Mean distance apart, of locks ..... 31 miles
Minimum distance apart, of locks ..... 15 ,,
Maximum distance apart, of locks ..... 52 ,,

Estimate of Cost of Protective Works on Murray River.

Embankments	33 miles, at £150	£4,950
Regulators	25, at £400	10,000
Dams, with sluices on small creeks and billabongs	110, at £50	5,500
Total (*say*)		£20,000

Estimate of Cost of Works at Frenchman's Creek
(off-take at R.L. 86·00, bed width 40 feet).

Excavation	20,000 cubic yards, at 1s.	£1,000
Embankments	640 chains, at £2 10s.	1,600
Regulators	2, at £500	1,000
Dams	8, at £60	480
Snagging (*say*)		250
Supervision, &c. (*say*)		470
Total		£4,800

Lake Victoria.

R.L. of Contour.	Depth of Water.	Capacity in Cubic Feet.	Surface Area.	
			Acres.	Square Miles.
Below bar or draw-off level.				
70·00	0	0	0	0
70·50	½	3,800,000	869	1·33
71·00	1	124,200,000	12,429	19·50
73·00	3	1,456,100,000	18,339	28·50
Above bar or draw-off level.				
73	3	0	18,339	28·50
75	5	1,628,100,000	19,041	29·75
80	10	6,089,500,000	22,036	34·50
85	15	11,171,500,000	24,656	38·50
90	20	16,683,700,000	25,968	40·50
95	25	22,398,900,000	26,515	41·30
100	30	.....	.....	.....

Assuming evaporation at 60 inches per annum, the loss in that direction would be, from a full lake of 41½ square miles, 5,785,000,000 cubic feet per annum. This is a rate of 182 cubic feet per second.

6223. *Mr. Murray.*] You say that locking will promote conservation by aiding the diversion of water into storages? Yes.

6224. We have had it in evidence that the locking of the river would, while maintaining navigation, afford improved facilities for pumping and irrigation, apart from the question of storages;—do you think it would

V. H. Turner. 16 Oct., 1902.

would do so? Yes, providing water was coming down the river at all, owing to the level being raised; but, of course, if no water were coming down locks would be useless as far as irrigation is concerned.

6225. *Mr. Burchell.*] Have you ever seen the river when no water is coming down it? No.

6226. Do you think it likely to happen? Not unless very large diversions take place higher up.

6227. You have been engaged on the river for the past four months, when it was at about summer level? Yes.

6228. Have you noticed any difficulty in raising water by pumps with the river at that level? It is practically at the limit of suction for some of the pumps.

6229. Would not pumping be facilitated by the construction of weirs? Yes; and in certain cases would allow of the abolition of pumping schemes. They would allow of the Psyche Bend pump being done away with.

Leslie Augustus Burton Wade, Principal Engineer for Water Supply and Sewerage, of Sydney, further examined:—

L. A. B. Wade. 16 Oct., 1902.

6230. *President.*] You have prepared a statement on the question remitted to the Commission? Yes.

6231. Will you read it?

Section 100, Federal Constitution.

Section 100 of the Federal Constitution provides that "The Commonwealth shall not by any law or regulation of trade or commerce abridge the right of a State or the residents therein to the reasonable use of the waters of rivers for conservation or irrigation." The framers of the section apparently had in view the peculiar conditions of the country, and intended that we should be left free to frame laws and regulations suitable to our necessities; and while safeguarding the State and the individual from unreasonable action by the Commonwealth, at the same time freed us from the application of the riparian principles drawn from other countries. When we compare the conditions of the Murray basin climatically and physically with the basins of the rivers of the other hemisphere, from which the riparian principles are drawn that are sought to be applied to the Murray, it is at once apparent that the conditions are so dissimilar that the application of any principle giving natural navigation priority over irrigation must be a grave injustice to the States of New South Wales and Victoria.

Natural conditions of Murray basin.

The climatic conditions of the arid portion of the Murray basin included in New South Wales are indicated roughly in the map now exhibited, which shows the lines of mean and minimum rainfall. [*Exhibit* 127.] It will be seen that the rainfall decreases gradually as the rivers recede from their sources. The actual yearly amounts do not accurately represent the available water of the country for all purposes, for in the more northerly areas the rainfalls are the result of monsoonal depressions, and irregular, and do not fall at periods suitable for seri-culture.

Profitable occupation of arid country.

The profitable occupation of the more arid portion of this area in the vicinity of the rivers is possible only by the diversion of water from the river channels for stock watering, and for the purpose of its application to the soil. It may be said that the water flowing in the river channels is the life blood of those portions of the country. This has been demonstrated by the increased losses during the droughts recently experienced, and no arguments can be stronger than the evidence of the Commissioners' own eyes during their recent visits of inspection in this State. It is not sought to be shown that there is no such aridity in any of the river basins of the other hemisphere, but that the conditions, as a whole, are dissimilar when the physical features are considered in conjunction with the aridity.

Contributing portions of catchment.

The whole of the arid portion is flat in character, and does not contribute to the flow of the streams. The contributory portion of the catchment may be divided into two distinct areas, one the south-eastern portion of New South Wales and north-eastern portion of Victoria, which includes the highest mountain ranges in Australia, and consequently the heaviest and most regular rainfall in the basin, and the only snow-fed streams. From this source irrigation may be carried on with certainty. The other, and by far the larger, area, and which comprises the tributaries of the Darling, includes the north-eastern portion of New South Wales and southern portion of Queensland. The mountain ranges in this area are low, and have no regular snowfall; the rainfalls are the result of monsoonal depressions, which in these latitudes are irregular and unreliable, the results being at times great floods and at other times dry river channels. Irrigation can only be carried on from such streams by means of storages.

Necessity for storages.

This cannot be more clearly demonstrated than by a comparison of the yearly discharges of the Murray and Darling at their junction. It will be seen that while in the one case they are regular in quantity and occurrence, in the other they are the opposite. The only possible occupation under natural conditions in years of normal rainfall of the portion of the arid area to the west of the line of, approximately, 17 inches average rainfall is for pastoral purposes, and in very dry years this class of occupation fails more or less over the whole area, while towards the west at such times occupation is practically abandoned.

Permanent occupation dependent on water diversion.

The greatest good must accrue to the State, and to the Commonwealth as a whole, by the whole of the area being under occupation. To make any such occupation constant and profitable, the waters flowing in the rivers must be diverted and applied to the land. It has been given in evidence that the ordinary flows of the rivers will irrigate a fraction only of the areas that can be commanded from them. A fraction only will be sufficient for pastoral purposes if the work of irrigation be carried out, and ensilage and other fodder stacked as an insurance against dry seasons.

Losses by drought.

When the enormous losses of national wealth are contemplated as the result of recent droughts, running into millions of money, can there be any argument but that the policy of this State must be the application of the whole of the available waters of the rivers to the land?

Irrigation *versus* navigation.

Can it be contended that the navigation of these streams by natural means can be even placed on an equal footing with irrigation? What are the benefits to be derived from natural water carriage by the natural flood? Cheap freights only. Can the slight difference in freight between rail and natural water carriage, if accummulated over the years of good seasons, compensate for the losses by drought, or will it outweigh the return to the land-holder from the increased productiveness of the land resulting from the application of water to the soil? Or can the claims of the merchants of Adelaide be placed against the losses which amount to a national calamity, and can, without doubt, be ameliorated by the use of the Murray waters for irrigation?

Means of communication.

The question of communication, whether to be by rail or locks and weirs, is one that concerns the States only that abut on the river. Victoria has already tapped the Murray at nine points, and has practically thus met the requirements of the class of settlement along, and adjacent to, the river. As regards this State, the profitable occupation of the western country as regards communication can be carried out only by means of railways. The country can only be worked in large areas, and in conjunction with the less arid areas of the more easterly portion of the State, and profits be made by taking advantage of good seasons by moving stock either way in large numbers by rail. The Darling is now tapped at two points by rail, Bourke and Brewarrina, works are under construction for tapping at two additional points, Walgett and Collarendabri, approval has been given by Parliament to tap at another point, Wilcannia, and the Western Land Commissioners recommend the construction of further railways with the same view, as the only means of effectually dealing with these areas. Communication by means of navigation by the natural flow is uncertain and intermittent, and not conducive to the profitable occupation of the country, and either locking the river or railways must be resorted to. The rivers have served a very useful purpose in opening out and developing the country in the first instances, in carrying cheaply large stocks of material such as fencing wire and plant, when the country was in a virgin condition, and no other means of communication. It is not anticipated that the traffic on the Darling will ever again reach its original dimensions in this class of goods, but that the principal traffic will be in stock, to deal with which river communication is of no use. The total expenditure in snagging the rivers of the Murray Basin in this State is:—

Murray	£36,545
Murrumbidgee	£87,772
Darling	£124,297

South Australian action inconsistent.

No expenditure has taken place in the Murray for many years, as the wants are now mostly met by railways, last expenditure on the Murrumbidgee below Hay and the Darling below Brewarrina has only just been completed. The action of South Australia in respect to navigation and irrigation is inconsistent. On the one hand, a claim is put forward for navigation by means of the natural flow of the stream down a channel that is wider than the Suez Canal, and which requires a flow of 340,000 cubic feet per minute to maintain navigation. This flow is sufficient for the irrigation of 1,000,000 acres under intense cultivation, the direct profits from which should equal not less than £10,000,000 per annum, or 50 per cent. more than would pay interest on the whole of the national debt of Australia. On the other hand, extensive rights to irrigate have been parted with to the Renmark Irrigation Colony Settlement without any reference to the other States

interested. At the same time, while claiming the priority of navigation over irrigation as vital to her interests, South Australia has constructed a railway to tap the Murray at Morgan, and by means of differential freight rates diverted the traffic from its natural channel down the river. It appears from this that the Murray in South Australia has served the same purpose as the rivers in New South Wales and Victoria, that is, opened up the country in its virgin state, but that the time has now arrived when railways will best serve future requirements. From the mouth of the Murray to Blanchetown, where the river is always navigable, facilities exist for the irrigation of rich alluvial flats on each side of the river. In this length a population can be carried that will be immensely benefited by a navigable river. The claim for sufficient water to keep up navigation in the breadth of river when there is no fall would be an equitable one were means taken to reduce the outflow into the ocean at Lake Alexandrina, the amount of water required being sufficient only to neutralise evaporation. The estimated cost of locking the various rivers of the Murray Basin is as follows:—

L. A. B. Wade. 16 Oct., 1902.

Murrumbidgee, from Hay to its junction with the Murray	£321,750
Darling, from Walgett to Wentworth	920,000
Murray, from Echuca to the South Australian border	730,800

Canalisation not practicable.

The three rivers dealt with vary in character, the Darling being deep and narrow, and the Murray shallow and wide, for the volumes carried. The depth of channel and consequent width of bank appears to be guided by the levels of the bars of hard and soft rock or indurated clay and sand. It has been suggested that the Murray above Wentworth might be canalized by cutting through the bars and confining the flow to a narrow and deep channel. Experience shows that these bars have a scouring effect in the river bed, and that deep holes nearly always exist immediately above them. Unless these bars be cut down to the level of the bed of the deep holes the slope of the river would still be a succession of steps, also the sand-drifts extending to a considerable depth, and it is probable that when the bars are cut the scouring would still continue. Altogether, I do not consider the suggestion a practical one.

Railways preferable to locking.

It will be seen that the cost of locking is little less than the construction of a light railway to serve the same purpose, and if interest on the expenditure is to be met from the traffic and convenience and rapidity of transit, considered with the other points already dealt with, so far as the interest of this State as a whole are concerned, the construction of railways is preferable to locking.

Priority of claim of irrigation over navigation.

The intention of this State is, therefore, that the priority of the claims of irrigation over navigation are essential for the occupation of the whole of the arid portion of the Murray Basin, over which water can be diverted from the rivers; that the use of the waters for natural navigation is a criminal and wanton waste of one of the most valuable assets of the State; that the construction of locks and weirs within its own borders should be left to the State that will be benefited.

Proposed basis of allotment of water.

If it be conceded that the conditions of the Murray Basin are such that the greatest good will accrue to the States as a whole, from the utmost use being made of the water in the river channels, and that irrigation is paramount over navigation by means of natural flow, then the most equitable allotment of the available waters must be determined. Looking at the conditions of each of the separate systems within the Murray Basin, the most practical basis of allotment that can be most easily worked, and will lead to the least complications, appears to be by setting apart certain lateral streams for the use of the States through which they pass, and reserving certain streams for the sole use of the Murray channel itself. Looking at the Murray River as if no territorial boundaries existed, each mile of river frontages would have equal rights to the flow of the stream, so that on that basis the division of the waters reserved for the Murray River is a simple matter. Taking the relative lengths of the river in South Australia and the other States, New South Wales, Victoria, and South Australia could be each entitled to a third portion, which should be delivered exclusive of losses by evaporation, &c., at the proposed points of diversion. I would suggest that the whole of the flow of the Murray above Albury, the whole of the flow of the Mitta, Kiewa, and Ovens be reserved for the supply of the Murray channel, and that each State have the sole use of the lateral streams other than those mentioned within its boundaries. As the amount of water allotted should be delivered exclusive of evaporation it is important that the various points of diversion should be definitely fixed.

Bungowannah diversion.

A proposal was put forward some years ago by this Department for the diversion of a supply from the Murray at Bungowannah, below Albury. Such a canal, with the amount of water proposed to be diverted, would only deal with the least arid portion of the areas that can be commanded from the Murray in New South Wales.

Tocumwal diversion.

It is now considered that the area in most urgent need of water is that at the lower end of the Murray, and a canal to deal with it is now proposed to take off from Tocumwal and follow generally the direction shown on Exhibit 128.

Original schemes recast.

It is also considered that more good will accrue from the application of the waters of the Murrumbidgee to the most arid areas that can be commanded, and with that view the original schemes have been recast, and the points of diversion altered from Narrandera to Pevensey slightly below Hay. It is still proposed to divert the same quantity of water from the Murray, namely, 1,300 cubic feet per second, and the whole of the available supply from the Murrumbidgee will be utilised mostly below Pevensey, and if sufficient is available a small quantity probably between there and Narrandera.

Irrigation on the Darling.

Of the Darling system, the whole of the available water in dry years may be utilised for irrigation purposes; the information at present at the disposal of this department shows that there are facilities for its utilisation. In the first instance, irrigation from the natural flow of the rivers alone will take place, but subsequently a demand will have to be met for perennial irrigation. The States, then, will each bear the whole cost of any storages constructed on the lateral streams; but any storages constructed in connection with the Murray Channel should be at the equal cost of the three States. Although sufficient information is not at present available as to the storage capacities of the various lakes along the course of the Murray, I have no doubt that if the fullest use be made of them, and an artificial storage provided above Albury, the whole flow of that portion of the Murray set apart for New South Wales could be made available for their joint use for perennial irrigation.

Very little low-lying land flooded by weir.

6232. Do the estimates you have given for locking the rivers include the cost of protective banks, and regulating gates for the various creeks and ana-branches? Yes. On the Darling the banks are so high that practically there will be no flooding of low-lying land; on the Lower Murrumbidgee the river bank is the highest part of the country adjacent to the river, and no flooding will take place there; in connection with the Murray instructions were given to fix the heights of the weirs so that there would be as little flooding of low-lying land as possible; this has been done, and it is estimated that the total flooding on the Murray will not amount to more than 2,000 acres.

6233. You have prepared details of the estimated cost of locking the Darling between Wentworth and Walgett, and the quantities of water that will be required for purposes of navigation, giving (*a*) The quantity allowed for navigation; (*b*) the quantity that will be required to compensate for loss due to opening of locks? Yes.

PROPOSED LOCKING OF RIVER DARLING FROM WALGETT TO WENTWORTH.

The quantity of water required to compensate for loss due to opening lock 200 feet x 37 feet, with average lift of 7 feet 9 inches, would be as under:—

	cubic feet.		cubic feet.
For 100 lockings (200 feet x 37 feet).....	5,735,000	For 350 lockings (200 feet x 37 feet).....	20,072,500
„ 150 „ „	8,602,500	„ 400 „ „	22,940,000
„ 200 „ „	11,470,000	„ 450 „ „	25,807,500
„ 250 „ „	14,337,500	„ 500 „ „	28,675,000
„ 300 „ „	17,205,000		

Assuming that 500 lockings took place during the year, the loss of water through a lock with average lift would be about 1 cubic foot per second.

Taking width of river at top-water level in pools, from pool at Walgett to lock No. 17 at Menindie, at 200 feet, and from lock No. 17 to Wentworth at 160 feet, the surface area of water would be 1,205,740,000 square feet, 27,680 acres, or 43 square miles. Then, if we allow for evaporation at 60 inches per annum, the loss of water would be, throughout the entire length of lockage, at the rate of 191 cubic feet per second. The pool created above Walgett would act as a storage, to be drawn upon for locking purposes when required, and would have a capacity above dead water of about 162,960,000 cubic feet.

After making allowances of 60 inches per annum for evaporation on this pool, the quantity of water remaining would be equal to 700 lockings of 10-feet lift, or a supply at the rate of 1·5 cubic feet per second for the year. These calculations are made under the assumption that no fresh supply flows down the river during the year.

It

L. A. B. Wade. 16 Oct., 1902.

It may be pointed out that the pool formed above Brewarrina Rocks would prove a fine storage for locking purposes below.

This pool would have a capacity above dead water-line of about 528,000,000 cubic feet, equal to over 7,000 lockings of 10-feet lift, or about 3,500 lockings after the usual allowance for evaporation. This is assuming that no fresh supply enters the pool during the year.

Following is a table showing quantity of water which would be required to compensate for loss due to opening a lock with lift of, say, 10 feet, if alternative proposal to increase the size of locks to 230 feet long by 42 feet wide be entertained :—

No. of Locking, 230 ft. x 42 ft.	Quantity of Water passed down in cub. ft.	No. of Lockings, 230 ft. x 42 ft.	Quantity of Water passed down in cub. ft.
100	9,660,000	350	33,810,000
150	14,490,000	400	38,640,000
200	19,320,000	450	43,470,000
250	24,150,000	500	48,300,000
300	28,980,000		

The loss for 500 lockings would be at the rate of 1½ cubic feet per second.

TABLE showing Lifts from Bourke upwards to Walgett :—

Name of Site.	No. of Lock.	Lift in feet.	Name of Site.	No. of Lock.	Lift in feet.
Bourke Lock	0	6¾	Brewarrina	6	10
Stoney Point	1	8	Collewarry Rocks	7	10
Vincent Rocks	2	6	Towrar	8	10
Beemery	3	7	Milrea	9	10
Walchara	4	7	Youendah	10	10
Below Brewarrina	5	7	Dangar Bridge	11	10

Average lift, 8½ feet.

TABLE showing Lifts from Bourke downwards to Wentworth.

Name of Site.	No. of Lock.	Lift in feet.	Name of Site.	No. of Lock.	Lift in feet.
Yanda	1	9	Henley	16	6
Gundabooka	2	7	Menindie	17	6
Singleton's Crossing	3	7	Bathinga	18	6
Louth	4	7	Netley	19	7
Dunlop	5	7	Ana Branch	20	7
Curranyalpa Rocks	6	10	Coorna point	21	7
Tilpa Rocks	7	10	Wolverton	22	7
Ryan's Island Reef	8	9	Pooncarie	23	7
Talyawalka Creek	9	9	Tarcoola Rocks	24	7
Kennedy Reef	10	8	Johnstone Rocks	25	5
Murtee	11	9	Burtundy Rocks	26	7
Eight-mile Rocks	12	9	Ellerslie	27	7
Culpaulin Rocks	13	8	Avoca	28	6
Mulyenery	14	8	Murray Junction	29	6
Christmas Rocks	15	8			

Average lift, 7½ feet.

TABLE showing Distances between Locks from Bourke upwards to Walgett.

Locks.	Distance in miles.	Locks.	Distance in miles.
Bourke Lock to Lock No. 1	25¼	No. 6 to No. 7	49¾
No. 1 to No. 2	9¼	No. 7 to No. 8	33
No. 2 to No. 3	37¼	No. 8 to No. 9	23
No. 3 to No. 4	25¼	No. 9 to No. 10	32
No. 4 to No. 5	26½	No. 10 to No. 11	29
No. 5 to No. 6	9		

Length of pool above Walgett	24	miles (about).
Bourke Lock to Lock No. 11 at Walgett	300¼	,, ,,
Average distance between locks	27¼	,, ,,

TABLE showing Distances between Locks, from Bourke Lock downwards to Wentworth.

Locks.	Distance in miles.	Locks.	Distance in miles.
Bourke Lock to Lock No. 1	38½	No. 15 to No. 16	33½
No. 1 to No. 2	32¼	,, 16 ,, 17	58¾
,, 2 ,, 3	26½	,, 17 ,, 18	14
,, 3 ,, 4	17½	,, 18 ,, 19	26
,, 4 ,, 5	18	,, 19 ,, 20	26
,, 5 ,, 6	54	,, 20 ,, 21	32
,, 6 ,, 7	24¾	,, 21 ,, 22	33
,, 7 ,, 8	41¼	,, 22 ,, 23	37
,, 8 ,, 9	51½	,, 23 ,, 24	22
,, 9 ,, 10	21½	,, 24 ,, 25	16
,, 10 ,, 11	32	,, 25 ,, 26	20
,, 11 ,, 12	35¼	,, 26 ,, 27	33
,, 12 ,, 13	25¼	,, 27 ,, 28	10
,, 13 ,, 14	33	,, 28 ,, 29	41
,, 14 ,, 15	25½		

Bourke Lock to Lock No. 29, at Wentworth	880	miles (about).
Average distance between locks	30¼	,, ,,

L. A. B. Wade. 16 Oct., 1902.

Approximate Cost.

40 locks (200 feet x 37 feet) and weirs, at £30,000	£1,200,000
40 lock-keepers' cottages, at £300	12,000
1,180 miles telephone, at £20	23,600
Allow for wharves, cranes, &c.	25,000
Allow for dredging	10,000
Allow for embankments and controlling gates on creeks and ana-branches	20,000
	£1,290,600
Contingencies and supervision, 10 per cent., say	129,400
	£1,420,000

If Bourke lock and weir be included, and cost put down at, say, £28,000, the total approximate cost for locking the river from Walgett to Wentworth would be £1,437,000. The average cost per mile of waterway would, therefore, be about £1,180.

The distance from Walgett to Wentworth, along line of travelling stock route, would be about 600 miles. The average cost per mile, taking this distance, would be £2,367.

If the greater dimensions, 230 feet x 42 feet, were adopted for the locks, the increased cost of each would probably not amount to more than £1,000.

LOCKING RIVER DARLING—BREWARRINA TO WENTWORTH.

TABLE showing particulars of project.

	Length of river proposed to be locked, in miles.	Number of locks, including Bourke lock.	Average length between locks, in miles.	Dimensions of locks in feet.	Lift, in feet. Minimum.	Maximum.	Average.	Total rise and fall, in feet.	Minimum navigation depth in pools, in feet.	Approximate quantity of water impounded, taking average depth at 11 feet. In cub. ft.	In gallons.
Bourke to Walgett Rocks,	*324	12	27	200 x 37	6	10	8½	95	6½	†3,763,584,000	23,522,400,000
Bourke to Wentworth	880¾	29	30¼	200 x 37	5	10	7½	217	6½	‡9,500,000,000	59,375,000,000
Walgett to Wentworth	1,204¾	41	29	200 x 37	5	10	7¾	312	6½	13,263,584,000	82,897,400,000

* To end of uppermost pool. † Average width of river from Bourke to Collewarry Rocks, 200 feet. ‡ Average width of river from Bourke to Menindie, 200 feet; average width of river from Menindie to Wentworth, 100 feet.

The estimate just given is on the lines laid down by Mr. Darley for fixed weirs, as laid before the Public Works Committee when inquiring into the scheme for locks between Bourke and Menindie. This scheme has been recast, and by the use of movable weirs the number of locks have been reduced from forty to twenty-four with a reduction in cost of £500,000, making a total for the whole scheme of £920,000.

PROPOSED LOCKING RIVER DARLING FROM WENTWORTH TO WALGETT.

Alternative Scheme with Movable Weirs.

IN the alternative scheme for locking the river Darling from Wentworth to Walgett, providing for movable weirs, there would be seven locks between Bourke and Walgett and seventeen between Bourke and Wentworth, in lieu of eleven and twenty-nine respectively provided for in scheme with fixed weirs.

The lifts would vary in height from 6¾ feet to 16 feet, including lift at Bourke lock.

Following are tables giving names of proposed sites, numbers of locks and lifts from Bourke to Walgett, and from Bourke to Wentworth :—

Bourke to Walgett.

Name of Site.	No. of Lock.	Lift, in feet.	Name of Site.	No. of Lock.	Lift, in feet.
Bourke Lock	0	6¾	Collewarry	4	14
Stony Point	1	15	Boorooma	5	15
Beemery	2	15	Youendah	6	15
Brewarrina (below)	3	16	Walgett	7	15

Average lift, 14 feet.

Bourke to Wentworth.

Name of Site.	No. of Lock.	Lift, in feet.	Name of Site.	No. of Lock.	Lift, in feet.
Bourke Lock	0		Mulyenery	9	16
Redbank	1	11	Henley	10	14
Singleton's Crossing	2	10	Bathinga	11	12
Dunlop	3	13	Ana-branch (below)	12	14
Curranyalpa	4	15	Wolverton	13	14
Ryan's Island Reef	5	14	Tarcoola Rocks	14	14
Tallyawalka Creek (below)	6	9	Burtundy Rocks	15	12
Mount Murcheson	7	13	Avoca	16	10
Eight-mile Rocks	8	16	Wentworth	17	9

Average lift, 12 feet 8 inches.

The

L. A. B. Wade. 16 Oct., 1902.

The following tables show the distances between locks from Bourke to Walgett, and Bourke to Wentworth :—

Bourke to Walgett.

Locks.	Distance.		Locks.	Distance.	
	miles	chains.		miles	chains.
Bourke Lock to lock No. 1	25	50	No. 5 to No. 6	44	00
No. 1 to No. 2	44	30	No. 6 to No. 7	36	20
No. 2 to No. 3	53	40	Total	306	20
No. 3 to No. 4	58	65			
No. 4 to No. 5	43	55			

Bourke to Wentworth.

Locks.	Distance.		Locks.	Distance.	
	miles	chains.		miles	chains.
Bourke Lock to lock No. 1	52	40	No. 10 to No. 11	72	60
No. 1 to No. 2	44	70	No. 11 to No. 12	52	00
No. 2 to No. 3	33	60	No. 12 to No. 13	65	00
No. 3 to No. 4	57	50	No. 13 to No. 14	59	40
No. 4 to No. 5	64	20	No. 14 to No. 15	36	00
No. 5 to No. 6	51	35	No. 15 to No. 16	43	20
No. 6 to No. 7	29	45	No. 16 to No. 17	41	30
No. 7 to No. 8	59	27			
No. 8 to No. 9	58	23	Total	880	60
No. 9 to No. 10	59	20			

Bourke Lock to lock No. 7 at Walgett	306¼ miles.
Bourke Lock to lock No. 17 at Wentworth	880¾ ,,
Walgett to Wentworth	1,187 miles.
Average distance between locks	47½ miles.

The pool above uppermost lock at Walgett would extend for a distance of about 30 miles up the Darling and 30 miles up the Namoi River.

The quantity of water which would be impounded throughout the entire length of lockage would be 14,156,200,000 cubic feet approximately.

The quantity of water required to compensate for loss due to opening lock, 200 feet x 37 feet, with an average lift of 13 feet 1 inch, would be as under :—

	cubic feet.		cubic feet.
For 100 lockings per annum	9,694,000	For 350 lockings per annum	33,929,000
150 ,,	14,541,000	400 ,,	38,776,000
200 ,,	19,388,000	450 ,,	43,623,000
250 ,,	24,235,000	500 ,,	48,470,000
300 ,,	29,082,000		

The loss for 500 lockings would be at the rate of 1½ cubic feet per second.

The capacity of uppermost pool at Walgett above dead-water line would be about 501,600,000 cubic feet, equal to 5,174 lockings of 13 feet 1 inch lift, or 2,451 lockings, after allowing 60 inches for evaporation during a year, and assuming that no fresh supply enters the pool.

For practical purposes the surface area of water impounded may be taken as already given in the scheme for fixed weirs :—1,205,740,000 square feet, or 43 square miles. Evaporation over this surface per annum at 60 inches would be equal to 191 cubic feet per second.

(1.) The quantity of water required for loss due to evaporation per annum may, therefore, be put down at	191 cubic feet per second
(2.) And for 500 lockings of 13 feet 1 inch lift	1½ ,, ,,
Total	192½ cubic feet per second

Assuming that no fresh supply should pass down the river, the following table shows quantity of water which would be required to compensate for loss due to opening a lock with average lift of 13 feet 1 inch, if size of locks be increased from 200 feet x 37 feet to 230 feet x 42 feet :—

No. of Lockings.	Quantity of water passed down, in cubic feet.	No. of Lockings.	Quantity of water passed down, in cubic feet.
100	12,654,600	350	44,291,100
150	18,981,900	400	50,618,400
200	25,309,200	450	56,945,700
250	31,636,500	500	63,273,000
300	37,963,800		

Five hundred lockings per annum as above would be at the rate of 2 cubic feet per second.

The total quantity of water which would be impounded throughout the entire length of lockage would be 15,674,620,000.

6234. You have also prepared the same information with regard to the Murrumbidgee between its mouth and Hay? Yes.

PROPOSED LOCKING OF THE MURRUMBIDGEE RIVER FROM ITS JUNCTION WITH THE MURRAY RIVER UPWARDS TO HAY.

The scheme for locking the Murrumbidgee River from its junction with the Murray River upwards to Hay provides for nine (9) locks, each 200 feet long by 37 feet wide, with lifts varying from 7 feet to 17 feet 6 inches, the average lift being 11 feet 3 inches.

The length of the Murrumbidgee River from its junction upward to lock site No. 9 is 215 miles, so that the average distance between the locks would be, say, 26½ miles.

Following

L. A. B. Wade. 16 Oct., 1902.

Following is a table showing the distances between the locks :—

No. 1 to No. 2	33 miles.	No. 7 to No. 8	26 miles.
No. 2 to No. 3	18 ,,	No. 8 to No. 9	22 ,,
No. 3 to No. 4	32 ,,	And from lock No. 9 to Hay	25 ,,
No. 4 to No. 5	33½ ,,		
No. 5 to No. 6	28½ ,,	Lock No. 1 to Hay	240 miles.
No. 6 to No. 7	22 ,,		

Taking an average width of river at top-water level in pools between the locks at 160 feet, the surface area of water impounded to Hay would be 4,650 acres, or, say, 7 square miles. The capacity of an average length of pool, say, that between locks 7 and 8, would be, roughly, 320,000,000 cubic feet, adopting cross section of river at Maude as a type, but the capacity above dead-water line would be about 258,500,000 cubic feet.

The quantity of water required to compensate for loss due to opening lock with average lift (11 feet 3 inches) would be as follows :—

For 100 lockings	8,320,000 cubic feet.	For 350 lockings	29,120,000 cubic feet.
,, 150 ,,	12,480,000 ,,	,, 400 ,,	33,280,000 ,,
,, 200 ,,	16,640,000 ,,	,, 450 ,,	37,440,000 ,,
,, 250 ,,	20,800,000 ,,	,, 500 ,,	41,600,000 ,,
,, 300 ,,	24,960,000 ,,		

The following table shows by what depth pool between locks Nos. 7 and 8, which would have an average length, would be reduced by lockings, assuming that no fresh supply enters the pool :—

Reduction in Water Level.	Number of Lockings.	Reduction in Water Level.	Number of Lockings.
1 inch	20	12 inches	241
3 inches	60	18 ,,	361
6 ,,	120	24 ,,	482
9 ,,	181		

If evaporation is taken at 60 inches per annum, and surface area of water impounded at 202,752,000 square feet (240 miles and 160 feet), the amount of water which would be lost in that way, throughout the whole length of lockage, would be 1,013,760,000 cubic feet per annum, equal to 32 cubic feet per second, or for average pool (7-8) about 3¾ cubic feet per second.

If, say, 500 lockings occurred in one year, the quantity of water required to compensate for loss in that direction would be about 1½ cubic feet per second. The total loss, therefore, through evaporation and locking 500 times would be 5 cubic feet per second per annum.

The quantity of water required during a year to compensate for loss due to opening lock No. 9—the uppermost one—which has also the greatest lift (17 feet 6 inches) would be as follows :—

For 100 lockings	12,950,000 cubic feet.	For 350 lockings	45,325,000 cubic feet.
,, 150 ,,	19,425,000 ,,	,, 400 ,,	51,800,000 ,,
,, 200 ,,	25,900,000 ,,	,, 450 ,,	58,275,000 ,,
,, 250 ,,	32,375,000 ,,	,, 500 ,,	64,750,000 ,, per annum,
,, 300 ,,	38,850,000 ,,		

or 2¼ cubic feet per second.

The length of this pool would be about 24 miles, and the loss due to evaporation over its surface would be 3 cubic feet per second.

TABLE showing number of lockings 200 feet x 37 feet x 17 feet 6 inches, necessary to reduce level of uppermost pool, not allowing for evaporation.

No. of Lockings.	Reduction in Surface Level, in inches.	No. of Lockings.	Reduction in Surface Level, in inches.
14	1	204	15
41	3	245	18
82	6	286	21
122	9	326	24
163	12		

The following shows the quantity of water which would be required during the year to compensate for loss due to opening a lock with a lift of 17 feet 6 inches, should alternative design for increase of dimensions of locks to 230 feet by 42 feet be adopted :—

No. of Lockings, 230 feet x 42 feet.	Quantity of water passed down, in cubic feet.	No. of Lockings, 230 feet x 42 feet.	Quantity of water passed down, in cubic feet.
100	16,905,000	350	59,167,500
150	25,357,500	400	67,620,000
200	33,810,000	450	76,072,500
250	42,262,500	500	84,525,000
300	50,715,000		

The loss for 500 lockings would be at the rate of 2¾ cubic feet per second.

It is believed that the discharge of the Murrumbidgee at Hay has not been known to fall below about 150 cubic feet per second.

LOCKING MURRUMBIDGEE RIVER JUNCTION, UPWARDS, TO HAY.

APPROXIMATE Estimate of Cost.

9 locks (200 x 37), at £30,000	£270,000
9 lock-keepers' cottages, at £300	2,700
240 miles of telephone, at £20	4,800
Wharves, cranes, &c., say	5,000
Allow for regulating creeks and ana-branches	10,000
	£292,500
Contingencies, supervision, &c., 10 per cent.	29,250
	£321,750

Cost per mile of waterway, £1,340.

L. A. B. Wade. 16 Oct., 1902.

LOCKING MURRUMBIDGEE RIVER, UP TO HAY.

TABLE, showing particulars of scheme.

Length of River proposed to be locked, in miles.	Number of Locks.	Average length between Locks, in miles.	Dimension of Locks, in feet.	Lift, in feet.			Total rise and fall, in feet.	Minimum navigation depth in pools, in feet.	Approximate quantity of water impounded, taking average depth at 17 feet.	
				Minimum.	Maximum.	Average.			In cubic feet.	In gallons.
215	9	26½	200 x 37	7	ft. in. 17 6	ft. in. 11 3	101·5	6½	3,443,000,000	21,519,000,000

6235. Also an estimate for the locking of the Murray from the South Australian border to Echuca, giving the same details? Yes.

PROPOSED LOCKING OF THE MURRAY RIVER FROM THE SOUTH AUSTRALIAN BORDER UPWARD TO MOAMA, ECHUCA.

In the scheme for locking the Murray from the South Australian border upward to Moama, to work in with the South Australian proposal, twenty locks are provided, each 200 feet long by 37 feet wide, with lifts varying from 5 feet to 15 feet.

The length of the river from the border to Moama is 665¾ miles, but the uppermost pool would extend about 12 miles above Moama. Following are the distances between the locks, as designed :—

No. 1 to No. 2	45·00 miles.	No. 11 to No. 12	17·90 miles.
No. 2 to No. 3	43·75 ,,	No. 12 to No. 13	17·34 ,,
No. 3 to No. 4	33·25 ,,	No. 13 to No. 14	15·64 ,,
No. 4 to No. 5	43·00 ,,	No. 14 to No. 15	20·12 ,,
No. 5 to No. 6	47·72 ,,	No. 15 to No. 16	14·56 ,,
No. 6 to No. 7	52·67 ,,	No. 16 to No. 17	21·44 ,,
No. 7 to No. 8	47·61 ,,	No. 17 to No. 18	21·00 ,,
No. 8 to No. 9	48·66 ,,	No. 18 to No. 19	34·27 ,,
No. 9 to No. 10	18·22 ,,	No. 19 to No. 20	19·23 ,,
No. 10 to No. 11	20·12 ,,		

The average length of pool would be 31 miles.

The average width of river from the South Australian border at A [*see diagram*] to B may be taken at 370 feet; from B to C, at 300 feet; and from C to Moama, about 250 feet. The surface area of water impounded would then be 26,222 acres, or 41 square miles, and the quantity of water impounded throughout to top-water level in pools about 16,278,000,000 cubic feet.

The capacity of an average length of pool would be, approximately, 597,000,000 cubic feet, but the capacity above dead-water line would be about 413,400,000 cubic feet.

The capacity of the uppermost pool above dead-water line would be, roughly, 818,000,000 cubic feet. This pool would be drawn upon for lockage purposes if at any time necessary. The lifts would be as under :—

At No. 1 lock	14 feet.	At No. 11 lock	8 feet.
,, 2 ,,	14 ,,	,, 12 ,,	8 ,,
,, 3 ,,	12 ,,	,, 13 ,,	6 ,,
,, 4 ,,	13 ,,	,, 14 ,,	5 ,,
,, 5 ,,	14 ,,	,, 15 ,,	8 ,,
,, 6 ,,	14 ,,	,, 16 ,,	8 ,,
,, 7 ,,	12 ,,	,, 17 ,,	10 ,,
,, 8 ,,	15 ,,	,, 18 ,,	11 ,,
,, 9 ,,	12 ,,	,, 19 ,,	10 ,,
,, 10 ,,	11 ,,	,, 20 ,,	10 ,,

Average, 10 feet 9 inches.

The quantity of water required to compensate for loss due to opening lock 200 feet x 37 feet x 10 feet 9 inches (average lift), would be as under :—

100 lockings	7,955,000 cubic feet.	350 lockings	27,842,500 cubic feet.
150 ,,	11,932,500 ,,	400 ,,	31,820,000 ,,
200 ,,	15,910,000 ,,	450 ,,	35,797,500 ,,
250 ,,	19,887,500 ,,	500 ,,	39,775,000 ,,
300 ,,	23,865,000 ,,		

The quantity of water required to compensate for loss due to opening uppermost lock, with lift of 10 feet, would be :—

For 100 lockings	7,400,000 cubic feet.	For 350 lockings	25,900,000 cubic feet.
,, 150 ,,	11,100,000 ,,	,, 400 ,,	29,600,000 ,,
,, 200 ,,	14,800,000 ,,	,, 450 ,,	33,300,000 ,,
,, 250 ,,	18,500,000 ,,	,, 500 ,,	37,000,000 ,,
,, 300 ,,	22,200,000 ,,		

TABLE showing depth by which uppermost pool would be reduced by lockings :—

Reduction in Water Level.	No. of Lockings.	Reduction in Water Level.	No. of Lockings.
1 inch	92	12 inches	1,106
3 inches	276	18 ,,	1,659
6 ,,	553	24 ,,	2,212
9 ,,	829		

If evaporation be assumed at, say, 60 inches per annum, the quantity of water lost in that way for the whole length of lockage would be 5,711,000,000 cubic feet per annum, or at the rate of 181 cubic feet per second.

Assuming 500 lockings per annum through lock No. 20, the quantity of water required to compensate for loss in that direction would be at the rate of 1¼ cubic feet per second, so that total loss would be 182¼ cubic feet per second.

The uppermost pool above lock No. 20 would have a capacity of 818,000,000 cubic feet above dead-water line, equal to about 5,530 lockings, after making allowance for evaporation, and assuming that no fresh supply enters the pool during the year.

Following

L. A. B. Wade. 16 Oct., 1902.

Following is a table, showing the quantity of water which would be required to compensate for loss due to opening lock with a lift of 10 feet, should alternative proposal (to increase size of locks to 230 feet long by 42 feet wide) be entertained :—

No. of Lockings 230 ft. x 42 ft.	Quantity of Water passed down in cub. ft.	No. of Lockings 230 ft. x 42 ft.	Quantity of Water passed down in cub. ft.
100	9,660,000	350	33,810,000
150	14,490,000	400	38,640,000
200	19,320,000	450	43,470,000
250	24,150,000	500	48,300,000
300	28,980,000		

The loss for 500 lockings would be at the rate of 1¼ cubic feet per second.

Approximate cost.

20 locks (200 x 37) and weirs, at £30,000	600,000
20 lock-keepers' cottages, at £300	6,000
665 miles of telephone, at £20	13,300
Allow for wharfs, cranes, &c.	15,000
,, dredging, say	10,000
,, embankments and controlling gates on canals and ana-branches	20,000
	£664,300
Contingencies and supervision, 10 per cent.	66,430
	£730,730, or say £730,800.

The average cost per mile of waterway would be £1,078.

LOCKING RIVER MURRAY—SOUTH AUSTRALIAN BORDER TO MOAMA.

TABLE, showing Particulars of Project.

Length of River proposed to be locked, in miles.	Number of Locks.	Average length between Locks, in miles.	Dimension of Locks, in feet.	Lift, in feet.			Total rise and fall, in feet.	Minimum navigation depth in pools, in feet.	Approximate quantity of water impounded, taking average depth at 14 feet.	
				Minimum.	Maximum.	Average.			In cubic feet.	In gallons.
*679	20	29	200 x 37	5	15	10¾	215	6½	16,278,000,000	101,737,000,000

* From South Australian border to end of uppermost pool.

6236. You have had a return prepared of the number of pumps for which licenses under the Water Rights Act of 1896, have been issued? Yes.

NUMBER of Pumps in New South Wales for which Licenses under the Water Rights Act of 1896 have been issued.

Locality.	No. of Pumps.	Locality.	No. of Pumps.
Murray River	4	Marra Creek	2
Edward River	3	Culgoa River	1
Billabong Creek	4	Gwydir River	1
Colombo Creek	1	Namoi River	9
Murrumbidgee River and tributaries	36	Macintyre River	5
Lachlan River	9	Darling River	11
Macquarie River	13		
Bogan River	1	Total	100

The total number of pumps for which licenses have been issued is 100. The capacity of these cannot in all cases be given. The quantity of water actually pumped in any one year is not estimated at more than, 300 cubic feet minute.

It may be remarked that some of the pumps are situated on unimportant watercourses; also that no less than thirty-eight of the licenses have been issued to the Railway Commissioners for railway purposes.

6237. You have also prepared a return of the licenses issued for dams on the Yanko, Edward, and Billabong Creeks, under the Water Rights Act? Yes.

LICENSED WORKS ON YANKO AND BILLABONG CREEKS AND EDWARD RIVER.

There are nine licensed dams on Yanko Creek, and the average height would be about 6 feet.

On Billabong Creek there are nineteen dams with an average height of about 7 feet; four pumps—one 6-inch, with a capacity of 141 gallons per minute, owned by the Railway Commissioners; one 10-inch 8 horse-power, and two 8-inch 8 horse-power.

On the Edward River there is one 10-inch 8 horse-power pump, and the maximum quantity of water used is 5,000 gallons per diem.

On Colombo Creek there are eight dams with an average height of about 7 feet, and one 3-inch pump owned by the Railway Commissioners; the maximum quantity of water used is 5,000 gallons per diem.

6238. Also a return of the number of diversions throughout the State authorised under the Water Rights Act? Yes.

LIST

L. A. B. Wade. 16 Oct., 1902.

LIST OF AUTHORISED DIVERSIONS IN NEW SOUTH WALES.

Name of District.	Name of Cutting.	Remarks.
	Departmental Diversions.	
1. Murray River	Wakool River	All surplus water diverted flows into the Murray River.
2. ,, ,,	Tuppal Creek	
3. ,, ,,	Eagle Creek	
4. Murrumbidgee River	Yanko Creek	
5. Lachlan River	Booberoi Creek	Surplus water diverted returns to Lachlan.
6. ,, ,,	Lake Cargellico	
7. ,, ,,	Willandra Billabong Creek	
8. ,, ,,	Middle Billabong Creek	
9. Gwydir River	Greenbah Creek	These cuttings form one scheme. Surplus water flows into the Barwon.
10. ,, ,,	Moomin Creek	
11. ,, ,,	Thalaba Creek	
12. Macquarie River	Crooked Creek	Surplus water returns to Macquarie River.
13. ,, ,,	Beleringar Creek	Surplus water flows into the Bogan River.
14. ,, ,,	Gunningbar Creek	Surplus water flows into the Bogan River.
	Private Diversions.	
1. Murrumbidgee River	North Yanco	*Irrigation* 100 *cubic feet* per second diverted for about four weeks in an average year.

The number of licenses issued under the Water Rights Act is 586.

6239. You have prepared a statement of the total area of land within the valley of the Murray and contributing streams in New South Wales suitable for irrigating, and the quantity of water it will be necessary to reserve in each place for the purpose? Yes.

IRRIGABLE Land and Quantity of Water required for same, allowing for flooding to a depth of 24 inches per annum.

Name of District.	Irrigable area in square miles.	Irrigable area in acres.	Quantity of water required in cubic feet.
Darling River	28,120	17,996,800	1,567,881,216,000
Macquarie River	6,860	4,390,400	382,493,648,000
North-westerly of Lachlan River	14,905	9,539,200	831,055,104,000
Between Lachlan and Murrumbidgee	2,816 } 10,931		
Between Murrumbidgee and Billabong Creek	8,115 }	6,995,840	609,477,580,000
Between Billabong Creek and Murray River	7,219	4,620,160	402,503,339,200
	68,035		

6240. You have prepared estimates of the cost of irrigation schemes on the Murray and Murrumbidgee rivers? Yes.

MURRAY RIVER IRRIGATION SCHEME.—TAKING OFF AT BUNGOWANNAH.

Approximate cost.

			£
Weir and head-works			50,000
Main canal and resumptions		129 miles	526,000
Branch canal towards North Gunambie		20 ,,	14,710
Do	do Jerilderie	44 ,,	50,215
Do	do Mulwala	25 ,,	17,464
Do	do Corrie	30 ,,	33,983
Do	do Tuppal	22 ,,	15,096
Do	do Conargo	14 ,,	12,976
Do	do Deniliquin	20 ,,	16,632
		304 miles	
Allow for escapes, say			20,000
			£757,076

or, say, £757,000.

(1.) Distributaries from canals not allowed for.
(2.) Cost of storage reservoir and resumptions for same not included.

MURRUMBIDGEE SOUTHERN IRRIGATION SCHEME.—TAKING OFF AT NARRANDERA.

Approximate cost.

			£
Half cost of weir			£15,000
Head-works			20,000
Flume over Yanko Creek			10,000
Regulator in Yanko Creek			3,000
Main canal and resumptions		136 miles	325,460
Branch canal towards Conargo		71 ,,	62,410
Do	do Tubbo	22 ,,	30,110
Do	do Wangonilla	43 ,,	44,720
Do	do Hay	20 ,,	14,710
		292 miles.	
Allow for escapes &c.			20,000
			£545,350

or, say, £550,000.

(1.) Distributaries from canals not allowed for.
(2.) Cost of storage reservoir and resumptions for same not included

L. A. B. Wade. 16 Oct., 1902.

MURRUMBIDGEE NORTHERN IRRIGATION SCHEME—TAKING OFF AT NARRANDERA.

Approximate Cost.

Half cost of weir in Murrumbidgee River	£15,000
Headworks	15,000
Main canal, including resumptions	154,000
Branch canal towards Hay	60,000
Allow for escapes (say)	10,000
	£254,000

(1.) Distributaries from canals not allowed for.
(2.) Cost of storage and resumptions therewith not included in above.

ALTERNATIVE SCHEME, LEAVING THE MURRAY AT TOCUMWAL TO MURRUMBIDGEE AT PEVENSEY.

This may be considered as a scheme for the supply of the lower portion of the Murray Basin in New South Wales. The total cost would be £1,333,000, or about £128,000 less than the original Murray and Murrumbidgee Schemes, while serving the same area of country.

Design for lock and weir.

6241. You have prepared, at the request of the Commission, a design for a lock and weir at Parcoola, the cross section being provided by South Australia? Yes. [*Exhibits* 129, 130, *and* 131]. The estimated cost is £80,000.

Lake Victoria.

6242. You have prepared a contour plan of Lake Victoria, showing its connection with the river Murray? Yes [*Exhibit* 132]. It is proposed to fill the lake through Frenchman's Creek. In the system of locking proposed, the weir is located in the river below the off-take to that creek; the reduced level of the upper point of that weir is 97. Allowing a fall of 7 feet from Frenchman's Creek to Lake Victoria, the top water level of the lake would be R.L. 90, and the amount of water stored would be 17,000,000,000 cubic feet. If this lock is located in the river channel above the off-take of the Rufus Creek, the level of the bed below that lock is R.L. 69, so that, allowing for a fall of 3 feet in the Rufus Creek, the lake could be drawn off to about R.L. 72.

6243. *Mr. Burchell.*] Would it not be possible to raise the level still higher than R.L. 90 in the lake? That allows for a fall of 7 feet between the river and the lake, down Frenchman's Creek. If the flow were kept up sufficiently long, so that you could reduce the fall to 2 feet, there would be an additional 5,000,000,000 cubic feet.

6244. Would that be a very great expense? No; but the flow would have to be maintained down the creek so much longer.

6245. *President.*] You put in a longitudinal section of the Murray River, from the South Australian border to Echuca, showing the proposed locks? Yes. [*Exhibit* 133].

6246. Also plans showing cross sections of the Murray River from the South Australian border to Echuca? Yes. [*Exhibits* 134 *and* 135].

6247. *Mr. Murray.*] You made some reference to monsoonal depressions as causing the rainfall in the north? I meant atmospheric depressions—they are called monsoons in Queensland.

6248. In referring to the locking of the rivers, you did not mention irrigation in connection therewith? No.

6249. You referred to navigation only? Yes.

Locking, apart from storage, would not benefit irrigation.

6250. Do you think that locking by itself, apart from storage, would be of essential service to irrigation? No.

Relative cost of locking and railway.

6251. *Mr. Burchell.*] In your statement you gave the cost of locking the river as compared with the construction of a railway;—did I understand you to say they were about equal to each other per mile? No; but the total cost would not differ greatly; for instance, the length of the channel of the Darling is about two and a half times the length that a railway to serve that country would be, so that you must take 2½ miles of locks against 1 mile of railway.

6252. What would be the cost of a light railway in that district? About £2,000 per mile.

6253. And the cost of locking the Darling? I may say that I put in two estimates for that work—one, the original estimate, as prepared by Mr. Darley, which provides for fixed concrete locks, and the other for movable weirs. If you take the original estimate, the cost would be £2,367 per mile along the travelling stock route; the average cost per mile of water-way would be £1,180, as against £2,000 per mile for railway.

Maintenance.

6254. Have you gone into the cost of maintenance of water carriage as against maintenance of railways? The maintenance of fixed weirs on the Darling would be less than the maintenance of railways.

6255. What would be the difference? I could not say; no doubt it would be considerable.

6256. At Bourke we were told that wool was shipped, and necessaries brought to Bourke for 25 per cent. less than could be done by rail, and that other commodities were brought by water for 50 per cent. less than by rail;—do you agree with that? I daresay it is so when the river is navigable.

Benefits by navigation no comparison to those by railway.

6257. You also said that the merchants in Adelaide would get the greatest benefit from the locking of the Darling;—would not the producer get a greater advantage than the merchants? My contention is that the producer would get even more benefit by the construction of a railway. I maintain that the small saving made bears no comparison with the losses to stock in times of drought; a producer could move his stock, or bring up fodder by rail and thus save them, but navigation is of no use for that purpose. The country can only be profitably occupied by the construction of railways.

6258. At the present time they prefer to use the river rather than the railways? Yes, for their wool and supplies, but I refer to the enormous loss of stock, which in our western districts has run into at least 10,000,000 sheep.

6259. How could they send away large quantities of stock from, say, Bourke? Mr. McCaughey has shifted, I understand, 200,000 sheep at a time from Toorale and Dunlop, below Bourke, on the Darling, entirely by rail, to North Yanko.

6260. Do I understand that it would be only for the purpose of shifting stock in times of drought? No, the railways would be equally serviceable for bringing stock to market.

FRIDAY, 17 *OCTOBER*, 1902.

[*The Commission met at the Court-house, Tumbarumba, New South Wales.*]

Present:

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

George Thomas Heinecke, Manager of the Union Jack Gold-mine, Tumbarumba, sworn and examined:—

G. T. Heinecke. 17 Oct., 1902.

6261. *President.*] What is your name? George Thomas Heinecke.
6262. You are manager of the Union Jack Gold-mine, Tumbarumba? Yes.
6263. How long have you been manager? Since the present company was formed; about six months.
6264. What is the kind of mining that you do there? *Hydraulic sluicing.*
6265. Can you give us an idea of the quantity of earth moved per month? About 16,000 yards.
6266. From where do you obtain the water for sluicing? Mostly out of the creek.
6267. At a higher level? Yes.

Pollution of Murray.

6268. What do you do with the earth? It is deposited on the bank, and we make dams with bushes and stakes, and let it lay there—that is, what *likes to lay.* Some of it goes down the stream.
6269. What quantity of water do you use? We have five ground sluice heads.
6270. What sludge is carried away in suspension? Only very light loam—we would not call it sludge. All the richest of the soil goes away in the water.
6271. Have you had any opportunity of proving that that is so? Yes.
6272. Where? On the edges of the creek—the grass and clover grow very freely.
6273. Have you been down the creek to see what effect this matter—that is, in suspension—has on the character of the water? Yes.

Discolouration extends 41 miles.

6274. Does it discolour the water? Yes, a *little.*
6275. How far does the discolouration go down the creek? Thirty or 40 miles, perhaps.
6276. Does any of the sludge settle on the flats? Yes; I daresay there would be a little.
6277. What effect has it upon the vegetation? It produces a good sod of grass in the Spring time.
6278. Can you give us any information as to the magnitude of this mine that you are managing? At the present time it is employing from seventeen to twenty men, and it is giving a return of about 200 ounces of gold per month.
6279. Have you had any opportunity of seeing the effect of the water, after it has been used for sluicing, upon machinery? Yes.

Effect on machinery.

6280. What is your opinion? It has but very little effect. I do not agree with what Mr. Hayes stated in Albury. I have seen the Murray water, and I do not think it is to be compared with the water that I have been using in my engine and boiler as regards the thickness of mud. I have blown out my boiler once a week, and have never found any mud in the bottom. Notwithstanding that the water I use is much thicker than that used by Mr. Hayes.
6281. *Mr. Murray.*] Do you make sludge dams? Yes.
6282. Is the greater part of the sludge precipitated in the dams? Yes; the greatest part is left behind in the dams.
6283. Is the soil that goes past mineral or vegetable? Vegetable soil.
6284. What depth of ground do you work? About 9 or 10 feet.
6285. You know the distinction between mineral and vegetable soil? Yes.
6286. Does it not prove injurious to the land it spreads over? No.
6287. Do you filter your water at all? No.
6288. Do you not find it injurious to machinery? No.
6289. Is there any poisonous mineral, or cyanide, used? *No; nothing but the pure water.*
6290. *Mr. Burchell.*] You said you were using five ground sluices? Yes.
6291. What quantity of water do they take? We measure it in a gauge, 3 inches for each head, by 12 inches, giving it 6 inches fall in 6 feet.
6292. That is for each sluice? Yes; we have a gravitation head of about 190 feet.
6293. What is the name of the creek you are *working on*? The Tumbarumba Creek.
6294. *President.*] How long have you known the Tooma Flats? About twenty years.
6295. When did you see them last? About twelve months ago.

Riverchannel, Tooma Flats.

6296. What was the condition of them then? The channel had been neglected from end to end, and the stream was blocked by the willows growing there. When a flood came, instead of the obstructions being removed, they were allowed to remain, and the result was the floods spread and carried the sand out of the main channel and left it up on the banks. That kept going on flood after flood.
6297. Where does the sand come from? From all parts.
6298. From the mining? A certain amount from the mining. It is also *brought down by washaways* and stormwater, and it all goes down the main channel.

Albury water supply.

6299. *President.*] Is there any other point you wish to speak on? With regard to the water supply for the township of Albury, I think it could be improved considerably. At present, it is pumped direct out of the Murray into a tank, and from there led round the town. It is almost the same as drinking the Murray water itself; it is not filtered in any way. I think the difficulty would be got over if the water were pumped into a large filtering tank, with sludge-gates provided, and it could then be washed out once a week. I consider that the poisoning of thousands of rabbits with phosphorus has also been responsible for considerable pollution.

Future methods of working.

6300. We understand that all is not being done at the present time that might be done to prevent pollution of the creek by the Union Jack mine;—what steps do you propose to take in the matter? As we take out the first paddock—say 4 acres—we have our machinery on the bank, and the stuff is discharged on to the banks of the creek. That is now almost completed; we have one paddock pretty well out. The machinery will be moved up to the bottom end, a bush dam will be thrown across, and all the stuff will be pumped into that hole again—that is, with these centrifugal pumps. In sluicing claims, everything has to go from one end of the creek to the other.

6301.

G. T. Heinecke. 17 Oct., 1902.

6301. When will you be able to do that? If we have rain, we will be able to do it within the next two months.
6302. *Mr. Murray.*] You propose to adopt the method known as dredging in working your claim in future? I do not intend to change the system of working it; it is only stacking the dirt. You put the second acre in where you took the first acre from.

James Thomson, President of the Tumbarumba Mining League, Tumberumba, sworn and examined:—

J. Thomson. 17 Oct., 1902.

6303. *President.*] What is your name? James Thomson.
6304. You are President of the Tumbarumba Mining League? Yes.
6305. What is your occupation? A contractor, at present. I have been connected with mining for the last thirty years, off and on.
6306. How long have you been acquainted with Tumbarumba? About twenty-three years.

Past and present mining operations.

6307. Comparing the mining that is carried on in the district to-day with what was done years ago, what do you say? At the present time it is of a different character to what it was years ago. There were more miners actually at work here then than what there are now.
6308. What was the character of the mining? Principally ground sluicing when I came here, twenty-three years ago. At the present time there are two pumps at work, and the balance is ground sluicing and tunnelling.

Pollution.

6309. Have you *gone into the question* of the alleged pollution of the Tumbarumba Creek? Yes; I do not consider that there is any more pollution in the Tumbarumba Creek, at the present time, than there was years ago. Some years ago, I was working on the Greg Greg bridge, 21 miles from here, and the water at that time was very much discoloured—in my opinion, quite as much as it is at the present time.
6310. What do you consider the pollution complained of is due to? I should consider it as much due to *dead carcasses as to anything else.* A little over three months ago I travelled down the Murray from Jingellic, and counted seven dead beasts in the river in a length of 12 miles.
6311. Are you acquainted with the mining in the Tumbarumba district? Yes.
6312. How many men are engaged? I suppose between 200 and 300.
6313. How many men would be engaged on the sluicing? Probably eighty or ninety, all told.
6314. What would be the effect, supposing you were *prohibited from using* the water in the way you are doing? I should say principally half the support of the district is due to mining.
6315. It would be serious, I suppose? Yes.
6316. Could you *suggest any means of improving matters*? The only way would be to impound the water and cause the sediment to be put back, but that would not make a great deal of difference, because the discoloured water would go down all the same, but probably not so much of it.
6317. Would that mean a very great expense or not? *It would* in some places.

Remedial measures.

6318. Take the two claims that are working? After they get well to work their natural dams would keep the stuff back. The Burra Claim is doing that at the present time.
6319. In your opinion, is everything being done that can be done to prevent pollution of the creek? If it is not done at the present time it will be done later on. The Tumbarumba Claim has just started; when they shift the machinery they will fill up the hole, which they have now taken out.
6320. *Mr. Murray.*] You say everything is being done that can be done to keep the sludge from finding its way into the river? At the present time.
6321. You mean that to be taken with a qualification? Yes.
6322. Would it be possible to impound the whole of the sludge? Yes; at great cost.
6323. How much would it cost to so *treat the water* that it would be fit for domestic use, say, a distance of a quarter of a mile away from the mine? I could not give an estimate.
6324. Do you know those elevators that are used in some mines? I have seen them.
6325. Are they very costly? No more than the present pump; but I do not think they would do the same execution.
6326. Will they lift loam, or only gravel and stones? I think they will lift loam.
6327. Would they impound it? I do not think so.
6328. Would it not require to be precipitated as well as being impounded? Yes; they have to lift the mud with water to get it away from the elevators again?
6329. How do they treat it after that;—do they put it into brush-wood dams? Yes; they are doing that now.
6330. Do you think it would be too costly for the mines to adopt that plan? I do not think the mines here would pay—not with the elevators.
6331. *Mr. Burchell.*] What is the distance from where these *sluicing operations* are carried out to the junction with the Murray? About 30 miles.
6332. How *far down the river* have you noticed the thick water from the sluicing claims? It is certainly discoloured down at Jingellic; but I was camped on the river at Jingellic for nearly three months, and used the water during the whole of that time. If we took out a bucket in the morning, it was clear by dinner-time.
6333. Have you heard of complaints by persons lower down the river? Yes.
6334. Have you received any protests from people below? No.

Alexander Baillie, Secretary to the Tumbarumba Mining League, Tumbarumba, sworn and examined:—

A. Baillie. 17 Oct., 1902.

6335. *President.*] What is your name? Alexander Baillie.
6336. You are Secretary to the Tumbarumba Mining League? Yes.
6337. For how many years have you been a resident of the district? About forty-two.
6338. Are you well acquainted with the *conditions* of the Tumbarumba Creek, both now and in the past? Yes.

Present and past mining operations.

6339. Will you compare, so far as the pollution from mining is concerned, what you know of it now and what you knew of it in the past? In the past there were various claims at work here sluicing—that is, running all the flats right away altogether. At the present time the claims that are working here are impounding their dirt or holding it back in dams.

6340.

A. Baillie. 17 Oct., 1902.

6340. We were told that that was not so in regard to the Union Jack Mine? The stuff is laying all on the flat.
6341. Is some of it going down? Some of it, but nothing in comparison with former years.
6342. I suppose you admit that there is some pollution from the mining? Some dirty water.
6343. Do you think any improvement can be made? I do not think so.
6344. It either means to put up with the pollution or to stop the mining;—is not that so? Yes, unless there is some other way of getting at it to purify the water.

Remedial measures.

6345. What would you suggest? If excavations were made on the banks of the Murray there is a certain amount of gravel that the water would filter through. I do not think it is possible for the miners to keep the water back and keep it clean before it enters the Murray.
6346. Do you know of pollution from any other cause? No, unless it would be caused by storms carrying dust or rabbit poison into the river.
6347. *Mr. Burchell.*] Is the effect of sluicing more noticeable on account of the low discharge of the river? Yes; had there been more water in the river, the dirty water would not have shown so much.
6348. How far down have you known the river to be affected by the sluicing? I do not know much of the river below Albury.
6349. Have you noticed the effects here? Yes.
6350. Have you noticed the same effects down there? I do not know much about the Murray River.
6351. Have you heard of any complaints from persons below your works who have been using the water for domestic purposes? No.
6352. Not as secretary to the league? No.
6353. *President.*] Is there anything else you wish to add? If we had the usual rainfall, the Murray River would be much larger, and the water that we are putting into it would have had more water to intermingle with, and consequently the river water would not be so dirty.

Stanley Ferguson Ramsay, storekeeper, Tumbarumba, sworn and examined:—

S. F. Ramsay. 17 Oct., 1902.

6354. *President.*] What is your name? Stanley Ferguson Ramsay.
6355. You are a storekeeper at Tumbarumba? Yes.
6356. How long have you been here? About twenty-nine years.

Past and present condition of water.

6357. On what particular point do you wish to speak about? The difference in the Tumbarumba Creek now as compared to what I remember it twenty years ago. There were far more men working then than at the present time, and it was all purely and simply sluicing. In my opinion, the water is not as muddy now as it was then. More earth was washed away years ago, and, as storekeepers, we used to buy three times as much gold as we do now. On two sluicing claims alone there were seventy men engaged—forty on the Burra and thirty on the Mannus.

John Wallace Watson, medical practitioner, Tumbarumba, sworn and examined:—

J. W. Watson. 17 Oct., 1902.

6358. *President.*] What is your name? John Wallace Watson.
6359. How long have you resided in Tumbarumba? About fourteen months.
6360. Are you interested in the Burra Creek claim? Yes, unfortunately.
6361. How long has that been in existence, so far as you are concerned? About twelve months.
6362. What is being done there? We are dredging there by means of a centrifugal pump. We break down the stuff with a nozzle, and it is run down by means of races to the pump; it is then lifted by the pump, passed down the boxes, and then discharged into a large tailing dam, the bottom end of which is fascine work.
6363. Does any large proportion of dirt get to the creek? There must be some, but it cannot be very much. It has a distance of a quarter of a mile to settle, and it only travels very, very slowly, so that there can only be a very little of the light stuff go down; all the heavy sand and clay must settle.
6364. Have you had an opportunity of seeing what effect the matter that is carried down in suspension has on the creek below? I cannot speak from my own knowledge?

Pollution not injurious to health.

6365. Speaking as a professional man, do you consider what is carried down would be injurious to health? Not at all. Simply and purely it is inorganic matter in suspension, and if the water is allowed a little time to settle it is just as good drinking water as it was before.

Duncan McInnes, Secretary to the Union Jack Gold-mine, Tumbarumba, sworn and examined:—

D. McInnes. 17 Oct., 1902.

6366. *President.*] What is your name? Duncan McInnes.
6767. You are secretary to the Union Jack Gold-mine? Yes.
6368. Will you give us an idea as to the importance of the mine that you are connected with? I estimate the value of the claim at £10,000—that is, judging by the results obtained during the few months we have been at work.
6369. What has been the yield lately? Within a fraction of 1 oz. to the paddock (12 feet square).
6370. What is the depth? An average of about 9 feet.
6371. How many paddocks have you moved during the last five weeks? We have moved 225.
6372. What has been the yield? 219 oz. 10 dwt.

Pollution.

6373. Have you observed how far the sludge in suspension gets carried down the creek? All the heaviest of the stuff is deposited just at the tail-end of the boxes. There is a little light stuff in suspension that is carried further on, but very little. At the present time there is not sufficient water in the creek to carry the sludge away—in fact, we are pretty well stopped just now for want of water. Of course, if there were a greater body of water in the creek, the water would not be nearly so thick—there would not be so much matter carried away in suspension.
6374. Do you think you are doing all you can to prevent sludge getting into the creek? At the present time, on account of just starting and having the machinery on the bank, we are forced to allow the tailings

tailings to run into the creek. Of course, when we have worked out what we are doing now, we shall move the pump further up, and dams will be put across to keep the stuff back. D. McInnes. 17 Oct., 1902.
6375. Is that all you can do to prevent pollution, so far as you are concerned? Yes.
6376. *Mr. Burchell.*] Have you ever received any complaints from persons down below with regard to the pollution? No.
6377. How long have you been in Tumbarumba? Ten months.

Thomas Bell, miner, Cherry Hill, sworn and examined:—

T. Bell. 17 Oct., 1902.

6378. *President.*] What is your name? Thomas Bell.
6379. You are a miner at Cherry Hill? Yes.
6380. How long have you resided there? About nine years.
6381. Have you formed an opinion as to the alleged pollution? I am not aware of any pollution except by discolouration.
6382. Assuming that is pollution? A certain amount of discolouration comes from the mining.
6383. How far down does it affect the creek? Not very far.
6384. Has it affected the Tooma flats? I do not think so; they are too far removed. I do not think the flats are any more discoloured than other places that I have been in. I have been at Bourke, and on the Culgoa, Warrego, and Lachlan, and I have seen the water of those rivers more discoloured twelve or fifteen years ago than it has been here.
6385. But two blacks do not make a white? Certainly not.
6386. *Mr. Murray.*] Have you ever had any experience in sluice-mining in other parts of the State? No.

Thomas Frederick Phillips, miner, Cherry Hill, sworn and examined:— T. F. Phillips. 17 Oct., 1902.

6387. *President.*] What is you name? Thomas Frederick Phillips.
6388. You are a miner at Cherry Hill? Yes.
6389. How long have you been there? About nine or ten years.
6390. Are you acquainted with the Tumbarumba Creek? Yes.
6391. Have you been down the creek? Not very far down from here.
6392. Do you know how far the alleged pollution goes? I really could not give you an exact answer—I should imagine a good many miles, that is to say, the discoloured water and so on.
6393. You cannot say anything definite? No.
6394. Is there anything else you wish to say? As to the pollution of the water, taking a broad view of it, I hardly think it is sufficient to cause any great alarm amongst the inhabitants further down the river. I might say that the mining industry is supporting a great number of people, and is the mainstay of the district.

SATURDAY, 18 *OCTOBER*, 1902.

[*The Commission met at the "Tooma Hotel," Tooma, New South Wales.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq., | FREDERICK N. BURCHELL, Esq.

David Langlands, agent for Messrs. Thomas Robertson and Brothers, Tooma Station, sworn and examined:—

D. Langlands. 18 Oct., 1902.

6395. *President.*] What is your name? David Langlands.
6396. You are agent for Thomas Robertson and Brothers, of Tooma Station? Yes.
6397. On 15th March, of the present year, you addressed a letter to the Under-Secretary for Mines, Sydney, in regard to the deposits that were taking place in the Tooma flats? Yes.
6398. You drew attention to the great damage done to the creek and river flats and frontages on this and other stations in the Upper Murray district by the sludge and mineral substances washed down the the creeks from the sluicing operations near their sources. You say, "This evil is extending year by year, and is increasing to such an extent that, should it be encouraged, the famed flats of the Murray will be a thing of the past, and, furthermore any irrigation schemes to carry the surplus waters of the Murray to the dry interior will be rendered futile by the accumulations of silt which will continually block the canals; from my personal experience, I know country that last year carried from eight to ten sheep to the acre and which is now utterly useless and must continue so";—will you tell us what area you referred to as being now useless and that formerly carried eight to ten sheep to the acre? That was a small piece that I knew of in front of the "Tooma Hotel"; the year before it had no sludge deposited on it at all. Whilst other country is not affected to the same extent, it is affected to a great extent, and there are 1,500 acres that come within the province of being submerged at one time or another if the creek rises sufficiently high.

Damage to land by sluicing operations.

6399. That is so far as your station is concerned? Yes.
6400. What damage do you think the silt has done so far? It is impossible to say. My knowledge is so limited as to what the country was in years gone by, but from what I can hear it has injured us to the extent of from 200 to 300 fat bullocks a year.

Extent of damage.

6401. What, in your opinion, is the cause of the silt? It appears to me to be from the mining.
6402. Wholly? There may be some degradation from the hills, but I should say to a very slight extent.
6403. Will you give us your reasons for that opinion? The Tooma River, which has its source in granite and runs wholly through granite, has no flats covered with sand the same as these flats. The water from that river is perfectly clear at present. [*Witness here produced a sample of water.*] That water is from a creek that has its origin in the Snowy Ranges, and has a fall of about 4,000 feet, or about one and a-half times greater fall than the Tumbarumba Creek.
6404. When was that taken? This morning.

D. Langlands. 18 Oct., 1902.

6405. What part? About 1 mile above the junction of the Tumbarumba and the Tooma. There is no mining on the Tooma, but the wash from the hills is greater than it would be on the Tumbarumba Creek.
6406. Owing to the nature of the country? Yes; more hilly, and more granite.
6407. Will you go on with your reasons? I have not been to all the mines, but I have been to some of them, and seen them at work, and, of course, to a great extent it is mere supposition on my part that the silt does come from the mines; but even if it was due to the natural wearing of the hills, it would only come at such times as there were rains to send it along—it would not be all the year round; whereas the water has much the same consistency the whole year round, except that to-day it is much clearer than what I have ever seen it before.

Silt not due to natural causes.

6408. You speak in your letter about the Murray flats;—what had you in your mind when you wrote that? That, as a natural consequence, as the creeks become silted up the river must become silted up, and as the river becomes silted up lower down it must spread on to the adjoining land.

Effects of siltation.

6409. That is what you anticipate will happen? Yes.
6410. Do you think the willows that are growing about in such profusion have anything to do with the silting? Yes; the willows do retard a certain amount of silt around themselves; but they do not dam the water back on to land that is of a higher altitude than themselves, although in the paddocks the willows are in they have altered the course of the stream in several cases; where a paddock is 8 or 10 feet higher, then, I say, the water cannot be affected by the willows.

Willows retard silt.

6411. You are aware that the mining is of some consequence to the community? Yes.
6412. And that it would be rather a serious thing to impede it in any way? That is a thing which I would be very sorry to do.
6413. Can you make any suggestion to get over the difficulty? Yes; so long as the water is returned to the stream in the same condition in which it is taken away, there would not be the slightest objection. People who have riparian rights want, at least, what is their own—that is, clean water.
6414. Would you suggest that the mine-owners should take means of precipitating the suspended matter before returning the water into the creek again? Yes.
6415. *Mr. Murray.*] Have you had any extended experience elsewhere of rivers in country like this? I have had considerable experience in irrigation.
6416. In what locality? On the Darling.
6417. Have you had any experience of rivers liable to siltation? No. I have had experience on the Loddon.
6218. What part of the Loddon? The property I was on is intersected by the Serpentine, and has a frontage to the Loddon.
6419. Is there any siltation there? I believe there is now, but there was no great siltation at the time I speak of.
6120. Do you know the extent of the mining on the Loddon? I know of it.
6421. It is vastly larger than the mining here? I have heard of the people complaining about it.
6422. Have you noticed generally the effect of denuding growing timber, especially in granite country? At certain periods of the year, yes; only when rain falls.
6123. It is only when the rain falls that the sand comes down? Yes.
6424. How would you distinguish between the mine sludge and the granitic sand? I say they are one and the same; the granitic sand comes from the mines as well as the sludge.
6125. How do you distinguish the mine sludge from that which comes from the hills? That from the hills is so slight that one can take no notice of it.
6126. Could you distinguish one from the other by the appearance? It would be impossible, because they are practically one and the same. That from the mines is taken out wholesale, whilst that from the hills is infinitesimal.
6126. Is not that from the mines mostly from alluvial flats? They will take the deposit from wherever they can get the most gold.
6128. Do you know the Burra Mine? I have seen it.
6129. You are not intimately acquainted with it? No.
6130. You say the effect of those trees is to arrest the silt in their own neighbourhood, but not to raise the river level to any extent? No.
6131. Does it not appear to the eye that the land adjacent to the bank of the creek is higher than the land back from it? That is natural to all Australian rivers.
6132. But I am speaking of this particular case; does not the creek bank appear to be rising;—would you not attribute that to the arrestation of the silt by the willows? No; the willows were originally planted, and had they been left alone in their original state they would have remained just as they were planted, viz., here and there; as it is, the limbs have fallen and taken root in the accumulations of silt. I attribute the willows to the silt, not the silt to the willows.
6133. Do you propose to remove the willows all along the course of the stream? Yes; and I might say this will entail very considerable expense.
6134. *Mr. Burchell.*] How far is the silt noticeable down stream from the bridge at this place? All the way to the junction of the Tumbarumba and the Tooma River.
6135. How far is that? In a straight line, about 3 to 4 miles.
6136. Is it noticeable further down than that? Yes; after floods.
6137. Have you taken any action? I have tried to get the matter fixed quietly, so that something should be done to stop the silting up of these flats.
6138. How long is it since you first objected to it? My own objection dates back about eight months.
6139. Was that the first objection? No; I believe it has been objected to as long as there has been mining.

Effect on stock and on fish.

6140. *President.*] Is there anything else you wish to add? Yes; with regard to stock drinking the water, when stock are in a well-grassed paddock and fattening, it stands to reason that if they do not get clean water to drink they do not fatten to the same extent as they would with clear water, and that the water in its present state interferes with the digestion of the animals. It has been said that the fish are dying. Such, I believe, is the case; there are not nearly so many fish now as formerly, whilst in streams that are not polluted the fish are just as prevalent as in the past. With regard to the irrigation channels, which I referred to in my letter, I believe, if you took a pannikin of water out of that stream when it was muddy, it

D. Larglands. 18 Oct., 1902.

it would be a good proof to you as to what you might expect if the water were allowed to lie stagnant before a weir; that a great deposit of silt would take place in front of the weir, and if deposited there it would rise and get into the channels.
6441. Do you pollute the water to any extent by wool-washes on your station? No; I think not. I run the water through charcoal dams after it comes away from the scour.
6442. How many wool scours have you? Two boxes.
6443. Where is the water discharged after you have treated it? Back into Paddy's River.

Thomas Paton, grazier, Welaregang, sworn and examined:—

T. Paton. 18 Oct., 1902.

6444. *President.*] What is your name? Thomas Paton.
6445. Where do you reside? Welaregang, on the Murray.
6446. How long have you been resident in the district? In this district and on the Mitta, since 1854.
6447. How long have you been at Welaregang? About sixteen years.
6448. Have you noticed any difference in the condition of the water at that point? A great difference.

Past and present conditions.

6449. Will you compare the present condition with what it was sixteen years ago? Sixteen years ago very little silt used to remain in flood-time; that is to say, after the floods went. Now, after a flood, a great deal of silt is left behind—in fact, a regular coating of sand.
6450. Do you notice any difference in the colour of the water? A terrible difference. You cannot drink it; stock will not drink it. On some days it is just like rolling mud—as if you had mixed a lot of black lead with the water.

Pollution not attributable to rain.

6451. Did you attribute that at the time to rain? No. Sometimes, after five or six weeks of dry weather, the water would be at the dirtiest. Three years ago the water was so thick in the Murray that it actually killed the fish; you could get hundreds of dead fish at every bend of the river.

Due to mining operations.

6452. From what you know of the district, to what source do you trace the suspended matter? The Tumbarumba Creek, Burra Creek, Paddy's River, and all the mining creeks. The Tumbarumba Creek is the principal source of annoyance. No doubt all these other ones help.
6453. Have you any doubt about that? I do not think there is any doubt at all. Where the Tooma River comes into the Murray there is no silt at all. The decayed vegetation that is washed down improves the soil.

Matter brought down by rain beneficial.

6454. Your opinion is that the suspended matter that is brought down in times of storm is of benefit? Of great benefit; it enriches the flats.
6455. What about the suspended matter that is brought down from the mines? It makes the country useless. At Tallandoon, Yabba, and Noorongong, 60 miles down, before the mining, the floods did no harm at all, I can show you a paddock where a man fattened twenty head of bullocks; now I do not think it would fatten three; it has 3 feet of sand on it.
6156. Are you acquainted with the mining that is done on the Mitta? Yes.
6457. Is the damage there the same? I think it is worse. It has been going on for years. The sluicing claims there have washed hills into the river.
6458. Did you know the Tooma River and the Tumbarumba Creek formerly? Yes.

Accumulation of silt increasing.

6469. During the sixteen years you speak of, what has happened? The accumulation of silt every year seems to get worse and worse. The low places, where there used to be good black soil, are getting filled up with sand.
6460. At Welaregang, on the river flats? Yes; this muddy water settles there, and when the river goes down the water goes with it, and the sand is left behind.
6461. Do you remember the Tooma River and the Tumbarumba Creek having a well-defined channel here? Not in my time. Mr. Rolfe and Mr. Moorhouse tried years ago to stop the silt coming down, as it was spoiling their flats, but they could never get any satisfaction.

Effect on stock.

6462. What has been your experience as to the effect of the water on stock? I think it has a very bad effect on stock of all kinds, especially fattening stock. I got in 300 bullocks in April last, and I took them to the river every day. They would smell the water and turn their noses up, and come away without touching it. They would go back to the swamps and drink the water there.
6463. Supposing they did drink the river-water, and it was charged with suspended matter, would it be conducive, or otherwise, to their well-being? I think it would be detrimental. If a beast swallows a lot of sand, it must be more or less injurious.

Colquhoun Crowe, grazier, North Welaregang, sworn and examined:—

C. Crowe. 18 Oct., 1902.

6464. *President.*] What is your name? Colquhoun Crowe.
6465. Where do you reside? At North Welaregang.
6466. Have you been resident there long? Since 1868.
6467. How long have you been acquainted with the Tooma River and the Tumbarumba Creek? Ever since I came to this part of the country, and, in fact, before that.

Past and present condition.

6468. Will you tell us what is the condition of the river now, as compared with when you knew it first? At first, it was a nice stream of comparatively clear water, and to-day it is nothing but a sludge-hole. The bed of the creek is sludged-up, and the course of the creek has been completely altered. When the bridge here was first constructed, the bed of the creek was 12 feet below the beams, whereas now it is only 4 or 5 feet.
6469. When you knew the Tooma Creek, in 1868, what was the condition of the water? It was a nice clear stream of water, and it took a tremendous lot of rain to flood the water over the banks.
6470. Was that condition maintained the whole year round? Yes.
6471. What effect was produced on the water by a storm? There was no effect that I could possibly see.
6472. Did it not discolour the water? Very little.
6473. What was the condition of the flats in 1868? They were all clear flats; and, in fact, most of the flats here have been cultivated by the original selectors, who grew splendid maize and potatoes. No flood ever came over them. Now, the main channel has become silted up, and a little rain in the creek goes all over the flats.

6474.

C. Crowe. 18 Oct., 1902.

6474. When were the willows planted? Some of them were planted, but most of them grew naturally. The present willows have accumulated from trees that have been lopped down and carried down the creek. There were only one or two willow-trees on the creek when I first came here.
6475. Would the willows on the banks of the creek have spread to the same extent had no sludge been sent down the creek? I do not think so; the sludge accumulates, and makes a bed for them.

George Thomas Heinecke, Manager of the Union Jack Gold Mine, Tumbarumba, further examined:—

G. T. Heinecke. 18 Oct., 1902.

6476. *President.*] We were present at the Burra Mine this morning, and a sample of water was taken from the boxes;—at the time we were there the nozzles were not working? No.
6477. How long had they been in disuse? I could not say. They do not use them while they are washing up.
6478. Have you been working at your own mine—the Union Jack? Yes, constantly; three shifts going night and day with the breaking-down nozzles, and also the Pelton wheel, on the same principle as the Burra Mine was working to-day. I have seventeen men employed constantly, and they are working now.

George Osmond, coach proprietor, Wagga Wagga, sworn and examined:—

G. Osmond. 18 Oct., 1902.

6479. *President.*] What is your name? George Osmond.
6480. Where do you reside? At Wagga Wagga.
6481. Have you known the Tumbarumba Creek for long? I see it occasionally as I come through this way, going to Victoria or down the Murray.

Past and present condition much the same.

6482. Do you consider there has been any change for the better or worse of recent years? As far as the silting goes, I do not see any difference. Of course, this year there may not be quite so much grass, but further than that I do not see any difference.
6483. Do you notice any more sand being deposited on the surface than usual? When I was last here I think they looked just as well then as they do now. I have never seen the water any more discoloured than it is to-day.
6484. Have you had any expert knowledge in station management? No.

MONDAY, 20 *OCTOBER*, 1902.

[*The Commission met at Bringenbrong Station, New South Wales.*]

Present:

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Walter Edward Mitchell, part owner of Bringenbrong Station, sworn and examined:—

W. E. Mitchell. 20 Oct., 1902.

6485. *President.*] What is your name? Walter Edward Mitchell.
6486. You are part owner of Bringenbrong Station? Yes.
6487. How long have you been intimately acquainted with the Swampy Plain and the Indi River? Twenty-five years. I might say that we have stock on both sides of the Swampy Plain River, and in working them across from one side to the other, the flow is necessarily *continually under observation.*

Contributions of Indi and Swampy Plain Rivers.

6488. Judging by your observation, will you tell us the relative quantities of water that come down the two rivers? In flood-time I consider four times as much comes down the Swampy Plain River as comes down the Indi—I mean that the Swampy Plain River is flooded four times to every once that the Indi is.
6489. I understand that the Swampy Plain River gets its water from the snow principally? Yes; from Kosciusko.
6490. Are the two rivers often in flood at the same time? Yes, when heavy rain occurs.

Swampy Plain River snow fed.

6491. How do you account for the Swampy Plain River being in flood more frequently than the Indi River? By the melting of the snow. With hot winds or exceptionally hot weather you will see the Swampy Plain River overflow its banks, and the Indi not more than 18 inches deep.
6492. *Mr. Burchell.*] Have you ever seen the flow very much less than it is now? At this time of the year I have never seen it nearly so low as it is at present. It goes considerably lower late in the summer.
6493. A little less than half of the present flow? Yes.
6494. At the beginning of the season does the Swampy Plain River commence to rise before the Indi, or do they flow about the same time? The Swampy Plain River always rises first, whether it rains or snows.
6495. With heavy rain, how long does the Swampy Plain River flow before the Indi? At least eight hours.
6496. What is the longest duration of snow on the Dargalls that you have known in one particular year? I have known snow all the year round on Kosciusko.
6497. Has that happened many times in your twenty-five years' experience? Yes, I think so.
6498. Would that flow into the Swampy Plain River then? Yes.
6499. So that you have known it flowing all the year round *with snow water*? Yes.
6500. Have you known the Indi to be kept flowing by snow waters all the year round? The Indi River would be influenced the same way to a certain extent by the Leather Barrel Creek.
6501. Is that creek supplied by the mountains on the New South Wales side? Yes.
6502. And not from the Victorian side? No.

TUESDAY,

TUESDAY, 21 *OCTOBER*, 1902.

[*The Commission met at the Shire Hall, Talangatta, Victoria.*]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Peter Wright, engineer, Talangatta, sworn and examined:—

P. Wright. 21 Oct., 1902.

6503. *President.*] What is your name? Peter Wright.
6504. Do you reside at Talangatta? I am most of my time here.
6505. Formerly you were shire engineer? Yes.
6506. How long have you known the Mitta and Kiewa rivers? The Kiewa since 1855, the Mitta since 1868.
6507. What mining is being done on the Mitta? In the way of alluvial mining, the principal claim is the Pioneer claim at the junction of Snowy Creek with the Mitta, and there are other smaller claims.
6508. Do you know the Sandy Creek claim? Yes; and I know the Argo above it, belonging to the same company. I know the creek generally.
6509. To what extent is sluice-mining carried on on the Kiewa? Quite trifling. The water is quite clear until joined by the Yackandandah Creek. There has been some little quartz-mining on the upper part of the valley, but of alluvial mining, that would pollute the stream, practically none.
6510. What is there on the Yackandandah Creek? It has thrown an immense amount of silt into the Little River where it joins that river comparatively low down.
6511. Is that due to the sluicing? Yes.

Source of pollution.

6512. Are there very large claims on the Yackandandah? Yes; but they do not send down the red soil; it comes from higher up. The Yackandandah Creek runs from near Beechworth this way, and from Stanley and its neighbourhood down there is sluicing going on, and the sluicing that is done there tends much more to the pollution of the stream than that from the big claims at the lower end, which is of a sandy nature.
6513. You have had opportunities of observing these rivers under different conditions;—do you consider that owing to the mining they are seriously polluted by mining sludge? They are, no doubt.

No preventive measures taken.

6514. Speaking generally, do you consider that the proprietors of the mines are doing all they can to minimise the effect of the sluicing, as far as the rivers are concerned? In a general way, they are doing nothing in that direction; they simply run their tailings into the nearest stream. At one time the bylaws on the Yackandandah provided that hill claims should run their tailings into dams made for the purpose, and that they should keep a certain amount of still water at the outlet of those dams, but that has been done away for many years.
6515. Does that apply to all the claims? The principal sinner in this district has latterly taken some sort of care with their tailings; the water still leaves in a very dirty condition, but it is not so bad as it used to be.
6516. What mine do you refer to? The Pioneer.
6517. Are there any other mines that are putting their tailings aside and not discharging them into the stream? I think not. I have not been all over the district of late, but the Pioneer is the only claim that I know of at present stacking their tailings.

No practicable remedy.

6518. From your knowledge and experience of the district, what remedy do you propose? I do not know that there is any remedy that would not stop the working altogether. The margin of profit at the present time is very low, and if the mines were compelled to stack their tailings it would add to the cost to such an extent that it would stop most of the claims from working.
6519. Have you any suggestions, on the face of that, to make to us? I do not know that I have any. The stacking of the tailings, as done by the Pioneer Company, is a thing that could be carried out elsewhere; the only thing is as to whether the cost would not be prohibitive.
6520. *Mr. Burchell.*] Have any complaints been made about the sluicing? Numerous complaints.
6521. Where from? All the landowners in the River Valley have been complaining for many years back. The complaints have been continuous in this Valley and also in some of the others. On the Yackandandah Creek, where it is worse than here, the people apparently got used to it, and I have heard very little about it from there.

Effects on grass.

6522. How does it affect them? Sometimes in the worst places it covers the soil with the *debris* from the mines, and at other times it dirties the grass, and, unless rain comes immediately after, the grass is very much injured; but the pastoral people can speak on that point with more authority than I can.
6523. Has any action been taken to prevent pollution? No legal steps have been taken.

Probable duration of sluicing operations.

6524. From your long experience, have you any idea as to how long this sluicing is likely to last, or could you say how much land is fit to be dealt with in that way? That would depend, to a great measure, on the rate of wages. At one time, the minimum wage here was £1 per day, and it took good ground to pay that rate; but gradually, as the better ground became worked out, the wage rate was lowered, and ground that could not be worked at a profit then could be worked at a profit now. The country is auriferous in some degree all over; but it is only in limited areas that it is paying. The wage rate is the principal factor in the case.
6525. Could you give us the extent of country up the Kiewa or Mitta, or any of these rivers—that is, fit to be dealt with by sluicing for gold? The whole of the valley from where we are now has been taken up under lease. It was proposed to work the valley by dredging; but I hardly think that that is likely to be done yet awhile. In mining, however, it is very often the unexpected that happens. The dredging, such as you saw at Sandy Creek to-day, has not got through the material as quickly as people expected; but some of the promoters say that with bucket-dredges they could work it ever so much cheaper. There is a possibility of bucket-dredging being started, and from here up to Omeo might be profitably worked in that way.
6526. With respect to Yackandandah Creek, is there any great quantity of land there to be treated yet? There is a good deal which it is claimed is likely to prove profitable. It was stated in evidence, in Court, that in one claim there were 800 acres on which they expected £1,000 per acre profit.

6527.

31288

P. Wright. 21 Oct., 1902.

6527. Are you acquainted with the Ovens River? Not with its recent dredging developments.
6528. Have you any idea as to the amount of land that could be treated there? No; I could not give you any reliable information.
6529. Do you know of any other land suitable for treatment by sluicing? The Sandy Creek, right down to the junction, and all the streams here, are more or less auriferous. What is stopping their being worked is the increased burden that has to be dealt with.
6530. What area of land do you think is suitable for treatment by sluicing in the Sandy Creek? About 4,000 or 5,000 acres; it may not prove payable, but that much has been taken up under lease.

Injury to land.

6531. *Mr. Murray.*] The evidence that you have been giving relates to the damage to land? In some degree. The water is polluted. But the difficulty here is not the pollution of the water; what affects the people here is the injury to the land.
6532. Do you know anything about the effect which the pollution of the water has lower down? The water is certainly injured for household purposes; when it gets down in the larger body, it is good enough for stock, but not for household purposes.
6533. Do you think it serious? It does not seem to me to be serious.
6534. Do you think it likely to be injurious to health? I do not think so. It is unfit for laundry purposes and unpleasant for drinking unless filtered, but I do not think it is injurious to health.

Andrew Paton, landowner, Noorongong, Victoria, sworn and examined:—

A. Paton. 21 Oct., 1902.

6535. *President.*] What is your name? Andrew Paton.
6536. Are you a landowner? Yes.
6537. Where is your land situated? On the Mitta Mitta, 10 miles from here.
6538. What land have you? 2,500 acres of river flats.
6539. Has it been injuriously affected by the sluicing? A good deal.

Extent of damage.

6540. To what extent? When a flood comes, the *debris* that is brought down the river from the mines is washed over the surface, and it deteriorates the quality of the land; instead of being good, rich, black loam, it is now a light sandy material, and whenever the dry weather sets in the grass burns up on it.
6541. Are you satisfied that it is due to the sluicing? I am; because I have been on the river since before the mining started on it at all, and I was familiar with the quality of the land then and I have watched its progress ever since.
6542. It did not occur before the sluicing commenced? No. It is only since these giant nozzles and these machines commenced that there has been any quantity of this deposit. It was scarcely observable in the early days.
6543. Does the condition of the water affect you at all? No; because we are not compelled to use the river water; we use spring water.

Water unfit for stock.

6544. Is the water fit for stock? It does not hurt the stock much, but it is very unpleasant to drink and I should think unwholesome too.

Remedial measures.

6545. After having taken into consideration the importance of mining to the community at large, have you any suggestions to make in the way of remedying the evil? I think if the conditions in all the leases that are granted were stringently carried out, we would not have much to complain of, but they are never enforced.
6546. What conditions do you refer to? They have to stack their tailings, and allow no rubbish at all to go into the river; these are conditions in their leases which are never carried out.
6547. Do you think if the tailings were stacked that that would get over the difficulty, so far as the injury to the land is concerned? Only to a certain extent; it would go a long way towards preventing the wholesale destruction of the flats up near the mines. It would get over a lot of the difficulty, but the water would still be polluted to a certain extent; it must come away muddy.
6548. I suppose you recognise that the mining is of very great importance to the community at large? I know that, and I do not think that any of the landowners on the Mitta would like to see the mines closed so long as they do not injure other interests. At the same time I think the land on the Mitta is of far more importance than the benefit that mining is to the district.

Fish injured.

6549. Is there anything else you wish to add? Before the mines were established at all there was a plentiful supply of fish in the river; now when you go down you have to beg and pray to get a fish, and it is a question whether you get one in a week. I think that is due to the muddy water.
6550. I understand you are Chairman of the Mitta Land League? Yes.
6551. And you are authorised to make a statement on their behalf? I am authorised to state that it is unanimously agreed by the landowners that their protest is entered against these mines polluting the river. We, as a league, have made appeals to the Government for redress, but without success.
6552. Anything else? I think the fact that we have not taken action for so many years bears out that we have not been antagonistic to the mining interests, although we might have resorted to legal process with every prospect of success.

Thomas James Murray, grazier, Talangatta, sworn and examined:—

T. J. Murray. 21 Oct., 1902.

6553. *President.*] What is your name? Thomas James Murray.
6554. What are you? A grazier.
6555. Where do you reside? Just above the town, in the valley of the river.
6556. What extent of land have you? 700 or 800 acres of purchased land.
6557. Where is it situated? Principally on the river; part of it is on the Talangatta Creek.
6558. Has the working of the sluice-mining on the Mitta affected your land at all? Not to the same extent as the land that is situated up towards the workings. For instance, Mr. Paton would feel the effects of the sludge more than I would, and people living higher up would feel it more still.

Grass spoiled.

6559. How does it affect you? Whenever the river overflows its banks it leaves a *sediment, and it spoils* the grass for the season. On the other hand, it does a trifle of good to counterbalance that—viz., the *filling up of lagoons.* With regard to the quality of the water, during last summer we had to fall back on the river water, and after three days standing in a cask it *putrifies and is unfit to drink.*
6560. Except at a pinch, you are not dependent on the water from the river? At present I am; for drinking purposes, we have to fall back on the river.

6561.

T. J. Murray. 21 Oct., 1902.

6561. Have you any suggestion to make as to what should be done to mitigate the evil that you complain of? The principal cause of the trouble is the Pioneer claim, at the junction; with its giant nozzle, it is computed that they run into the river so many million yards of stuff annually. If they were compelled to put up tailing dams, that would greatly mitigate the evil.

Fish injured.

6562. Is there anything else you wish to add? With regard to the fish, it is quite true what Mr. Paton has said. In my opinion it kills the fish. There are not one-twentieth the number of fish in the river as compared to the time when these streams were not polluted by the mines. I might say that a meeting was held here some years ago with a view to preventing the Pioneer claim from discharging their tailings into the river, but nothing came of it.

Henry Andrews, Manager of the Mitta Mitta Station, near Talangatta, sworn and examined:—

H. Andrews. 21 Oct., 1902.

6563. *President.*] What is your name? Henry Andrews.
6564. Where do you reside? At Mitta Mitta.
6565. What are you? I am manager of Mitta Mitta station.
6566. Is it on the Mitta Mitta? Yes.
6567. What frontage have you to the river? From 3 to 4 miles.
6568. How long have you known the station? Twenty-five years.
6569. How long is it since the sluicing commenced up there? Sluicing was carried on before my time, but not under the present conditions. To the best of my belief, it is about eighteen or nineteen years since the sluicing was carried on under this hydraulic system.

Past and present condition of river.

6570. Could you compare the condition of the river, so far as your station is concerned, before the hydraulic sluicing was commenced with what it is now? There has been a very great difference since this hydraulic sluicing has been carried on. As regards the land, the complete loss of land since hydraulic sluicing started amounts to something over 40 acres. That I am positive of. Between four and five years ago a survey was made of the pre-emptive right, and it was found that 25 acres had been washed away owing to the channel being filled up with tailings from those big claims.
6571. And the water making other channels? Yes, widening the channels. It has gone beyond the chain frontage in some places 4 chains.
6572. Is the damage being done now to the same extent as it was? Not for the last few months—there has been very little water in the river; we have had no floods.
6573. Are you affected by the condition of the river? No. At one time the homestead was on the bank of the river—some ten or eleven years ago. At that time the water was unfit for household use, but the house has been removed now, and the water supply is obtained from a creek.

Remedial measures.

6574. Have you any suggestion to make in regard to what should be done, if possible, to minimise the evil? I think that a great deal could be done by stacking the tailings and forming dams so as to allow the water to settle.
6575. Would that, in your opinion, affect the condition of the water. I think it would very much. If the water were stored in dams for a few hours, it would leave a great deal of the sediment behind in them. The Pioneer claim, when in full swing, sent in something over 1,000 tons a day of coarse stone—some of the stones weighing 1½ and 2 lb.—besides gravel and sand.
6576. We understood from a witness that we had to-night that measures are being taken by that company to stack their tailings? Some time since the Minister for Mines was petitioned by the landowners on the Mitta to enforce the covenants of those leases, and the company promised to leave a water-way of 250 feet, but they have never done so. *The water-way has never been more than 50 feet.*
6577. Have they done anything in the way of stacking their tailings? Very little.
6578. Would there be any difficulty in stacking the tailings? I do not think so; certainly it would be a little more expensive, but I think there is room to stack them.

Peter Sutherland, grazier, Thologolong, Victoria, sworn and examined:—

P. Sutherland. 21 Oct., 1902.

6579. *President.*] What is your name? Peter Sutherland.
6580. What are you? A grazier.
6581. Where do you reside? At Thologolong, on the Murray.
6582. At what part of the Murray is that situated? About 40 miles from Albury on the Upper Murray, on the Victorian side.
6583. What land have you? Between 15 and 20 miles of frontage to the Murray.
6584. How long have you known that locality? Over twenty years; we have had the place nearly eighteen years.

Condition of water affected by sluicing.

6585. Do you consider that the condition of the water of the Murray in the locality where your land is situated has changed during that time? *Only during the last seven or eight months.* I never saw the river dirty until last autumn, when they commenced sluicing on the New South Wales side of the Murray; that would be about 50 or 60 miles further up.
6586. At Tumbarumba? Yes.
6587. What has been the condition since? Until very lately—it is quite clear again now—it was as thick as pea soup.
6588. Does it injuriously affect you when it is in the condition you speak of? No, not at all; we have never had a flood since it has been like that.
6589. Do you use the water for domestic purposes? No, we have a spring.
6590. The effect of what you say is, that the condition of the water is bad; but, so far, you have not been seriously affected by it? So far, *it has done us no damage.* My *neighbour, 12 miles up,* informed me last year that the fish were dead in the river. I am an inspector of fisheries, and he thought I should write down about it.
6591. Is there anything else you wish to add? *During* the last three or four years this Council has spent about £50 in procuring fish for the different streams; of course, they are out in the creeks, and when they grow they get into the river, and I do not think it would be possible for them to live in that water. I have seen the Mitta at its worst, but I do not think the Mitta was ever worse than the Murray has been the last six months.

David

David Hastings Young, medical practitioner, Talangatta, sworn and examined:—

D. H. Young. 21 Oct., 1902.

6592. *President.*] What is your name? David Hastings Young.
6593. You are practising in Talangatta? Yes; I am medical officer for the shire.
6594. Do you know the Mitta? Yes; well.
6595. How long have you been in the district? Scarcely two years; so that necessarily my experience is somewhat limited.
6596. You are aware that grave complaints have been made as to the condition of the water? Yes.

Water unfit for human consumption and injurious to fish.

6597. And that it is alleged it is owing to the sluicing that is carried on? Quite so. It has only been during the last few months that I have really seen the water to any degree pure and fit for human consumption. Before that it was always of a more or less dirty appearance. From that point of view I consider the water, up till recently, has not been pure enough for domestic purposes. There is indirect evidence bearing on the question of health (which we cannot trace directly), and that is in regard to our food supply; formerly we were able to obtain a pure supply of fish locally from the river, whereas our supply at present is practically nil.
6598. Can you directly trace any sickness as the result of the consumption of the water? No.
6599. In your opinion, would the consumption of the water be likely to affect the health of the people? It could do so, unless they boiled or filtered the water; but I have no individual case in my mind which warrants my saying that it was caused by the condition of the water.
6600. I suppose the water would be polluted more or less by inorganic matter? Quite so.
6601. And therefore not likely to cause any serious trouble from the point of view that we speak of? It is both organic and inorganic, and therefore might cause injury to health.

Pollution serious in its effect on health.

6602. From what you have said, you regard this pollution as really serious from the health point of view? Yes. One reason why it has not shown itself more directly in causing illness is that the population is of a scattered nature, and there are other counteracting influences such as the fact that the majority of the people have wells away from the river and have an independent source of supply for domestic purposes.
6603. Have you any suggestion to make with a view to preventing this trouble? The only one is the general suggestion to stop the present unnatural condition of affairs in the mining.
6604. You know how difficult it would be to precipitate suspended matter of that kind? I can imagine so.
6605. *Mr. Murray.*] Referring to the pollution of the water by inorganic matter only, supposing the earth were precipitated, either by the use of a precipitant or by the lapse of time, I suppose the water would not then be injurious unless there were poisonous minerals in solution? Yes, it could be. You could have solid matter suspended—such as calcareous salts—in the water, and that in itself might be injurious to health.
6606. That would be poisonous mineral? Indirectly poisonous.
6607. Have you any means of knowing whether the water does contain any soluble minerals of that kind? No, because I have had no analysis. There have been two cases in my experience up Tallandoon way of gall stones, and I have had other cases of stone in the bladder; but I could not justly say that one was cause and the other effect.
6608. Would it be a proper course to prevent the discharge of water into the rivers when such water is polluted by possibly poisonous minerals? I think so.
6609. Suppose the water contained only mineral matter, earth, in suspension, would it then be likely to be injurious to health? Not so likely.
6610. Do you think the public safety would be sufficiently met by preventing the discharge into the river of water containing poisonous matters in solution? I am not able to state.

WEDNESDAY, 29 OCTOBER, 1902.

[The Commission met at the Board Room, Public Works Department, Sydney.]

Present:—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq. | FREDERICK N. BURCHELL, Esq.

Colin James McMaster, Chief Commissioner of the Western Lands, Sydney, sworn and examined:—

C. J. McMaster. 29 Oct., 1902.

6611. *President.*] What is your name? Colin James McMaster.
6612. You are Chief Commissioner of the Western Lands? Yes.
6613. You were President of the Royal Commission appointed by the Government to advise in respect to the western lands question? Yes.
6614. During this investigation, apart from the knowledge that you had acquired during your experience extending over some years, you had an opportunity of making yourself acquainted with the general requirements of the country west of the Lachlan? Yes.
6615. Do you know the Darling? Intimately, as far as Bourke.

Requirements of Western Division.

6616. Are you also acquainted with the Lachlan? No; I do not know the Lachlan.
6617. From your knowledge and experience, we would like you, as representing your Board, to tell us precisely what your view is, in respect to the western country as to the use of the waters of the rivers? We think that we are entitled to the entire use of our share of any available waters—that is, in proportion to our area. What I mean to say is this: that the Central Division should not be watered at the expense of the Western Division.
6618. What use would you put the waters to? At present, watering stock, and in the near future for the purpose of irrigation.

Conservation of water.

6619. How would you propose to conserve, say, the water of the Darling for the purpose of stock? I do not think it would be necessary to conserve water at the heads of the rivers; I think sufficient could be conserved in the channels to answer the purpose of watering stock. For the purposes of irrigation it would be necessary to store water near the heads of the tributary streams.
6620. By the erection of weirs? Yes, and taking advantage of high floods to conserve water in the side channels.

6621.

C. J. McMaster. 29 Oct., 1902.

6621. Do you regard it of material interest, so far as the development and settlement of the western country is concerned, that you should have the use of these waters? I look upon it as the most important factor; that, and the extension of railways.

Navigation and irrigation.

6622. Will you give us your views as to navigation; necessarily a certain amount of water would be required if navigation is to be maintained, and that would be at the expense of irrigation;—how do you regard the two questions? I look upon navigation as quite an unimportant matter as far as our Western Division is concerned, even if the rivers were locked. I consider the Western Division, without irrigation, would not produce enough material to justify a large expenditure in providing for navigation at the expense of irrigation. When country takes 10 acres to carry one sheep, there must be a very little product either inwards or outwards. Navigation would only be of practical value during the shearing time of the year; wool is the only product that would be taken away by steamers. With the extension of railways, the necessity for navigation would to a large extent disappear.

Railway extension.

6623. Is it your policy, as far as possible, to get the railways extended through the country? Yes; we have already recommended the construction of one long line of railway, and we propose later on to recommend another.
6624. So that, when these railways are constructed, the necessity for locking the Darling will disappear? For the purpose of navigation, entirely.

Mallee country most suitable for irrigation.

6625. How does the importance of the use of the water, apart from stock and domestic purposes, bulk in the mind of your Board? I would not like to commit my colleagues, as we have not considered that aspect of the question. My own impression is that, where possible, the water should be diverted to the mallee country chiefly; that I look upon as our best soil for the purpose of irrigation. The other country could be made use of in good seasons. The mallee at present is practically worthless, but it could be made profitable by irrigation.
6626. How many acres are there in your division? 80,000,000.
6627. What proportion of that would be mallee? I could not say exactly, but a great many millions of acres.
6628. Could you use as much water on the mallee as it would be possible to supply? We could use more water than we are likely to get.
6629. Where is the mallee situated? From the Murray up towards Cobar and Bourke.
6630. On either side of the river Darling? Yes, but there is not so much on the north-western side as there is on the south-eastern. I do not think the mallee extends up into the artesian area at all.

Artesian water.

6631. Do you think that the artesian water can be made use of for irrigation purposes? To a limited extent only.
6632. You do not expect, then, to use the artesian water except for stock and domestic purposes? Chiefly; and for such purposes as wool-scouring and things like that, it would be very largely used.
6633. Is there anything further you wish to say? I might say that the artesian area covers one-third of the Western Division.

Leslie Augustus Burton Wade, Principal Engineer for Water Supply and Sewerage, Public Works Department, Sydney, further examined:—

L. A. B. Wade. 29 Oct., 1902.

6634. *President.*] I see that in the particulars you gave in regard to the locking of the river Darling you supplied alternative estimates for fixed and movable weirs, and that you stated there would be a reduction, if movable weirs were used, of £500,000? Yes.

Fixed and movable weirs.

6635. Do you favour movable weirs? Yes. The first estimate is based on the lines of the scheme placed before the Works Committee by Mr. Darley; that was for locking the river between Bourke and Wilcannia. That estimate provided for fixed weirs throughout.
6636. *Mr. Murray.*] That was for locking for navigation? Yes. Of course, in using fixed weirs you are somewhat limited in the height of your lifts, but by providing movable weirs of the needle type we have increased the lift and reduced the number of locks, and I think by that means the estimate could be reduced in the way I have mentioned—by about half a million. I might say that these estimates have been rather hurriedly got out; but I think they can be taken as approximately correct.

Number of locks and weirs on Darling.

6637. *President.*] How many weirs were provided for by Mr. Darley? The details are shown. Using the lifts provided for by Mr. Darley, there would be forty locks and weirs, and to the best of my recollection we have cut about half of them out by using movable weirs of the needle type.
6638. You have prepared a type lock and weir that would be suitable for the whole of the rivers? Yes [*Exhibit* 137] with modifications as the lift increases and decreases, and as the width of the stream to be dealt with increases and decreases.
6639. You have shown in the type drawing a longer length of needle weir than you did at Parcoola? Yes.
6640. For what reason? This is a type for a 10-foot lift; Parcoola was a 17-foot lift. As the lift increases, I propose to use less needles and more sluices, and vary each weir to meet the circumstances of the case.

Modification of design.

6641. Why are you taking that course? Parcoola involved needles of, I think, about 21 feet, and handling those needles would be the most serious part of the manipulation of the weir, so we have reduced that length to a minimum, and left just sufficient for a navigation pass, and to pass the drift timber through. The needles are a cheaper form of construction than the sluices, so that, as the lift decreases and the needles become more easily handled, we increase the length of weir where needles are used and decrease the length where sluices are used.

Best form of movable weir.

6642. Which do you regard as the best form of movable weir? I think, for controlling a stream, the most perfect type you can have is a lifting sluice.
6643. Such as you have shown? Yes.

Object of needle design.

6644. I understand you have only adopted the needle portion for the sake of economy? For the sake of economy, and for the sake of providing the navigation pass for vessels immediately the river is navigable, and for the passage of timber.
6645. In view of the fact that you have got the lock, is it necessary to have a navigation pass? Yes.
6646. For what reasons? I think immediately the river rises to the navigation level you should place no obstruction at all in the way of traffic.
6647. Supposing you put the lock in the middle of the stream, and when the river rises in flood-time the gates were opened, and there were buoys to indicate the position of the lock, would it not be a proper thing

L. A. B. Wade. 29 Oct., 1902.

thing for the vessel to negotiate the lock as when the river is low? I think it would be too fine work. If you were coming down stream with a good current and a broad-beamed steamer that would just squeeze through, it would be very dangerous. When the locks are in use you have practically still ponds, and you can come in and out without any danger of collision with the lock walls.

Leakage from needle design.

6648. Is there not an objection to the needles from the point of view of leakage? No. In a paper read before the American Institution of Civil Engineers it was pointed out that, in the case of a weir 200 feet wide, by the use of screw-jacks for screwing up the needles, they reduced the total leakage to about 5 gallons per second.

6649. Supposing the needles happened to be out long enough to get dry, and they were put in position in a dry condition and screwed together in the way you have indicated, when they came to swell would not the tendency be to lift the concrete walls? No; you can screw up the body of the needles, and you can always leave one or two loose needles at the end. Another thing in connection with needles or drop-bars is that they soon take up with stuff like grass and twigs; in nearly all big streams there is sufficient vegetable matter coming down to make any construction like that water-tight.

Passage of timber in flood times.

6650. Leaving out of the question for the moment the extra cost, would you not advocate the whole width of the weir being movable gates, as shown by you, and the omission altogether of the needle weir? No. Drift timber is a consideration, too. You get large quantities of big timber down all these rivers, and I think it is necessary to provide one portion of the weir where the timber would meet with no obstruction whatever.

6651. When the river is in flood, presumably, it would be considerably above the top of the weir and the top of the lock, and consequently the whole width of the river would be available for timber? No; when it is water-logged and green, that heavy hardwood timber does not stick absolutely to the surface of the water—it will probably travel and alternately bump the bottom and come to the surface.

Width of needle portion.

6652. What is the width of the needle portion that you provide? I think 100 feet.

6653. How would you control the timber so as to direct it into this 100 feet? It is placed where the greatest current is, on the outside of the bend. Probably you will get a small amount of timber on the other portion, but you will have to look out for that.

Position of lock.

6654. What is your special reason for putting the lock on the side? To keep it out of the way of navigation when you are having unimpeded navigation, and also to keep it in the current where there will be no deposit of silt. You may have noticed at Bourke that the lock was placed on the side of the river out of the current, and the entrance is practically silted up.

6655. *Mr. Murray.*] You have had some practical experience of building locks and weirs in this State? Yes.

6656. And of managing navigation? Yes.

6657. What types of weir did you build? The type of weir at Bourke is the "Chanoine." You are somewhat limited to the height of your lift with that weir; it is only suitable for a low lift.

Northern Murray irrigation scheme taking off at Tocumwal.

6658. *President.*] You put in an estimate for the Northern Murray River Irrigation Scheme on the New South Wales side amounting to £700,000? Yes.

6659. And as an alternative you suggest that the take-off, instead of being at Bungowannah, should be at Tocumwal;—will you tell us what the estimated cost of that scheme would be? The total cost of the whole scheme (which would include the canal from the Murrumbidgee taking-off at Pevensey) would be £1,333,000. This includes the main canal and main branches. The main canal proposed from Bungowannah will be in more or less deep cutting before water can be supplied on the surface for a length of about 40 miles. We have no complete surveys, but it is estimated that the cutting involved by taking-off at the head of Tuppal Creek would be only about 16 miles, and the weir and head works required in connection with each take-off would be much the same and would cost about the same amount. Therefore, the canal from Tuppal Creek to supply the same quantity of water, and deal with the same area of land, is estimated to be some £200,000 cheaper than the one taking off from Bungowannah.

6660. Nothing, you estimate, would be saved in taking-off at Narrandera instead of at Pevensey, so far as the Murrumbidgee is concerned? No.

6661. The whole saving, therefore, would be in regard to the Murray take-off? Yes.

Arid country requires first consideration.

6662. Do you think the saving you have indicated—£200,000—is sufficient to warrant you in casting aside every other consideration? I am not casting aside every other consideration. I regard the more arid part of the country as the area requiring first consideration, and think it should be the first dealt with. The soil is of equally good quality in the more arid part. If, however, sufficient water is allotted to us from the Murray to deal with the upper part, then I should say go on with the upper canal from Bungowannah.

6663. You know that an examination of the country is being made by Mr. Allen, the Agricultural Expert connected with the Agricultural Department? Yes.

Interests to be considered in deciding merits of irrigation schemes.

6664. Supposing when he comes to give evidence, which will be in the course of a few days, he reports to us that the land that would be served—although more arid, as you say—would not be so suitable as the land that would be served by the upper take-off at Bungowannah, would that modify your views? It all depends on the view that Mr. Allen takes of it. If he looks at it from a horticultural point of view, for fruit-growing, or purely for intense cultivation, it would not modify my view. I take it that we have to make that arid land capable of profitable occupation, and it may be that perhaps on each holding an area equal to one-twentieth of it might be put under lucerne or some crop to assist in carrying stock. Then, again, we have to look upon the canal from the point of view of providing water for stock purposes also, filling tanks, and such like purposes.

6665. Supposing Mr. Allen comes to the conclusion that for mixed farming the land below Tocumwal, which would be served by your alternative scheme, is not so suitable as the land above Tocumwal in the direction of Howlong;—what would you say? I should say it requires to be balanced then as to which of the two would be in the best interests of the State—whether the whole of the water is to be put on the land where there is already a good rainfall and the productiveness of that land increased, and the other land left to go from bad to worse.

6666. Would you hold that distributing the water to squatters, who have a limited area under cultivation, probably one-twentieth of their holdings, would not pay? When we have the actual cost of the canal supplying the water, that is a matter that will have to be thrashed out; we will have to take very careful evidence on that point—as to what they can afford to pay. Personally, I am of opinion that it would pay to

to construct a canal from the Murray at Tocumwal, and from the Murrumbidgee at Pevensey, to supply water through that arid country for stock purposes and for a small amount of irrigation.

L. A. B. Wade. 29 Oct., 1902.

6667. Would this fact have any weight with you in modifying your opinion: You know that in the vicinity of Berrigan, and upwards towards Howlong, there is not only good country but there is a good class of men there, and you know that below Deniliquin there is very little settlement, and consequently very few men;—do you not think, therefore, seeing that the personal element in connection with irrigation is of such great moment, that it has to be thought of in forming an opinion as to whether irrigation works should be carried out? I think the fact of good men being already settled there shows that there is not nearly the same necessity for irrigation as there is down below.

6668. What I want to get at is, whether we should make use of these good men? You may probably induce these good men to go down where the water is.

6669. *Mr. Barchell.*] And make use of more land? Yes.

Bungowannah v. Tocumwal canal.

6670. Which would give the greatest benefit or relief to the dry country of New South Wales for the same expenditure—the weir and channels at Bungowannah or at Tocumwal? I consider the canal from Tocumwal would give the most relief.

6671. *President.*] Your officials have made surveys of the proposed reservoirs in the Upper Murray district? Yes; the plans that I put in [*Exhibit* 138] show the contours from Cumberoona up to the head of the Talmalmo proposal.

Proposed Cumberoona, Thologolong, and Talmalmo reservoirs.

6672. Is there anything else? I also put in a longitudinal section and cross-sections of the proposed dam at Cumberoona. [*Exhibit* 139.] I have not taken out any estimate of the proposed dam at Talmalmo on account of the foundations. Our borings showed a deep gutter going to the full length of the boring tools we had at the time, 60 feet, and it was not bottomed then. I select Cumberoona as the most suitable site on the grounds of capacity and cost. I also put in a sheet [*Exhibit* 140] showing a cross-section at each of the proposed sites at Cumberoona, Thologolong, and Talmalmo. The sections show the borings at each site, and the capacities of the storage for each 10 feet in depth. By this it will be seen that at Cumberoona there is a storage of over 25,000 million cubic feet available with a dam of 70 feet to F.S.L.; at Thologolong a dam of 100 feet to F.S.L. will store 27,000 million cubic feet; and at Talmalmo a dam of 100 feet to F.S.L. will store 19,000 million cubic feet.

6673. What is the estimated cost of the Cumberoona dam having a total capacity of 25,367 million cubic feet? I estimate the cost, exclusive of land, at £670,000. At the Cumberoona site, which gives us the greatest storage with the least depth of water, we can construct an earthen dam. I have satisfied myself that the Cumberoona site is the most economical for the storage of water.

Details of Cumberoona scheme.

6674. Is there anything else? From the longitudinal section of the Cumberoona dam, which I put in [*Exhibit* 139] it will be seen that it is proposed to pass the flood water through sluices without raising the T.W.L. of the dam. In dealing with the foundation across the river flat, where the rock is the greatest depth below the surface, the estimate provides for dredging a channel across the whole width of the flat, depositing the dredged material on the back slope of the dam, and filling up this dredged channel with selected material and gravel.

Discrepancies in gaugings.

6675. You desire to make a statement in regard to the gaugings? The tabulated statement on page 141 of the evidence, supplied by Mr. Checchi, shows in one column the annual discharges from the catchment of the river Darling, and I wish to draw attention to the discrepancy between that statement and the statement of the discharges in respect to the Darling that I put in at the beginning of the inquiry, and in this connection I put in *Exhibit* 144. I also put in plan and longitudinal section of the River Darling, from Wentworth to Walgett, showing moveable weirs. [*Exhibit* 145.]

MONDAY, 3 NOVEMBER, 1902.

[The Committee met at their Offices, Modern Chambers, Collins-street, Melbourne.]

Present—

JOSEPH DAVIS, Esq. (President).

STUART MURRAY, Esq.

William John Allen, Fruit Expert, Agricultural Department, New South Wales, examined:—

W. J. Allen. 3 Nov., 1902.

6676. *President.*] At the instance of the Government of New South Wales, you have made an examination of the country between the Murray and the Murrumbidgee, below the proposed off-takes at Bungowannah and Narrandera? Yes.

6677. You have prepared a report, giving your opinion of the country generally, in view of irrigation? Yes, and pointing out what I consider the best part.

6678. Will you read it?

The Under-Secretary, Department of Public Works, Sydney.

Sir, *Department of Agriculture, Sydney, 6 October, 1902.*

Country inspected.

Acting under instructions from the Minister for Agriculture, I was deputed to inspect, on behalf of your Department, the country lying between Gol Gol, Balranald, Hay, Deniliquin, Berrigan, and Corowa, and to report to your Department as to its suitability for irrigation, and to point out which portions would, in my opinion, give the best results for either fruit-growing or farming under irrigation.

Balrana district.

On the 8th of September, I left for Balranald, from whence I made a start. The land in the immediate vicinity of Balranald I found to be rather patchy and rolling, and it was not until the town was left a few miles behind that fairly even country was seen. The timber found growing on this soil is chiefly mallee; in places a little belar and sandalwood, with very narrow ridges of pine and occasional open flats, mostly covered with dillon bush, were passed. Most of this country is underlaid with a large deposit of limestone, mixed through the subsoil. In some places there are from 12 to 24 inches of good loamy soil before this is reached, but in many places it is only a few inches below the surface, in which latter case the land would be found so hard to till as to be practically useless for farming purposes. The deeper mallee soil, however, which is underlaid with the pebbly limestone is some of the best lucerne land, and in no part of the State or country here, or in other parts of the world which I have visited, have I seen better crops of lucerne growing than in this quality of soil, when assisted by irrigation. Better country is reached at a distance 5 to 7 miles from the town, where there are some good sized areas of deep mallee soil, suitable for farming, provided water were available. Wherever deep red mallee soil is found with a few pines growing among the mallee, good grapes, such as sultanas, raisin grapes, currants and wine grapes, can be grown, but the soil is of very little value for growing fruit-trees of any description, unless, perhaps, olives, which would do remarkably well on such soil. On the Paika station some very fair lucerne land was seen, but

W. J. Allen. 3 Nov., 1902.

but it was patchy. In driving through Yanga station no tracts of land of any size upon which I could recommend putting water were passed, much of the land being suitable only for grazing purposes, being very open and, in places, wind swept. The blue-bush soil would be the most suitable for lucerne growing. The timber found growing on this station is chiefly bull oak, myall, and box, with an occasional small pine ridge. Entering this station on the south-eastern corner along the old Deniliquin road some very fair-sized areas of pretty good mallee and pine land are passed; yet, in between these good portions there is considerable heavy country, and it is questionable, in face of the fact that in other places large areas can be secured in one block, whether it would be worth while considering putting such lands under water.

Keri Keri.

On Keri Keri station the country, generally speaking, is not so good as that on Yanga. There are a few small tracts of blue-bush country which would grow fair lucerne, but most of the country is very open and exposed to the winds, and of little value for anything but grazing purposes, much of the soil being rather heavy in character.

Moolpa.

Travelling from Keri Keri to Moolpa, I passed through some very good red mallee soil within a few miles of the Moolpa woolsheds. There are several thousand acres here suitable for lucerne, hay, grape, and olive growing, if cleared and put under water, but at present it is heavily timbered with mallee.

Balranald, Tin, Bidura.

Again travelling from Balranald to Tin, on the Paika station, I passed through some good red mallee country suitable for lucerne and hay growing. From Tin to Bidura, on the back part of the station, the country is chiefly plain, salt-bush, dillon and blue-bush, and of little value for anything but grazing, as, in most places, the soil is a heavy clay.

Bidura, Prungle.

Between Bidura and Prungle, on the back of Euston station, the country is chiefly mallee with occasional dillon and open plains, until within a few miles of Prungle house, when there is a large blue-bush plain, but the soil here is inferior. From Prungle House to Euston is chiefly mallee country, with occasional porcupine hills, until within a mile or so of Lake Taila. A considerable area of this mallee country would, if water were available, make fair farming country, but in its present condition, without water, it is of little value. Skirting the lake is a fringe of good red soil, covered with pine and mallee, which would be suitable for either fruit-growing or farming. The land extends for several miles, but it only covers back one or two ridges dividing the box flats or frontage from the mallee at the back. The area of good country would be rather small for starting a decent irrigation settlement. The narrow strip of good land must extend about 15 miles at least, and runs past the back of Euston township to the north and west.

Euston.

In the immediate vicinity of Euston the country is chiefly box, little of which is of any value for growing crops under irrigation. The only portion which might be of any value would be the open paddock lying to the north and west of the town, where a few hundred acres might give fair results if used for cropping.

Cowl Tank.

Between Euston and Cowl Tank, to the north, after leaving the box country near the town, is some fairly good farming country—red soil, chiefly timbered with pine and mallee. After leaving this, a lot of inferior mallee country is passed for a distance of about 10 miles, comprising porcupine hills, covered with whipstick mallee, and with limestone very near to the surface—in fact, in places there are outcrops of this stone, and very little herbage of any kind was visible.

Bulbuc Tanks, Butt Hat.

From this point to Cowl and Bulbuc Tanks lies some very fair mallee country, suitable for farming purposes; but from Bulbuc Tanks to Butt Hat the country is very rolling, and of little value for anything but grazing.

Euston, Gol Gol.

Again travelling between Euston and Wickett's, there is a lot of poor mallee country, with, in patches, a little good land; but from Wickett's, on to Gol Gol, I passed the largest area of good land yet seen in any one place. In all, there must be at least 20,000 acres of good fruit-growing and farming country lying almost along the route taken by the coach. It is a long, narrow strip, in some places about a mile in width and in others from 2 to 3 miles in width. This land is at a considerable height from the river, and at different points has high ridges running right up to it. This latter is the best and most suitable tract of land which I have yet inspected, and is well worth a further inspection in order to take levels and ascertain whether there would be any difficulty in placing water on this land.

Mr. Wicketts informed me that he had a paddock which he has sown with wheat for the last eight years, and has only succeeded in harvesting one decent crop, with one or two very light ones, and from experience I have had on that country, I consider this soil absolutely useless for farming purposes without irrigation, but given a fair supply of water there is nothing which could not be grown.

Toogimbie. Tchelery Homestead. Nap Nap. Yanga.

After a lapse of a week, I again proceeded to inspect the part of the country lying between Hay, Balranald, and Corowa. Leaving Hay on the morning of the 9th October, I drove in a westerly direction as far as Toogimbie, taking a good look at the country lying in this direction. From Toogimbie, across the whole length of the station, I drove in a southerly direction as far as Tchelery Homestead, inspected the back part of the Keri Keri station, Nap Nap, and the upper part of Yanga, and, generally speaking, I do not consider the country suitable for irrigation. On Tchelery, Nap Nap, and Yanga, there are small areas which might produce fair crops (with irrigation); but, as a whole, the country hereabouts has a heavy subsoil, and the greater proportion of the soil in the stations through here is of a heavy black character, which, if put under water, would be found almost impenetrable by the latter within a reasonable time, and when the soil became dry after an irrigation it would harden and crack, and unless the water could be applied sparingly and often crops would not do well. As a matter of fact, it would be a waste of time to try and cultivate most of this soil, as the expense would eat up all the profits derived from irrigation. As for running a channel through this country for the purpose of watering the stock, I should hardly think the expense justified, as in many places the stations are striking well water, which, though salt in the majority of cases, still in some instances good fresh flows have been struck, and it is my opinion that if they had the feed there they could find plenty of good well water to supply more stock than they could possibly carry. This country is level, and had the soil been good it could have been easily irrigated, but the soil being of such a heavy nature, and without any natural drainage, it would set like a brick when water was applied, and neither lucerne nor cereals could possibly do well except on the blue-bush or sandy ridges, which are found in spots on the back of the runs.

Balranald. Windomal.

Between Balranald and Windomal there lies a fair strip of country, portion of which is plain, the balance being mallee, hop-bush, pine, and belar. Some of this would give good results under irrigation, more especially that portion lying close to the Murray and Edwards or Wakool Rivers, and generally known as Windomal, on the Canelly run, where there is a large area of good pine and mallee country, extending for a distance of from 10 to 12 miles, and having a width of from 1 to 3 miles. If put under water this area would give first-class results, and is particularly adapted for fruit-growing and farming; its elevation is certainly rather high, but if water could be diverted from the Murray anywhere up the river, and run into the Edwards or Wakool at a point above Moulamein, it could be diverted and taken by gravitation to this country. Even by this means there would, perhaps, still be a portion of this land found too high for the water; if so, it would be a very easy matter to lift a volume of water on to the higher portions, and at very small cost, as I should imagine the highest point would not exceed at the most 20 feet above the position reached by gravitation. The country is equally as good as that hereinbefore referred to as Mallee Cliffs, near Gol Gol.

Tooleybuck.

After leaving this part and travelling to Tooleybuck, on the Murray River, the country was of a heavy character until within about 2 miles of Tooleybuck, where some good mallee and pine country was again struck, extending in length about 8 miles and of about 2 miles in width. This also is rather high and rolling, and would, I imagine, be rather difficult to place under water. It would be worth while, however, to have levels taken, in order to ascertain whether it could be placed under water at a reasonable expense.

Poon Boon, Moulamein.

After leaving here I drove on over Poon Boon homestead, *via* McKenzie's Crossing, to Moulamein, but did not see much country that would be of any value, except a few small ridges which were covered with mallee and pine, but which, I imagine, would be too small to be of any use. Between Moulamein and Morago the country was very open, being sparsely covered with dillon-bush chiefly, with, in places, clumps of box. The soil here was chiefly black clay, with a few spots inclined to be loamy, but on the whole it was unsuitable for irrigation. After leaving Morago for Deniliquin, *via* Pretty Pine, some fair soil was passed in places, but from this point (Pretty Pine) into Deniliquin it was chiefly a heavy clay of little value for irrigation. The best land which I saw in close proximity to Deniliquin was that lying to the east, on the Tuppal-road, and extending out about 6 miles, where some moderately fair clayey loam was passed, and which might give fair results for farming and dairying purposes if placed under water. From here to the 20-mile post the soil was very changeable in character, patches of good and poor being mixed all through. The next 5 miles the soil is a heavy black clay, being practically valueless for irrigation. The surface soil in many portions of this country is rather shallow, and whereas in many places it is of a loamy nature, the subsoil was found to be rather heavy, and therefore the natural drainage would be poor. The land would, however, I consider, grow fair crops of lucerne and cereals, but would be of little value for fruit-growing. In every case the water would have to be applied in moderation if anything like fair results were to be obtained. From this 25-mile post into Tocumwal the land improves, is slightly rolling, and with but few exceptions the soil is of a loamy nature, in places quite sandy, some of which would be suitable for fruit-growing, and a greater portion of which would give fair results for farming purposes.

Morago. Deniliquin.

Tocumwal.

Continuing

W. J. Allen. 3 Nov., 1902.

Continuing from Tocumwal towards Jerilderie there is considerable good loamy soil, with occasional inferior areas, the best land being passed close to the 8 and 9 mile posts. Again, from Finley to the 17-mile post is found some more excellent land, but from here on much of the land is heavy until one reaches Jerilderie, when some fair soil only is again seen.

Jerilderie. Berrigan. Savernack. Corowa.

Travelling from Jerilderie to Berrigan by rail, there are patches of good and bad soil until Gum Swamp road is left behind, when good country is seen, and from here on to Berrigan most of the land is of good quality, equal to the best portions seen at the 8 and 17 mile posts between Tocumwal and Jerilderie, and there is considerable good country lying between Berrigan and Finley. Leaving Berrigan, and travelling east towards Savernack, there is a fine tract of good country passed, reaching almost to Corowa, and extending as far as I could see in many places on either side of the coach road. There are small patches here and there of inferior swamp and heavy soil, but, generally speaking, this is the best country I have yet seen, where such a large tract of good, practically level land could be secured, where a good supply of water could be made available, as there is good land from Corowa to the Tuppal station; but the pick of the country lies between the boundary of Ringwood nearest Corowa, and extends through to Finley, and I think I am right when I estimate that three-quarters at least of this land is country suitable for fruit-growing and farming were water available for irrigation.

Best country.

Summary.

During the six weeks I have been inspecting country I have travelled over as much country as I could between Corowa to Gol Gol, taking in all that lying around Euston, Balranald, Hay, Moulamein, Deniliquin, Tocumwal, Finley, Jerilderie, Berrigan, Savernack, and Corowa. Generally speaking, I found that much of the country was of such a heavy nature as to discourage the expectation of anything like good results from irrigation. There is much of the mallee country which, if water could be applied to it, would produce some of the best lucerne; but without water, in my opinion, it is practically useless for other than grazing purposes. Certain portions are certainly good for fruit-growing, viz., those on Mallee Cliffs, and from there to Gol Gol; also at Windomal, where a large tract of good mallee country seems to stretch towards Moolpa and Balranald, as well as along the banks of the Wakool, and comprising many thousands of acres, the whole of which is suitable for lucerne and wheat-growing, dairying, &c., and a large part suitable, as I said before, for fruit-growing.

At Tooleybuck there is a small area, which, if placed under water, would produce some of the best quality of drying and citrus fruits. There is also some good fruit-growing soil found in the country between Finley, Berrigan, and Corowa.

By road from Corowa to Gol Gol is upwards of 350 miles; and during the short space of time which I have been able to devote to the inspection of country, I have only been able to see a small portion of such a vast stretch of country; and while I consider I have seen about the average, it is possible there may be other good areas in country not seen. I feel sure that if water can be put on one or all of the four or five favourable tracts referred to that good results could be obtained.

In the mallee and limestone country the channelling would be more expensive than on the heavier country; but when once the channels were constructed, the returns from the land would more than justify the expenditure.

I have, &c.,
W. J. ALLEN.

Country unsuitable for irrigation.

6679. You have stated in your report that, so far as you have been able to ascertain by examination, the country west of Deniliquin, with the exception of two or three spots which you have indicated, is not suitable for irrigation? Yes.

Gol Gol suitable for irrigation.

6680. One of those spots is in the vicinity of Gol Gol, nearly opposite the Mildura Irrigation Settlement? Yes.

6681. What is the area there? About 20,000 acres.

Gravitation possible.

6682. Would pumping be necessary at that place? You might bring water by gravitation from the Murrumbidgee or the Murray, but failing that it would be necessary to pump.

Pumping lift.

6683. What would be the lift? Seventy feet as a maximum.

Irrigable area near Euston.

6684. You have also indicated that there is some suitable land in the vicinity of Euston? Yes; to the east, west, and north of Euston.

6685. What area? About 20,000 acres.

Altitude.

6686. Would that be as high in relation to the river as the Gol Gol land? Very nearly; but I could not say definitely. It lies back from the river, in the vicinity of Lake Taila.

6687. Did you examine Lake Taila to see whether it could be used to pump from? No.

Irrigable area near Balranald.

6688. The next piece of land you indicated as being suitable for irrigation lies in the fork between the junction of the Murray and Murrumbidgee, in the vicinity of Balranald? Yes.

6689. What is its extent? About 8 to 12 miles wide and 15 miles long—running from 5 miles west of Windomal to the Wakool Crossing.

Gravitation possible.

6690. How would you propose to irrigate that area? The water would have to be diverted from the Murray into the Edwards at some point sufficiently far up to allow of its being gravitated on to the land.

6691. Is it your opinion that if the necessary water were diverted from the Murray into Tuppal Creek, the Edwards River, or the Gulpo Creek, it could be conveyed on to the land which you consider suitable for irrigation, and that artificial channels would not be necessary for bringing water across country from the Murray? I think water could be diverted into the Edwards and gravitated on to the land.

Irrigable area near Deniliquin.

6692. Did you find any land which you considered suitable for irrigation between Deniliquin and Finley? I found a little fair land round Deniliquin—not what I call good land, but crops such as lucerne could be grown on it. This land extends from Deniliquin along the Tuppal-road for about 6 miles. I could not give the area, as I do not know the width, but I believe there is a good stretch of country there—perhaps 10,000 acres; and I should say fully half of it would answer very well for farming, if water could be applied to it. From 15 miles to 20 miles out it is fair country—part of which is suitable for irrigation; from 20 to 25 miles the country is practically useless for irrigation; and from 25 miles on to Finley the land improves, a larger proportion being suitable for farming under irrigation. Some of it is particularly good, being light, sandy, and suitable for fruit-growing.

Proportions of irrigable land.

6693. What, in your opinion, is the proportion of country suitable for irrigation, taking the following townships as a boundary—Tocumwal, 10 miles west of Finley, Jerilderie, and Corowa? I should say two-thirds of the area—say, 600,000 acres. Beginning 10 miles west of Finley, there would be about three-eighths of the country irrigable. From Finley on to Berrigan the country gets better, and probably one-half to two-thirds is suitable for irrigation. East of Berrigan and on to Savernack is the best country; and passing through the Ringwood station it is particularly good, nearly all of the land being fit for irrigation, with very little broken country.

Land which should first be irrigated.

6694. From what you have seen of the country, if you were asked your opinion as to which portion should be irrigated in the first instance—the piece between Finley and Goolwa or between Finley and Deniliquin, then on to the west of Deniliquin,—what would you say? If water is only available for one part, I would start on the dry country near Windomal and Gol Gol. That country is all suitable for dairying, farming, and fruit-growing, and in parts is better than the country near Berrigan, but has no reliable rainfall.

6695. I understand you to mean that where the rainfall is lowest the people most require water? Exactly so.

6696.

W. J. Allen. 3 Nov., 1902

6696. Therefore, if money can be spent in one place only, you are in favour of its being spent in the dry country? Yes.

Relative value of irrigation and navigation.

6697. From your knowledge of the country, having been acquainted with it some years—first at Mildura, and since then in the service of the New South Wales Government—what, in your opinion, is the relative value of irrigation and navigation? I think if you do not get irrigation you cannot hope to open up and settle the country. Without irrigation there will be comparatively little use for navigation.

6698. *Mr. Murray*] You were at Mildura? Yes; for five or six years.

6699. Were you with Messrs. Chaffey Brothers? Yes.

6700. You were their Fruit Expert? Yes.

Prospects of agricultural settlement on Victorian mallee.

6701. Do you know the Victorian mallee? Yes.

6702. What do you think of the prospects of agricultural settlement there generally? Without water it is impossible. The land is no good as it is.

WEDNESDAY, 5 NOVEMBER, 1902.

[*The Commission met at their offices, Modern Chambers, Collins-street, Melbourne.*]

Present:—

JOSEPH DAVIS, Esq. (President).

FREDERICK N. BURCHELL, Esq.

Alfred Henry Chesterman, Licensed Surveyor, New South Wales, and Authorised Surveyor, Victoria, of Albury, sworn and examined:—

A. H. Chesterman. 5 Nov., 1902.

6703. *President.*] What is your name? Alfred Henry Chesterman.

6704. You are an officer of the Lands Department, stationed at Albury, in charge of that land district? Yes; also a licensed surveyor of New South Wales and an authorised surveyor of Victoria.

6705. In your official capacity you have prepared estimates of the value of land which will be affected by the proposed reservoirs at Cumberoona, Thologolong, and Talmalmo? Yes.

Lands affected by proposed reservoirs at Cumberoona, Thologolong, Talmalmo.

6706. Will you give us the result of your labours? The lands privately owned within the submergence area have been valued in accordance with the contour as shown on the two maps which I put in [*Exhibits 141 and 142*], and which were supplied to me by the Works Department of New South Wales. On these exhibits, the top submergence contour is shown by a blue line, the boundaries of the properties I have shown by red lines, and the edges of the alluvial flat lands are shown by green lines. In making my valuations, I have valued the lands and the improvements within the submergence contour, and also submitted estimates as to the depreciation of properties as a whole. I will now read my report:

Estimates approximate.

1. The estimates of quantities and values supplied on schedules [*Exhibit* 143] and summaries are approximate, and are dependent upon the accuracy of the plans supplied for my guidance, which are herewith, and are marked *Exhibits* 141 and 142. Upon these plans I have shown boundaries of properties and reputed owners thereof, also by dark green lines the edges of alluvial lands.

Values estimated on a freehold basis.

2. The values of all lands are estimated upon a freehold basis. As a "set-off" against this, the amounts owing to the Crown on conditional purchase lands will have to be considered in any detailed estimate. To ascertain these balances owing—at any rate, so far as New South Wales lands are concerned—would require an exhaustive investigation into the Treasury books, as they vary so much, and every conditional purchase will require independent investigation. Conditional lease lands in New South Wales, where the right to convert exists—rendering the title indefeasible—have been treated as conditional purchase lands, but terminable leases have been excluded from my estimates, although the improvements thereon have been included where the lessee is entitled to claim their value.

Improvements.

3. In connection with the matter of improvements, it will be noticed that many of them, such as homestead buildings, &c., have a certain removal value. This will necessarily vary considerably according to state of repair, quality of material, circumstances of each case, &c., and would represent only a small proportion of the values quoted by me, which are present values under the conditions in which the improvements exist.

Closer inspection might modify estimates.

4. Viewing the compensating circumstances—amounts owing to Crown and removal value of any improvements,—it would appear as if my estimates should be reduced; but on the other hand, the claims that will probably be put forward for forced resumption, general depreciation of back lands by the severance of alluvial frontages, &c., must be considered, and, as the estimates I have submitted to meet these claims must necessarily be regarded as approximate, it is advisable that some margin should be retained. It is also apparent that a final settlement of these claims will necessitate a close investigation into each property, as in very few cases are the circumstances and conditions similar. From inspections in some instances, and a good general knowledge of back lands in others, I have prepared my estimates under this head, but closer and more detailed inspections in some cases (necessarily occupying more time than is warranted at this stage) might result in several modifications. Suffice it to say that I can adduce reasons for each estimate.

Owners should retain their lands, and be compensated for depreciation.

5. In many instances whole properties will require resumption; but, as a general rule, I would favour the principle of allowing owners to retain their severed lands and compensate them fairly for the depreciation caused to these lands by the severance of the alluvial frontages. When the remnants are not sufficient to maintain independent homes, the owners will dispose of them to adjoining holders, doubtless with advantage in many instances. This method would in the end prove more satisfactory and economical to the Crown than the resumption outright of large areas of inferior back lands, on which the cost of administration and subsequent disposal would be excessive in proportion to their values.

Estimates liberal.

6. On the lands actually within the submergence area I have endeavoured to submit liberal estimates, and would not anticipate much opposition, if any, to these. As regards the question of severance and depreciation, some extravagant claims would doubtless be submitted, but under this heading I have endeavoured to be fair in the estimates submitted, viewing the circumstances of each case and the extent and possibilities of the severed lands, either for holding or disposing to adjoining owners. Still, as before stated, these estimates are submitted as approximate, since detailed values on this point would involve considerable investigation and occupy much time. One factor impossible to determine is that of sentiment. On some few properties that would be submerged the owners have resided for the greater part of their lives, and to relinquish in old age homes hallowed by the associations of a lifetime represents a loss which cannot be estimated from a monetary point of view.

Sentimental considerations.

Quality of lands varies considerably.

7. The lands requiring resumption vary considerably, rich alluvial flats being in many instances "backed up" by poor hills. In some cases good undulating country extends back from the flats. Alluvial flat lands have been valued unimproved at from £4 per acre up to (in a few cases) £9 per acre, according to quality, situation, &c. Undulating forest land of good quality has been valued unimproved at from £2 per acre to £5 per acre, and ridgy and hilly lands at from 20s. to 35s. per acre. In one or two instances I would have gone below 20s. per acre for stony hills, but, in view of the fact that the land had been selected at this price, did not consider it advisable to do so. In valuing the parts of properties within the submergence area, I have in every case determined the extent of alluvial flat, undulating forest, and ridgy or hilly land.

Present increased value of land not permanent.

8. The comparative uniformity of climatic conditions in this district, droughts, as understood in the western country, being practically unknown, has during the past few years given an added value to property along the Upper Murray Valley; but it is questionable whether the whole of the increased value can be regarded as permanent. With a return of good seasons in the Lower Riverina and the western country the demand for mountain country must necessarily lessen, and I do not think that anyone anticipates a maintenance of the exceptionally high rentals that have recently been paid for grass lands in the district under reference.

9.

A. H. Chesterman. 5 Nov., 1902.

9. There are two main roads along the Upper Murray Valley, one on each side of the river. Both of these roads will be submerged in parts, and a reference to maps—*Exhibits* 141 and 142 herewith—will show to what extent. In the event of it becoming necessary to form new roads above the top submergence contour, a great deal of sideling cutting will be involved. To clear, cut, form, and culvert roads in this class of country is not likely to cost much under £600 per mile.

Cumberoona, Thologolong, and Talmalmo.

Summary of particulars, as per detailed schedule (*Exhibit* 143), in connection with Land Resumption involved in the construction of Storage Reservoirs at Cumberoona, Thologolong, and Talmalmo (as deduced and estimated from information supplied to me on *Exhibits* Nos. 141 and 142):—

		acres		acres.
1.	Approximate area of submergence, as per plans supplied marked A and B...		N. S. Wales,	
			Victoria,	,,
2.	Approximate area of privately owned lands that will be submerged, as per plans A and B.	24,415 ,,	N. S. Wales,	12,045 ,,
			Victoria,	12,370 ,,
3.	Approximate area of Crown lands (including terminable leases) that will be submerged, as per plans A and B=(1)—(2).	,,	N. S. Wales,	,,
			Victoria,	,,
4.	Number of private properties affected (exclusive of terminable leases).....	112 ,,	N. S. Wales,	50
			Victoria,	62
5.	Number of landowners affected (not including any who are lessees only)..	93 ,,	N. S. Wales,	41
			Victoria,	52
6.	Number of homesteads that will probably be submerged, and will require removal.	67 ,,	N. S. Wales,	32
			Victoria,	35
7.	Estimated unimproved freehold capital value of privately owned lands that will require resumption in the event of the construction of dams at Cumberoona, Thologolong, and Talmalmo	£119,210	N. S. Wales,	£52,777
			Victoria,	£66,433
8.	Estimated value of improvements thereon (schedules show removable and irremovable).	£42,353	N. S. Wales,	£18,902
			Victoria,	£23,451
9.	Estimated total value of lands and improvements..	£161,563	N. S. Wales,	£71,679
			Victoria,	£89,884
10.	Estimated necessary additional expenditure as compensation for depreciation of properties through resumption of good lands from (in very many instances) inferior back lands.	£33,680	N. S. Wales,	£18,300
			Victoria,	£15,380
11.	Estimated total cost of resumption of privately owned lands in connection with construction of storage reservoirs at Cumberoona, Thologolong, and Talmalmo.	£195,243	N. S. Wales,	£89,979
			Victoria,	£105,264

6707. The statement you have read relates to the three dams proposed on the Upper Murray;—will you supply similar information with regard to those dams separately? I can do so with regard to Cumberoona and Talmalmo. It is as follows:—

Cumberoona.

Summary of particulars, as per detailed Schedule (*Exhibit* 143) in connection with Land Resumption involved in the construction of Storage Reservoir at Cumberoona, Murray River, as deduced and estimated from information supplied to me on Plan A (*Exhibit* 141).

Approximate area of privately owned lands that will be submerged, as per blue contour on plan A, from the Cumberoona dam site to the Thologolong dam site, and thence including roughly alluvial flat lands only from that site to a point where the backed-up water would tail into the river banks.	13,950 acres.	N. S. Wales,	6,330 acres.
		Victoria,	7,620 ,,
Number of private properties affected (exclusive of terminable leases) ..	67 ,,	N. S. Wales,	30 ,,
		Victoria,	37 ,,
Number of land-owners affected (not including any who are lessees only) ...	57 ,,	N. S. Wales,	26 ,,
		Victoria,	31 ,,
Number of homesteads that will probably be submerged and will require removal.	43 ,,	N. S. Wales,	20 ,,
		Victoria,	23 ,,
Estimated unimproved freehold capital value of privately owned lands that will require resumption in the event of the construction of a dam at Cumberoona.	£76,250	N. S. Wales,	£31,363
		Victoria,	£44,887
Estimated value of improvements thereon (schedules show removable and irremovable).	£23,970	N. S. Wales,	£10,467
		Victoria,	£13,503
Estimated total value of lands and improvements	£100,220	N. S. Wales,	£41,830
		Victoria,	£58,390
Estimated necessary additional expenditure as compensation for depreciation of properties through resumption of good lands from (in very many instances) inferior back lands.	£16,980	N. S. Wales,	£ 8,600
		Victoria,	£ 8,380
Estimated total cost of resumption of privately-owned lands in connection with construction of storage reservoir at Cumberoona.	£117,200	N. S. Wales,	£50,430
		Victoria,	£66,770

The above estimates are given as approximate only, as plan A does not supply the whole of the Cumberoona top submergence contour. This contour is supplied from Cumberoona to the Thologolong dam site, and the point above this site, where the backed-up water from the Cumberoona dam would tail into the river banks, is also indicated from information supplied. Between the Thologolong site and this point I assumed a contour varying but little from the edges of the alluvial flat lands.

Talmalmo.

Summary of Particulars, as per Schedule (*Exhibit* 143) in connection with Land Resumption involved in the construction of Storage Reservoir at Talmalmo, Murray River, as deduced and estimated from information supplied to me on Plan B (*Exhibit* 142).

Approximate area of privately-owned lands that will be submerged, as per Plan B.	7,307 acres	N. S. Wales,	4,325 acres
		Victoria,	2,982 ,,
Number of private properties affected (exclusive of terminable leases)	38 ,,	N. S. Wales,	16 ,,
		Victoria,	22
Number of land-owners affected (not including any who are lessees only)	33 ,,	N. S. Wales,	13
		Victoria,	20
Number of homesteads that will probably be submerged or will require removal	19 ,,	N. S. Wales,	6
		Victoria,	13
Estimated unimproved freehold capital value of privately-owned lands that will require resumption in the event of the construction of a dam at Talmalmo, as suggested.	£33,763.	N. S. Wales,	£18,314.
		Victoria,	£15,449.
Estimated value of improvements thereon (schedules show removable and irremovable.	£14,817.	N. S. Wales,	£ 6,712.
		Victoria,	£ 8,105.
Estimated total value of lands and improvements	£48,580.	N. S. Wales,	£25,026.
		Victoria,	£23,554.
Estimated necessary additional expenditure as compensation for depreciation of properties through resumption of good lands from (in very many instances) inferior back lands.	£12,300.	N. S. Wales,	£ 8,830.
		Victoria,	£ 3,470.
Estimated total cost of resumption of privately-owned lands in connection with construction of storage reservoir at Talmalmo.	£60,880.	N. S. Wales,	£33,856.
		Victoria,	£27,024.

This estimate includes the resumption of the whole of the main part of the Talmalmo Estate, although some of it is below the dam site, but this course is rendered necessary by the position of the proposed by-wash. The Talmalmo and Burrowye homesteads are both below the dam site, but as they would be immediately under the dam, if constructed, would require removal. The above estimates include their values.

A. H. Chesterman. 5 Nov., 1902.

6708. *The schedule giving particulars of how you arrive* at the valuations you have supplied you put it for the information of the Commission? *Yes.* [*Exhibit* 143.]

6709. You have read the statement prepared by Mr. Small, of the Works Department, New South Wales, in regard to the waters of the Upper Murray, and which he put in as evidence on the 16th October last? Yes.

Experience of country above Albury.

6710. Will you tell us what you know about the Upper Murray country, above Albury? I have had an experience of that part of the country extending over seventeen years, and have carried out surveys on the Swampy Plain River, in order to define its position, also on the Indi River, in connection with the defining of the boundary of the State. While engaged on this work I had excellent opportunities of observing the various creeks running into these rivers.

Proportion of flow of Murray contributed by New South Wales and Victoria.

6711. You will notice that Mr. Small made certain gaugings of streams above Jingellic, and the conclusion he came to was, that at the time those gaugings were taken—September and October—21 per cent. of the total supply was coming from Victoria, and the balance from New South Wales;—would that agree with your own opinion? Had I been asked—without seeing that evidence—the proportions contributed by each State, I should have said that *from two-thirds to* three-quarters of the water at Jingellic came from New South Wales.

6712. What are your *reasons for so thinking*? Taking, first, the Indi, I think that more than half the water in it comes from *Victoria*; taking the Swampy Plain River, the whole of which water comes from New South Wales, I consider that more water comes down that river than down the Indi—*my reason* for so thinking being that the Swampy Plain River is fed exclusively *from the higher snowy country*; the Indi River is only fed partly from that source. Between the junction of the Indi and Swampy Plain River, and Jingellic, there is, on the New South Wales side, one very large feeder—the Tooma River—which probably brings down almost as much water as the Indi does. On the Victorian side, between the junction of the Swampy Plain River with the Indi and Jingellic, there are only two streams of any account—the Cudgewa and Corryong Creeks. *Assuming that the Tooma River* is equal to the Indi, and that the waters of the Upper Murray, above Jingellic, are represented by 14 parts, the proportion would be:—

For the Indi	New South Wales, 2 parts; Victoria, 2½ parts.
For the Swampy Plain River (which I consider brings down rather more water than the Indi, and is exclusively New South Wales)	,, ,, 5 ,,
For the Tooma River (estimated as equal to the Indi)	,, ,, 4 ,,
For the Cudgewa and Corryong Creeks	,, ½ ,,

The proportions thus being—New South Wales, 11 parts; Victoria, 3 parts.

6713. Do I understand that these proportions hold the whole year round, taking one year with another? Yes; I *consider them* a reasonable average.

Victorian catchment.

6714. You are aware that the catchment *on* the Victorian side of the river, above *Jingellic*, is in favour of Victoria? Yes.

New South Wales catchment.

6715. Yet you state that the proportion of water contributed is greatly in favour of New South Wales? Yes. The New South Wales catchment is in the lofty Snowy *Mountains*, and the streams are snow-fed. I have rarely seen the Indi in flood without the Swampy Plain River being in flood also; but I have repeatedly seen the Swampy Plain River in flood without the Indi being so.

6716. *Mr. Burchell.*] How often have you seen the Indi River in flood without the Swampy Plain being in flood also? I can only actually recall one occasion, which was fixed on my mind by a special occurrence.

6717. Is that because the *Indi comes* down more quickly than the Swampy Plain River? I do not think it does so.

6718. *President.*] Are you acquainted with the country on the New South Wales side of the Murray, between Albury and the junction of the Murrumbidgee with the Murray? I know the country very *well between Albury* and *Tocumwal*; *from* Tocumwal to Deniliquin I have *only had a little* experience about twenty-four years ago.

Character of country between Albury and Tocumwal, Tocumwal and junction of Murrumbidgee with Murray, and between Murray and Billabong Creek.

6719. Will you give *us your idea* of the country between Albury and Tocumwal, and between the Murray and the Billabong Creek; *and also that between Tocumwal and the junction of the* Murrumbidgee with the Murray and between the Murray and Billabong Creek? About 6 miles below Albury the Murray issues from a well-defined valley, the country on the north becoming undulating, and then, after a short distance, practically level. North of the *Murray* River, between Bungowannah and Tocumwal, and extending northerly generally almost to the Billabong Creek, the country is level and gently undulating, timbered principally with box and pine, and interspersed with small open plains. The soil as a rule is very good, suitable for wheat-growing, and, with irrigation, the yields would probably be constant and regular. The average annual rainfall of this district varies from about 22 inches at Corowa *to about* 18 or 19 inches at Berrigan. North of this belt the country becomes very open and clayey in nature, and is less suitable for agricultural purposes. Speaking after the lapse of many years, I would say that the country from Tocumwal westerly towards Moulamein contains broad belts of *timbered land* suitable for wheat growing, these belts being broken up by open plains which are more or less clayey. Generally speaking, I would *not consider* that belt of country so well adapted for wheat-growing as the Corowa-Berrigan-Finley country, and the average rainfall is *rather* less. *I consider* the best land for cultivation to be between Deniliquin and Finley. North of this belt of country on to the Billabong *Creek* the country is *in* every respect open.

Country served by Bungowannah canal.

6720. On Exhibit 128 is shown a system of canals which it has been proposed should be constructed, with a view of conveying water from Bungowannah for irrigation and stock purposes;—do you consider *that system of canals would serve the best* part of the country—that is to say, so far as it is adapted for irrigation? I should say they would serve the best land.

Land resumed, Corowa and Berrigan.

6721. You have had recent experience in connection with the resumption of land *under the Closer Settlement Act, in connection with Corowa and Berrigan*, will you tell us what you think of *that* land, as to its suitability for irrigation? I consider *it suitable*. I believe the whole belt would yield exceptionally well if they had water. The properties in question are Ringwood and Old *Berrigan*. The former is about 16 miles north-westerly from Corowa, and the other 6 miles northerly from Berrigan, having an area respectively of 26,000 acres and 16,000 acres. On these properties I consider 700 acres sufficient to maintain a family, even under present conditions with *irrigation it* would certainly carry double the population.

6722.

A. H. Chesterman. 5 Nov., 1902.

6722. *Mr. Burchell.*] Which area is in most need of the water—that above Tocumwal or below it? Below; the average rainfall is less there.

6723. Would not the land below yield as much as that above if it were irrigated? Some parts of it might, but there would not be the quantity.

6724. What distance below Albury is Corowa? *Thirty-seven miles.*

6725. You remember the undulating country there, and the vineyards not sustained by irrigation? Yes.

6726. Do you know if they are doing well? Yes.

Best results of irrigation

6727. Taking it as a whole, which *do you consider would be of most value to* New South Wales—putting water on to the land below Tocumwal or above it where they have a larger rainfall? I think that the best results would be attained by putting it on the greater area of better land, but would not place too much stress on *my comparison, as it is twenty years since* I was in the locality of Deniliquin and Moulamein.

6728. Your experience of the droughts is somewhat limited, then? Yes; I was there at the end of the 1877 drought, also in 1879 and 1880, which were good years. I base my opinion more upon the soil than anything else—my experience has led me to do this.

6729. What would you suggest the settlers should grow on the 700 acres, if they had irrigation? Wheat, lucerne, sorghum, &c.

Rainfall required for wheat-growing.

6730. Have you had experience of wheat-growing on less than 20 inches of rainfall per annum? Yes; I consider wheat-growing risky on a 17-inch rainfall. If you could get rain just as it was wanted, 12 inches would be ample, but it takes a 17 inch rainfall to average a certain fall in October when it is required.

6731. How does settlement compare in the two areas above and below Tocumwal respectively at the present time? It is better above Tocumwal, owing to the improved climatic conditions

6732. Do you think the settlers below Tocumwal can exist under present conditions? They would have a hard fight to do so.

6733. Do you not think 19 to 20 inches of rainfall sufficient for the settlers above Tocumwal? I consider 17 inches risky.

6734. You think that by the addition of irrigation, settlement below Tocumwal would be ensured? Yes.

6735. *President.*] Are there other things besides rainfall to be taken into consideration? Yes; the quality of the soil.

6736. You think that must be borne in mind in coming to a decision? Yes.

6737. If we have had it in evidence from an irrigation expert, who has made a special examination of the locality, that between Tocumwal and the junction of the Murrumbidgee with the Murray there is very little land suitable for irrigation, what would you say? I would say that I believe the greatest benefit would be derived by irrigating in accordance with the *Bungowannah scheme.*

6738. *Mr. Burchell.*] Do I understand that you consider it would not be worth while running the water west of that point? It depends on the quantity. If there is sufficient water, it might pay to run it into some of the natural depressions, for stock and *domestic purposes.*

Messrs. John Broughton, District-Surveyor, Hay, New South Wales, and Enoch John Cobcroft, District Surveyor, Wagga Wagga, New South Wales, were asked to supply the Commission with the following information :—

(1.) Area and quality of land that will be served by the proposed canals between the Murray and Murrumbidgee, giving (*a*) timbered lands, (*b*) plain lands, (*c*) area suitable for grazing, and (*d*) area suitable for agriculture.

(2.) Area of land which, in their opinion, would be necessary to maintain a settler, given a permanent water supply.

(3.) Their views as to the adequacy of the present natural supply of water in the creeks and billabongs, with an expression of opinion as to the volume of water and the period during which it is available.

(4.) The wisdom or otherwise of mixed farming within the area named.

(5.) Location of the land most suitable for grazing and also for agriculture.

Also a plan showing the timbered lands, the plain lands, and the best grazing lands.

In response to the above request, the subjoined statutory declarations and replies were received :—

(L.B. 02-6678.) District Survey Office, Hay, 3 October, 1902.

The Secretary, Inter-State Royal Commission on the River Murray,
Modern Chambers, Collins-street, Melbourne,—

Sir,

In response to your request, contained in your letter of the 3rd ultimo and later communication of 24th idem, I have the honor to forward herewith the particulars desired.

The information is set out in four (4) annexures to my statutory declaration of this date, and arranged in paragraphs numbered similarly to those in your letter of the 3rd ultimo.

A plan of illustration (*Exhibit* 136) accompanies this letter, and it is hoped that the information supplied may be of some assistance to the Inter-State Royal Commission on the River Murray.

I have, &c.,
J. BROUGHTON,
District Surveyor.

New South Wales, }
to wit. }

I, JOHN BROUGHTON, of Hay, New South Wales, District Surveyor, in the State of New South Wales, do hereby solemnly declare and affirm that the particulars and information embodied in the attached four (4) annexures, marked A, of this date, are true and correct to best of my knowledge and belief. And I make this solemn declaration, as to the matter aforesaid, according to the law in this behalf made, and subject to the punishment by law provided for any wilfully false statement in any such declaration.

Taken and declared at Hay, in said State, this third day of October, A.D. 1902, before me, } J. BROUGHTON.

R. B. BARNETT, J.P

Annexure marked "A" to Statutory Declaration by John Broughton, District Surveyor, Hay, N.S.W.

The country now dealt with is that which I consider likely to be affected by the canal between the Murray and Murrumbidgee Rivers, within the Hay Land Board District.

No lands south of the Edwards River are touched upon, presuming that this watercourse would bar those lands from deriving any material benefits from the proposed canals.

(1.) Area served by proposed canals between the Murray and Murrumbidgee :—

(*a*) 800,000 acres of timbered lands, consisting of box forests interspersed with pine, oak, &c.; partly subject to inundation ; soil, grey and red clay and loam.

(*b*) 3,600,000 acres of plains, with belts and clumps of box and pine, and occasionally a sprinkling of wilga, myall, boree, needle-bush, &c.; soil is red, grey and black clays (the two latter predominate), and patches of sandy soil.

(*c*) About 4,400,000 acres, all good healthy grazing land capable of depasturing sheep, its carrying capacity ranging from 1 to 4 acres per sheep when fully improved.

(*d*) About 300,000 acres, suitable for the cultivation of cereals and hay crops.

(2.) In the vicinity of large towns, such as Hay and Deniliquin, an area sufficient to carry 1,000 sheep would be necessary to maintain a settler, given a permanent water supply. In remote parts, an area sufficient to carry up to 2,500 sheep would be necessary.

(3.) The only creeks worthy of the name were the Billabong and Yanko Creeks. The Euroley and Box Creeks are shallow, dry watercourses, containing water in good seasons only, being usually dry in early summer. The Billabong and Yanko are chiefly served by an improved channel from the Murrumbidgee. The correct outflow to these streams can be better obtained from the records of the Public Works Department of New South Wales. Without this outflow the water supply would be uncertain. Under present conditions the water is almost permanent, but only sufficient for stock purposes.

(4.) Mixed farming is highly desirable. In remote parts cultivation is a valuable auxiliary to pastoral pursuits, and in the vicinity of large towns agricultural produce generally has a ready market and is an assistance in dairying.

(5.) The whole of the area under review is suitable for grazing. The agricultural land is generally situated north of Edwards River and south of a line running westerly from Coree to Morago. There are also small patches of land suitable for cultivation of hay crops in ordinary and good seasons on the plain country between the Murrumbidgee and Murray Rivers.

New

New South Wales, }
to wit. }

I, ENOCH JOHN COBCROFT, District Surveyor, of Wagga Wagga, in the State of New South Wales, do hereby solemnly declare and affirm that the contents of my report, dated 20th November, 1902, to the Inter-State Royal Commission on the River Murray, and the information furnished in that report and indicated on a roll map accompanying, are, to the best of my knowledge and belief, true and correct. And I make this solemn declaration, as to the matter aforesaid, according to the law in this behalf made, and subject to the punishment by law provided for any wilfully false statement in any such delaration.

Taken and declared at Wagga Wagga, in said State, this 20th day of November, 1902, before me,— } ENOCH J. COBCROFT, D.S.

PHILIP E. ELDERSHAW, J.P.

Information for Inter-State Royal Commission on River Murray.

From the District Surveyor, Wagga Wagga, New South Wales, to the Secretary, Inter-State Royal Commission on the River Murray, Modern Chambers, Collins-street, Melbourne.

(L.B. 02/11,896). 20 November, 1902.

IN reference to your communication, dated 25th ultimo, requesting certain information relating to the country that will be served by the proposed canals between the Murray and Murrumbidgee, for the Inter-State Royal Commission on the River Murray, I have now the honor to forward the information asked for under the five headings stated in your communication. I also return under separate cover the plan (*Exhibit* 136) which accompanied the communication, having indicated the information on the plan as requested.

I also forward a statutory declaration having reference to this information, as desired.

(1.) The area of land in the Murray and Murrumbidgee basins that will be more or less directly affected by the proposed canalisation scheme amounts, as per plan herewith, to about 3,401,380 acres. A very large extent of this land is agricultural, the soil being a strong reddish loam mostly. On the remaining area the soil is of a clayey nature, with belts and patches of loam suitable for cultivation. Generally speaking, the timbered land is agricultural, and the open plain country clayey, and suited for grazing only. The whole area involved can be classed as good grazing land in average seasons.

(*a*) The timbered lands comprised about 1,791,200 acres.
(*b*) The open plain lands comprise about 1,610,180 acres.
(*c*) The whole area involved (about 3,401,380 acres) is suitable for grazing.
(*d*) About 1,610,180 acres may be classed as suitable for agriculture.

(2.) Under present conditions, on the timbered agricultural lands an average area of from 700 to 800 acres would be necessary for the maintenance of a settler. Given a permanent water supply, and the opportunity of irrigating, less than one-half of this area would suffice. On the clayey plains, suited only for grazing purposes, about 2,000 acres would be necessary for the maintenance of a settler. With a permanent water supply this area might be reduced to about 1,200 acres. This would vary according to the quantity of water available for flooding parts of the land.

(3.) The present natural supply of water in the creeks and billabongs between the Murray and Murrumbidgee Rivers is quite inadequate for the requirements of settlement. The principal watercourse between these rivers is the Billabong Creek, which rises in a mountain range nearly 25 miles west of Tumbarumba, and, after a general westerly course, finally empties itself into the Edwards River, near Moulamein. This creek is not snow-fed, and consequently the stream is intermittent, at times approaching almost to the dignity of a river, and again at other times being merely a chain of waterholes at distant intervals. For the past few years the latter has been generally its chronic condition. Judged by the result of water storage carried out at Jerilderie, it would appear as if a large body of water could be stored along the greater part of this channel by a series of comparatively inexpensive dams. Under present conditions a supply can be looked for only after a succession of heavy rains, and generally during the winter or early spring months. Flowing into the Billabong are the Yanko and Colombo Creeks, which are fed by the surplus water of the Murrumbidgee, and generally rise in the spring. The above are the principal watercourses in the area under reference, and the principal natural storage depressions are Lakes Urana, Cullivel, and Uranagong, not one of which apparently can be regarded as absolutely permanent without artificial aid. At certain times the Urana Creek brings down a big volume of water into Lake Urana ; but there is no permanent stream, and the supply is uncertain. Nevertheless, Lake Urana is a depression of considerable importance, and when filled has probably a perimeter of over 20 miles and a depth of 14 feet. At the present time, if not absolutely dry, it must be very nearly so.

(4.) Under existing conditions, mixed farming would appear to be advisable over the greater part of the country affected by the proposed scheme ; but with a permanent water supply, and opportunities of irrigating if necessary, no doubt agricultural pursuits could be carried on exclusively where the soil is suitable.

(5.) The accompanying map shows the land most suitable for agriculture, and also the open plain country, which is, except in belts and patches, adapted for grazing only.

(6.) The foregoing information has been prepared, having reference to the country that will be served by the proposed canals, the routes of which were marked on the plan above referred to.

I have, &c.,
ENOCH J. COBCROFT,
District Surveyor.

L. Davis. Mun. Engl. C.E. Prudential. 16/8/01.

L. Aldred 29/8/01
Principal Engineer
Water Supply & Sewerage

ESTIMATED MONTHLY DISCHARGE OF MURRUMBIDGEE RIVER AT HAY

CATCHMENT AREA — SQUARE MILES

APPENDIX 1.

Year	1885					1886					1887					1888					1889					Year
Month	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Month
	Max.	Min.	Mean			Max.	Min.	Mean			Max.	Min.	Mean			Max.	Min	Mean			Max.	Min.	Mean			
January	1.800	650	790	48.575		1.350	650	751	46.177		3.100	1.850	1.605	98.690		7.000	2.600	4.778	293.750		5.550	1.550	3.148	193.560		January
February	6.450	1.350	3.128	173.720		1.150	500	632	35.100		11.750	1.350	5.175	320.750		2.500	1.350	1.740	96.634		3.150	850	1.552	86.194		February
March	2.100	650	1.050	64.514		500	500	500	30.744		6.800	3.600	5.524	339.660		1.350	500	1.178	72.541		1.850	650	858	52.756		March
April	500	500	500	29.752		500	500	500	29.752		9.100	3.350	5.668	337.218		1.650	750	870	51.769		1.350	750	1.030	61.289		April
May	500	500	500	30.745		500	500	500	30.744		3.400	1.600	2.221	136.570		1.150	700	965	59.382		5.800	1.050	2.596	178.680		May
June	2.550	500	857	49.605		500	500	500	29.752		7.250	1.500	3.857	229.510		3.750	950	1.700	101.160		10.100	3.450	5.538	333.100		June
July	3.450	1.150	1.972	121.256		500	500	500	30.744			5.200				4.000	2.300	3.022	185.820			5.000				July
August	4.800	1.100	1.750	110.070		5.800	700	2.619	161.040		12.200	3.750	10.351	636.450		4.700	1.900	3.022	185.870		7.750	4.500	5.734	352.570		August
September	6.300	2.800	3.583	234.510		9.950	6.100	7.835	466.210		13.300	8.450	10.963	652.150		5.700	2.550	4.263	253.970			5.350				September
October	5.250	1.100	3.525	216.380		6.400	3.600	5.175	318.450		11.100	7.300	9.372	551.650		6.200	1.650	3.497	215.030			7.500				October
November	1.950	800	1.329	73.032		5.600	2.200	4.285	254.570		12.100	6.550	9.235	591.850		1.600	700	1.063	63.253		7.200	4.400	5.783	344.110		November
December	800	500	509	31.297		9.600	1.850	4.508	277.190		5.450	3.850	5.550	347.410		5.900	550	1.564	110.760		8.300	2.700	5.547	347.070		December
For year																										For year

Year	1890					1891					1892					1893					1894					Year
Jan.	2.650	1.150	1.600	98.380		9.560	2.500	5.875	361.490		3.500	1.400	1.984	122.990		2.500	1.650	2.667	115.810		6.600	1.850	4.271	231.830		Jan.
Feb.	3.050	750	1.357	75.364			2.850				1.950	950	1.345	73.031		1.750	1.800	1.254	71.965		6.100	2.750	4.010	222.710		Feb.
Mar.	4.000	1.450	2.268	139.453		2.400	1.600	2.087	128.370		1.350	850	1.058	65.054		5.700	800	2.021	124.210		5.500	1.350	3.256	199.430		Mar.
Apr.	5.700	1.350	2.995	177.860		3.500	1.500	2.805	173.200		10.000	900	857	53.078		1.400	1.150	1.232	73.309			6.250				Apr.
May	1.650	1.750	1.318	81.041		5.750	1.500	2.853	187.890		4.050	1.000	1.326	81.535		5.700	1.000	2.596	159.350			4.650				May
June	8.700	1.850	4.890	290.970		6.780	1.000	3.195	190.099		5.400	1.200	3.150	187.440		9.300	1.700	5.822	346.440		11.700	5.200	5.110	302.660		June
July	15.300	5.000	11.591	707.728			4.850				6.550	3.450	4.999	305.820		13.600	6.100	8.705	535.500			7.750				July
Aug.	12.850	8.200	10.314	634.198			15.000				5.900	2.550	3.406	209.458		11.850	6.100	8.969	551.490			11.150				Aug.
Sep.	12.200	7.950	9.206	550.250		12.750	7.200	9.265	550.120		9.150	5.700	7.667	456.220		8.100	5.600	6.957	411.780			10.600				Sept.
Oct.	9.550	8.450	9.011	554.870		11.400	6.900	8.455	519.398		15.900	7.700	10.193	626.490		8.600	6.404	7.764	446.650			9.700				Oct.
Nov.	11.900	6.450	9.352	556.540		6.700	4.450	5.545	330.130		15.300	9.350	10.817	643.360		8.250	3.600	5.283	314.360		11.500	5.550	7.157	458.009		Nov.
Dec.	7.850	2.700	4.445	273.560		5.420	2.250	3.297	202.420		5.700	2.550	4.242	260.850		6.100	2.850	3.605	221.670		9.300	2.700	3.886	155.900		Dec.
For year																										For year

Year	1895					1896					1897					1898					1899					Year
Jan.	3.900	1.950	2.564	157.670		1.600	700	740	45.500		4.250	550	2.355	144.800		850	328	620	38.112		750	350	552	33.941		Jan.
Feb.	3.750	1.850	2.577	143.120		1.850	700	741	41.154		2.100	900	1.312	72.865		5.300	250	773	42.950		570	270	390	21.660		Feb.
Mar.	2.950	1.150	1.445	88.816		1.550	750	976	53.864		1.050	700	947	58.462		4.850	490	1.148	70.581		290	204	250	14.142		Mar.
Apr.	1.250	1.000	1.120	66.644		1.400	350	942	56.053		900	500	645	38.380		490	370	411	24.456		1.750	750	641	38.142		Apr.
May	1.650	1.050	1.322	81.286		3.700	1.100	1.860	114.370		500	450	457	28.100		390	340	362	22.266		1.150	450	554	34.074		May
June	1.950	1.350	1.568	93.305		5.800	2.300	3.492	207.790		1.350	450	750	44.628		3.250	420	1.222	72.714		2.200	450	1.495	88.958		June
July	7.700	2.700	4.595	282.410		6.450	2.650	4.840	297.600		1.850	800	1.340	82.385		2.700	1.850	1.527	108.040		4.650	1.950	3.379	207.760		July
Aug.	4.450	2.400	3.731	192.520		2.850	1.850	2.184	134.290		4.500	1.850	2.938	180.650		5.350	1.150	3.614	222.210		8.600	2.000	4.901	301.300		Aug.
Sep.	9.150	5.900	7.506	470.380		5.100	1.900	3.501	234.454		7.200	3.900	5.233	311.380		6.600	3.700	5.148	306.330		8.450	2.500	5.516	233.140		Sep.
Oct.	7.350	3.200	5.258	323.760		4.300	2.250	2.911	178.990		6.100	3.600	5.013	308.240		3.600	1.950	2.508	154.210		3.950	1.600	2.237	137.550		Oct.
Nov.	3.200	1.350	1.950	116.630		2.100	1.050	1.375	81.699		5.500	1.250	2.118	126.030		6.100	1.950	3.998	237.940		4.500	1.800	2.643	157.270		Nov.
Dec.	1.600	1.000	1.283	73.970		1.950	850	1.384	85.100		1.200	650	859	52.818		2.100	750	1.334	82.012		2.000	700	1.129	69.410		Dec.
For year																										For year

Year	1900					1901					1902					1903					1904					Year
Jan.	750	350	528	32.455		1.150	700	840	51.650		950	700	830	51.035												Jan.
Feb.	630	220	391	22.179		1.050	600	632	35.096		650	330	454	25.212												Feb.
Mar.	950	200	338	20.251		650	520	564	22.381		330	240	270	16.602												Mar.
Apr.	3.550	1.000	1.888	112.340		650	450	525	31.240		550	240	335	19.954												April
May	4.950	1.150	2.158	132.690		1.600	450	868	53.371																	May
June	11.400	1.700	7.042	446.000		2.500	700	1.153	68.628																	June
July		5.500				2.600	1.550	1.650	101.450																	July
Aug.	10.600	6.750	7.660	471.100		4.850	1.350	1.887	116.010																	Aug.
Sep.	11.300	7.200	9.150	544.930		7.700	5.000	6.802	404.750																	Sep.
Oct.	11.450	4.650	8.335	512.550		7.200	3.000	4.954	304.640																	Oct.
Nov.	4.500	1.850	2.880	171.370		5.350	3.650	6.703	410.360																	Nov.
Dec.	3.750	1.050	1.966	120.880		3.350	1.000	1.793	110.250																	Dec.
For year																										For year

Year	1905					1906					1907					1908					1909					Year
Jan.																										Jan.
Feb.																										Feb.
Mar.																										Mar.
Apr.																										Apr.
May																										May
June																										June
July																										July
Aug.																										Aug.
Sep.																										Sep.
Oct.																										Oct.
Nov.																										Nov.
Dec.																										Dec.
For year																										For year

Year	1910					1911					1912					1913					1914					Year
Jan.																										Jan.
Feb.																										Feb.
Mar.																										Mar.
Apr.																										April
May																										May
June																										June
July																										July
Aug.																										Aug.
Sep.																										Sep.
Oct.																										Oct.
Nov.																										Nov.
Dec.																										Dec.
For year																										For year

EXHIBIT No. 2
Roland Lewis Esq
Secretary,
Interstate Royal Commission
on the Murray River.
16.

99294

Photo-Lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

L. Davis. M. Inst. C.E. President. 16/5/02.

ESTIMATED MONTHLY DISCHARGE OF

DARLING RIVER

AT

WILCANNIA

CATCHMENT AREA — SQUARE MILES

L. A. K. Wade 19/4/02
Principal Engineer
Water Supply & Sewerage

APPENDIX 2.

Year	1885					1886					1887					1888					1889					Year
Month	Discharge in Second Feet			Total for month in Acre-Feet	Run off	Discharge in Second Feet			Total for month in Acre-Feet	Run off	Discharge in Second Feet			Total for month in Acre-Feet	Run off	Discharge in Second Feet			Total for month in Acre-Feet	Run off	Discharge in Second Feet			Total for month in Acre-Feet	Run off	Month
	Max.	Min	Mean			Max	Min.	Mean			Max.	Min	Mean			Max	Min	Mean			Max	Min.	Mean			
January	15.000	0	1.748	107 480		500	0	158	9 715		15 300	2 100	8 154	503 896		3 590	1 700	2 503	154 511		0	0	0			January
February	15.000	0	5 961	319 927		700	100	329	18 277		11 800	1 300	5 239	290 958		3 500	1 800	2 083	119 805		500	0	164	5 776		February
March	1 800	0	553	40 990		700	0	358	22 013		18 600	12 300	16 537	1 018 165		14 300	2 000	5 110	550 152		200	0	57	3 383		March
April	1 500	400	2 110	66 049		400	0	57	2 282		12 200	10 800	11 042	1 150 168		14 600	1 300	6 883	409 567		700	0	87	5 176		April
May	400	6	93	5 718		0	0	0	0		10 700	2 400	11 848	728 505		1 200	800	735	45 155		1 300	500	731	45 005		May
June	0	0	0	0		10 800	0	2 965	176 137		2 400	1 500	1 733	103 171		0	0	0	0		10 700	900	3 853	229 345		June
July	0	0	0	0		13 460	11 200	15 294	940 591		5 000	1 500	2 464	151 505		0	0	0	0		16 800	11 600	14 442	888 004		July
August	500	0	181	11 129		19 400	17 600	18 429	1 145 450		16 100	6 000	12 768	785 044		0	0	0	0		16 900	15 500	15 923	979 063		August
September	0	0	0	0		20 900	15 400	20 707	1 232 519		17 300	10 900	14 865	884 982		0	0	0	0		16 900	4 800	14 605	868 536		September
October	0	0	0	0		21 000	19 300	20 638	1 270 215		18 200	11 700	17 042	1 048 079		0	0	0	0		3 600	1 800	2 448	150 523		October
November	0	0	0	0		18 700	15 200	17 590	1 046 675		6 200	1 700	2 767	164 645		0	0	0	0		3 900	1 300	2 660	158 281		November
December	0	0	0	0		28 100	14 400	18 700	1 149 849		1 600	350	1 252	76 983		0	0	0	0		2 700	1 500	1 984	121 951		December
For year																										For year

Year	1890					1891					1892					1893					1854					Year
Jan.	5 900	1 000	2 742	168 599		15 400	1 400	4 535	278 877		8 100	4 100	6 205	381 408		18 800	2 400	8 516	523 629		2 200	1 105	1 416	87 067		Jan.
Feb.	9 500	3 900	5 615	335 830		17 700	10 300	14 658	814 596		3 600	1 100	1 620	89 578		6 300	2 900	3 459	190 592		3 800	1 000	2 082	115 526		Feb.
Mar.	16 800	9 600	13 988	855 410		19 900	17 800	18 687	1 149 019		1 200	1 000	1 077	66 222		17 900	7 300	10 935	671 845		3 200	1 100	1 610	98 995		Mar.
Apr.	19 100	16 800	17 867	1 063 200		19 700	3 800	14 305	851 087		1 300	900	1 040	61 864		19 600	17 300	18 835	1 121 851		11 700	3 800	11 433	705 457		Apr.
May	22 900	19 200	22 006	1 353 108		5 300	3 000	4 195	255 767		4 500	1 500	3 464	212 953		18 700	6 200	9 671	594 642		19 500	11 800	14 008	1 166 164		May
June	22 800	21 400	22 077	1 310 700		5 200	5 600	4 955	241 170		4 100	2 300	3 847	229 408		10 500	5 700	7 940	472 463		20 900	15 200	16 940	1 117 008		June
July	21 400	20 800	21 053	1 294 600		16 700	5 800	12 532	776 711		9 400	3 000	6 615	407 601		19 400	11 100	16 535	1 016 588		14 800	8 400	11 175	686 195		July
Aug.	21 500	21 000	21 168	1 301 600		18 700	16 100	17 600	1 054 486		7 900	2 500	5 709	351 035		21 200	19 600	20 776	1 273 777		15 300	7 400	10 926	671 868		Aug.
Sep.	22 600	19 400	20 650	1 228 700		20 800	18 300	19 380	1 147 240		5 400	1 500	2 177	129 247		20 700	19 400	20 577	1 224 416		8 700	3 500	5 601	333 699		Sept.
Oct.	19 200	16 000	15 526	951 680		19 400	17 200	18 126	1 114 574		11 400	2 600	6 643	406 617		19 500	5 500	16 416	1 009 381		6 500	3 300	4 987	306 639		Oct.
Nov.	9 500	5 500	7 377	435 950		17 900	2 800	11 937	703 729		17 300	11 500	15 170	902 677		5 200	2 700	4 277	254 499		7 400	3 700	5 150	306 446		Nov.
Dec.	7 000	2 400	4 114	254 650		4 400	1 900	2 449	150 533		16 700	13 300	15 045	1 112 110		3 800	2 700	2 900	178 368		6 700	1 500	3 242	199 343		Dec.
For year																										For year

Year	1895					1896					1897					1898					1899					Year
Jan.	1 400	900	1 105	67 802		2 800	500	1 932	118 794		3 300	600	1 764	108 464		4 000	500	2 958	157 285		600	100	425	26 378		Jan.
Feb.	12 100	300	5 379	298 735		15 100	1 500	6 876	381 614		2 200	1 100	1 641	91 148		11 900	4 100	7 11	39 830		200	200	200	11 107		Feb.
Mar.	14 100	2 900	10 159	625 425		15 400	10 600	11 568	698 991		1 300	500	778	47 857		14 900	4 700	13 334	758 784		6 500	200	3 387	208 259		Mar.
Apr.	2 400	200	1 351	83 121		10 500	1 700	4 107	250 894		600	200	1 846	109 945		4 300	500	1 730	102 941		1 400	400	700	42 843		Apr.
May	800	500	625	38 807		1 700	900	1 245	76 552		600	200	381	23 423		800	600	661	40 645		400	300	358	22 013		May
June	500	300	483	28 760		900	800	855	50 757		400	200	230	13 654		600	400	463	27 550		400	200	276	16 423		June
July	500	500	500	30 744		900	700	843	47 959		500	200	258	15 866		600	400	473	29 394		200	200	200	12 298		July
Aug.	500	500	500	30 744		2 200	900	1 461	89 833		13 700	500	5471	336 399		700	500	632	38 860		2 500	200	1 459	88 480		Aug.
Sep.	500	500	500	29 751		2 100	1 300	1 685	95 385		14 500	7 300	6 610	408 733		700	500	550	32 717		2 300	1 400	1 533	91 220		Sep.
Oct.	400	400	400	24 595		2 100	500	1 284	78 950		3 000	1 200	1 848	113 629		1 500	500	1 093	67 206		2 100	800	1 194	73 446		Oct.
Nov.	1 400	400	863	51 351		900	500	617	36 714		6 100	2 400	4 960	292 282		700	200	368	22 612		900	300	523	31 110		Nov.
Dec.	1 800	500	1 071	65 853		900	400	615	38 061		2 200	1 000	1 700	104 541		200	100	184	11 314		500	200	316	19 430		Dec.
For year																										For year

Year	1900					1901					1902					1903					1904					Year
Jan.	200	100	168	10 330		600	100	248	15 248		200	0	123	7 565												Jan.
Feb.	200	0	89	4 945		400	200	236	13 197		0	0	0	0												Feb.
Mar.	400	0	313	19 246		300	0	100	6 149		0	0	0	0												Mar.
Apr.	2 000	1 100	1 567	93 283		100	0	90	5 542		0	0	0	0												April
May	3 000	1 000	1 842	113 260		100	50	51	3 136																	May
June	2 200	500	840	49 985		50	0	10	595																	June
July	6 800	2 100	3 811	233 800		2 000	0	765	47 038																	July
Aug.	11 800	7 300	10 329	635 100		3 800	1 900	2 794	171 800																	Aug.
Sep.	10 700	3 700	5 275	313 770		7 900	1 300	3 723	221 618																	Sep.
Oct.	2 200	1 600	1 568	96 413		8 200	1 000	3 658	225 009																	Oct.
Nov.	1 700	300	900	53 550		900	500	683	40 641																	Nov.
Dec.	300	100	165	10 145		500	200	384	23 611																	Dec.
For year																										For year

Year	1905					1906					1907					1908					1909					Year
Jan.																										Jan.
Feb.																										Feb.
Mar.																										Mar.
Apr.																										Apr.
May																										May
June																										June
July																										July
Aug.																										Aug.
Sep.																										Sep.
Oct.																										Oct.
Nov.																										Nov.
Dec.																										Dec.
For year																										For year

Year	1910					1911					1912					1913					1914					Year
Jan.																										Jan.
Feb.																										Feb.
Mar.																										Mar.
Apr.																										April
May																										May
June																										June
July																										July
Aug.																										Aug.
Sep.																										Sep.
Oct.																										Oct.
Nov.																										Nov.
Dec.																										Dec.
For year																										For year

EXHIBIT No. 3
Letter from Secretary, Interstate Royal Commission on the Murray River. 1/6. 5. 02.

99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

J. Davis. M. Inst. C.E. President. 16/8/02.

ESTIMATED MONTHLY DISCHARGE OF MURRAY RIVER AT ALBURY

CATCHMENT AREA — 6700 SQUARE MILES

J. A. K. Wade 19/4/02
Principal Engineer
Water Supply & Sewerage

APPENDIX 3.

Year	1885					1886					1887					1888					1889					Year
Month	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Discharge in Second-Feet			Total for month in Acre-Feet	Run off	Month
	Max.	Min.	Mean			Max.	Min.	Mean			Max.	Min.	Mean			Max.	Min.	Mean			Min.	Max.	Mean			
January	3.500	700	1.390	85.468		2.200	900	1.294	79.563		3.500	1.400	1.961	120.577		5.800	3.180	5.300	325.884		8.100	1.380	3.271	201.126		January
February	3.000	800	1.586	76.975		3.900	1.000	1.715	95.681		3.200	1.060	1.681	97.306		3.200	1.590	2.517	144.775		6.900	1.200	2.432	135.066		February
March	1.200	200	710	43.656		1.600	600	923	56.753		7.860	2.100	3.915	234.452		2.400	1.580	1.884	115.843		1.100	780	959	57.757		March
April	1.300	1.000	1.163	69.203		1.300	600	757	45.054		6.200	2.400	3.665	217.964		2.400	1.100	1.498	88.661		3.580	706	1.518	90.050		April
May	1.500	1.008	1.174	72.186		3.000	700	1.235	75.957		3.500	2.100	2.555	157.101		3.800	1.100	2.010	123.590		1.200					May
June	7.100	1.200	3.057	181.904		2.000	1.000	1.273	75.749		9.600	2.700	5.687	338.600		9.500	1.600	4.736	281.811		5.600					June
July	2.900	1.600	2.085	123.160		2.700	1.800	1.465	90.079			7.900				9.700	3.500	5.874	361.178		6.600					July
August	5.500	1.600	2.974	182.864			1.500					7.100				6.300	4.300	5.042	310.020		6.100					August
Septembr		2.600					6.300					10.200					5.400									Septembr
October	10.300	3.600	6.929	401.453			5.300					5.700				9.700	3.900	6.148	378.076		3.500					October
November	6.300	1.800	5.023	179.881		10.300	5.500	6.180	367.735			7.800				3.700	1.600	5.820	345.884		6.400					November
December	3.360	1.100	1.667	103.729		8.908	2.700	4.842	297.723			4.400				3.300	1.100	5.013	308.258		3.700					December
For year																										For year

Year	1890					1891					1892					1893					1894					Year
Jan.	3.100	1.300	2.061	126.726			4.700				2.400	1.100	1.555	95.615		3.800	1.300	2.110	129.739		2.500					Jan.
Feb.	2.700	1.100	1.486	82.528		7.500	3.200	4.639	257.637		1.100	800	909	51.768		1.500	880	1.064	59.092		3.220	1.600	2.121	117.795		Feb.
Mar.	2.300	1.100	1.445	88.850		3.220	1.930	2.322	143.389		1.000	800	858	52.756		2.700	898	1.087	66.857		6.900	1.680	2.646	160.951		Mar.
Apr.	2.480	1.200	1.477	87.898		4.500	2.820	2.728	161.851		1.500	700	1.040	61.884		1.900	1.000	1.265	75.154		9.220	2.100	4.190	249.322		Apr.
May	4.900	1.100	1.925	118.241		3.400	2.000	2.361	145.172		6.300	1.300	2.855	176.357		10.300	1.500	2.261	139.023		5.820	2.700	3.797	233.468		May
June		3.400					1.980				9.100	2.380	4.540	270.148			4.100				4.000					June
July		5.800					8.100				8.500	3.200	4.729	290.775			5.380				7.400					July
Aug.	10.000	7.200	9.934	661.790			5.900				9.500	2.900	5.197	319.551		9.900	6.000	7.529	462.940							Aug.
Sep.		9.200				7.800	5.800	6.317	375.887			6.100					9.100									Sept.
Oct.						9.480	4.800	5.826	361.178			7.800					9.860									Oct.
Nov.		8.400				7.800	4.500	5.748	341.559			6.800					5.600				5.200					Nov.
Dec.	9.600	4.400	6.857	376.950		4.780	2.880	3.369	284.877		6.689	3.800	4.629	284.676		8.880	2.700	3.823	235.436		8.660	3.700	4.761	292.742		Dec.
For year																										For year

Year	1895					1896					1897					1898					1899					Year
Jan.	5.100	2.100	3.010	185.078		2.000	1.100	1.345	82.701		10.300	1.880	3.655	217.624		1.350	580	878	53.966		3.880	1.280	1.644	101.085		Jan.
Feb.	3.400	1.800	2.175	120.793		2.000	980	1.893	68.047		5.800	1.704	2.592	148.620		6.550	460	1.784	99.078		1.300	608	899	49.928		Feb.
Mar.	3.300	1.300	1.793	110.247		3.800	950	1.926	81.535		2.900	1.300	1.805	110.867		1.580	670	948	57.755		3.200	700	1.272	78.212		Mar.
Apr.	2.600	1.480	1.793	106.691		5.200	1.080	2.737	161.863		1.300	960	1.015	60.278		1.960	670	1.077	64.062		4.100	1.680	2.760	164.251		Apr.
May	5.500	2.800	2.745	168.785		5.400	2.340	3.158	194.178		1.400	900	1.055	64.869		5.700	960	1.691	103.976		4.900	1.800	2.483	151.674		May
June		2.780				5.880	2.800	3.117	185.474		6.000	1.100	1.898	112.463			2.100					2.600					Jurie
July	8.200	3.600	4.642	285.425		6.500	2.280	4.255	260.600		5.400	2.900	3.406	209.417		6.900	2.400	3.367	206.739		8.900	5.200	5.115	314.510		July
Aug.		3.500				5.800	2.300	2.680	164.787		9.100	3.200	5.057	313.402			4.800				8.900	5.200	5.714	351.340		Aug.
Sep.		7.700				10.300	4.400	6.673	397.071			6.300					5.600				7.300	3.880	4.759	283.180		Sep.
Oct.		5.200				8.600	3.800	5.982	368.126			5.500					4.400				3.100	3.600	4.859	295.234		Oct.
Nov.	5.100	2.480	3.460	205.884		6.300	2.000	3.213	191.187		5.880	2.100	3.677	218.737			4.800				5.500	2.300	3.275	194.757		Nov.
Dec.	3.800	1.640	2.468	151.751		3.500	1.300	2.280	140.807		2.100	1.100	1.584	97.396		4.880	1.900	3.832	186.430		2.200	1.100	1.547	91.956		Dec.
For year																										For year

Year	1900					1901					1902					1903					1904					Year
Jan.	2.100	780	1.083	66.591		1.300	880	1.069	65.669		2.620	1.000	1.433	88.112												Jan.
Feb.	900	408	554	30.767		800	500	655	36.432		1.200	700	811	45.041												Feb.
Mar.	6.400	400	2.066	127.156		1.500	400	678	41.197		3.200	400	698	42.918												Mar.
Apr.	7.600	2.800	4.147	246.764		2.200	880	920	54.744																	April
May	8.008	2.400	4.271	262.673		5.900	1.080	1.341	82.455																	May
June		3.200				4.080	1.780	2.646	155.068																	June
July		5.208				2.300	1.568	1.887	111.098																	July
Aug.		5.500				8.400	1.720	3.666	225.413																	Aug.
Sep.		9.700					5.988																			Sep.
Oct.	9.590	6.880	8.260	547.855			5.680																			Oct.
Nov.	6.860	3.000	4.723	281.038			3.398																			Nov.
Dec.	3.400	1.200	2.058	126.542		3.200	1.280	1.988	122.237																	Dec.
For year																										For year

Year	1905					1906					1907					1908					1909					Year
Jan.																										Jan.
Feb.																										Feb.
Mar.																										Mar.
Apr.																										Apr.
May																										May
June																										June
July																										July
Aug.																										Aug.
Sep.																										Sep.
Oct.																										Oct.
Nov.																										Nov.
Dec.																										Dec.
For year																										For year

Year	1910					1911					1912					1913					1914					Year
Jan.																										Jan.
Feb.																										Feb.
Mar.																										Mar.
Apr.																										April
May																										May
June																										June
July																										July
Aug.																										Aug.
Sep.																										Sep.
Oct.																										Oct.
Nov.																										Nov.
Dec.																										Dec.
For year																										For year

EXHIBIT No. 11
Robert K. Murray
Secretary, Interstate Royal Commission on the Murray River.
16 Oct 02

99284

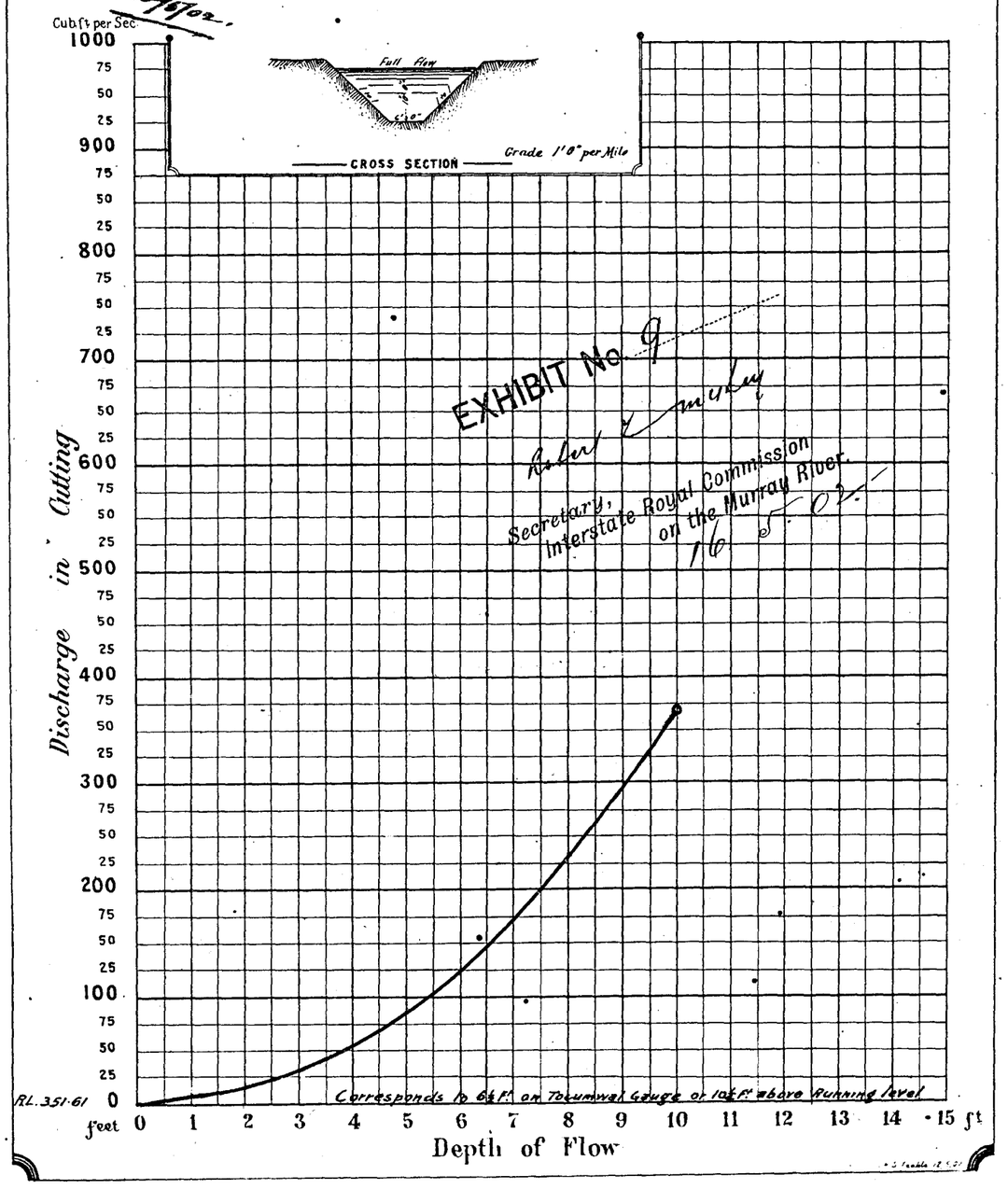
Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Murray RIVER DISTRICT

Discharge Curve at Tuppal Cutting

L. Davis, M. Inst. C.E. Sandhurst. Victoria.

L. Aldwell 12/5/02
Principal Engineer
Water Supply & Sewerage



99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

MURRAY RIVER DISTRICT

Discharge Curve at Eagle Ck Cutting

L. Davis, Inst. C.E. Penrith. 11/5/02.

L. Abbott 12/5/02
Principal Engineer
Water Supply & Sewerage

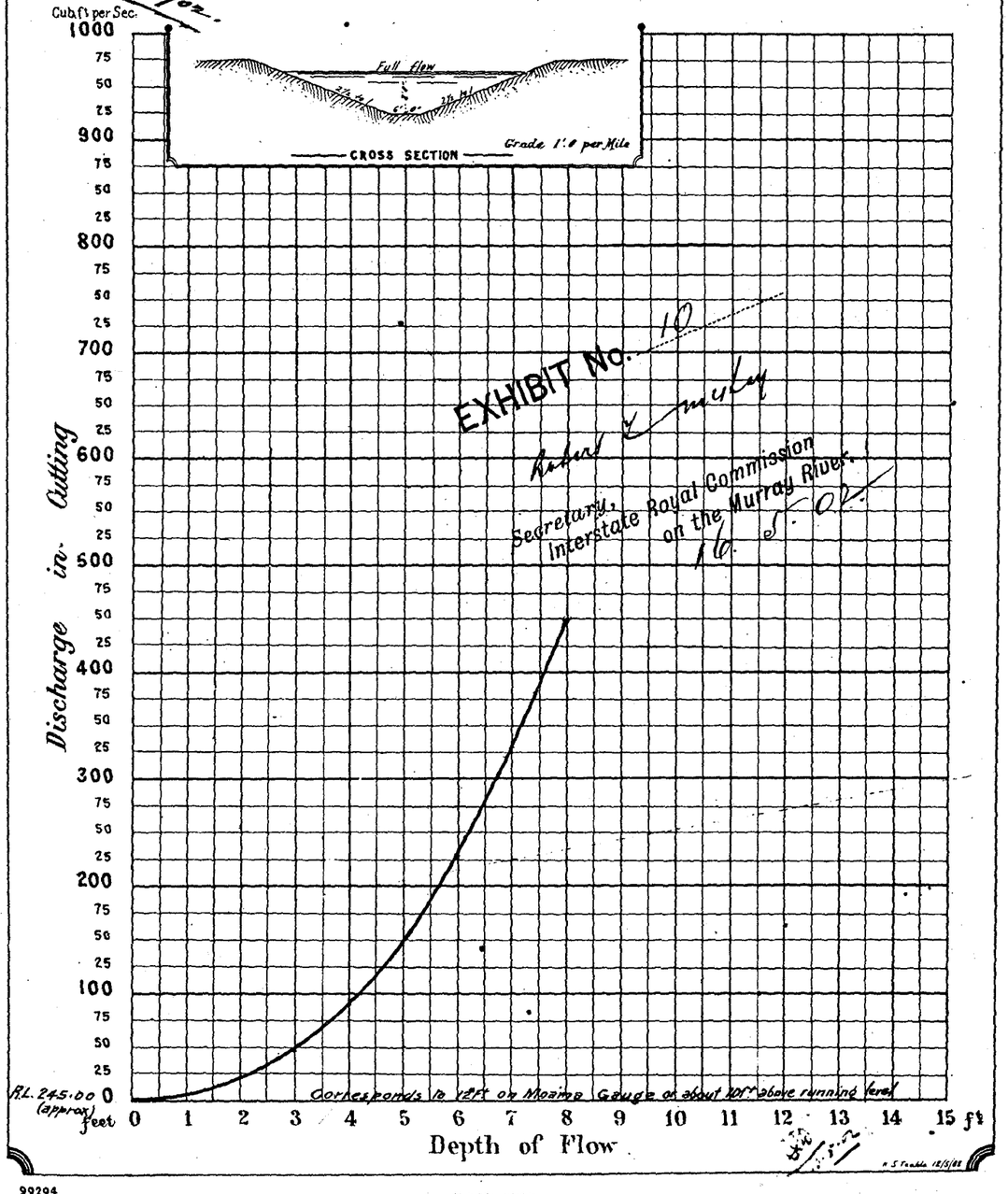


EXHIBIT No. 10
Federal & Murray
Secretary, Interstate Royal Commission on the Murray River.
16. 5. 02.

H S Trouble 12/5/02

99294

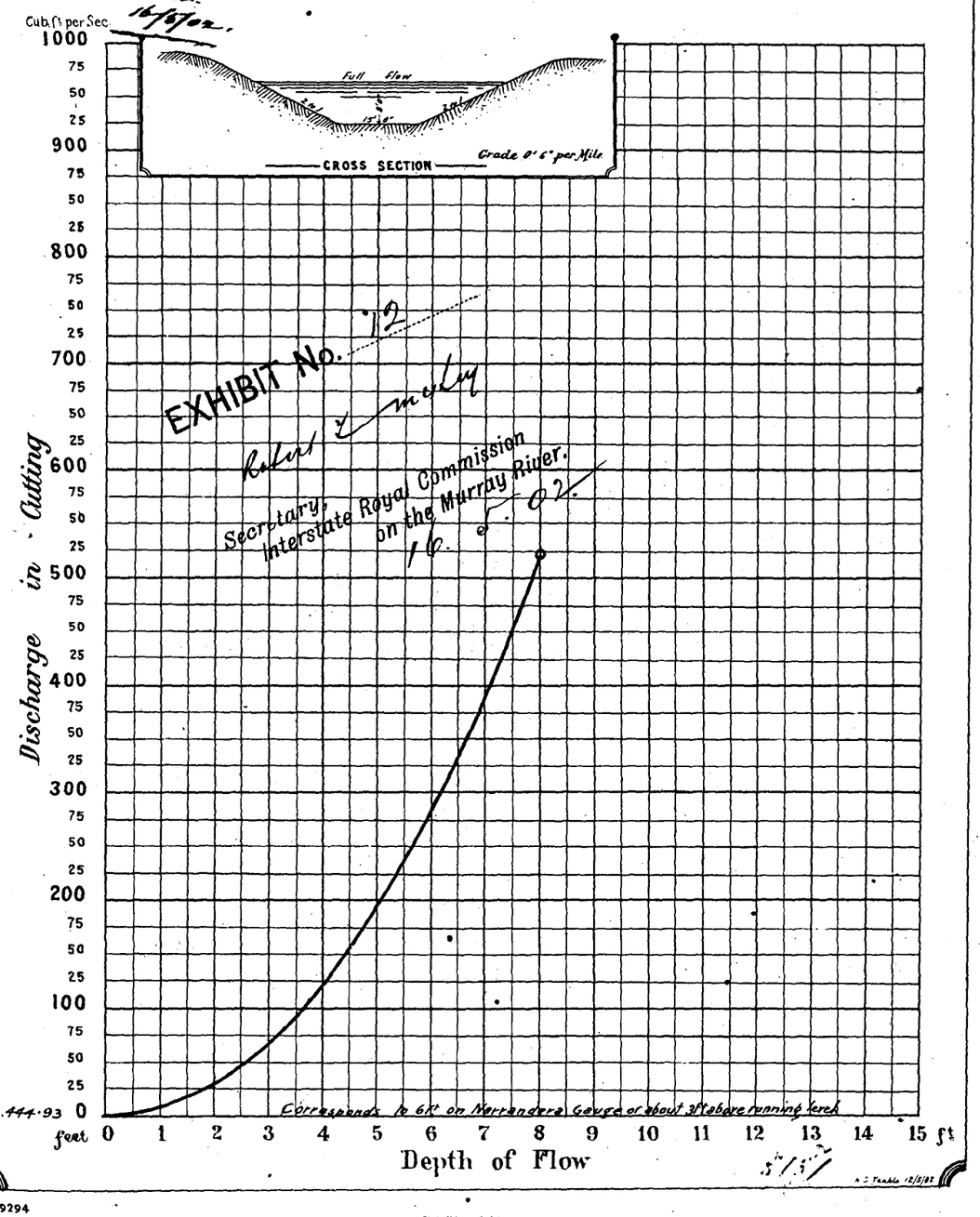
Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Murrumbidgee RIVER DISTRICT

Discharge Curve at Yanko Ck Cutting

L. Dans. M.Inst. C.E. Resident 16/5/02.

L. Abbott 12/5/02
Principal Engineer
Water Supply & Sewerage



99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Lachlan RIVER DISTRICT

Discharge Curve at Willandra Weir Cutting

L. Davis, Mast. C.E. Penstock. 14/5/02.

L. Abbott 14/5/02. Principal Engineer Water Supply & Sewerage

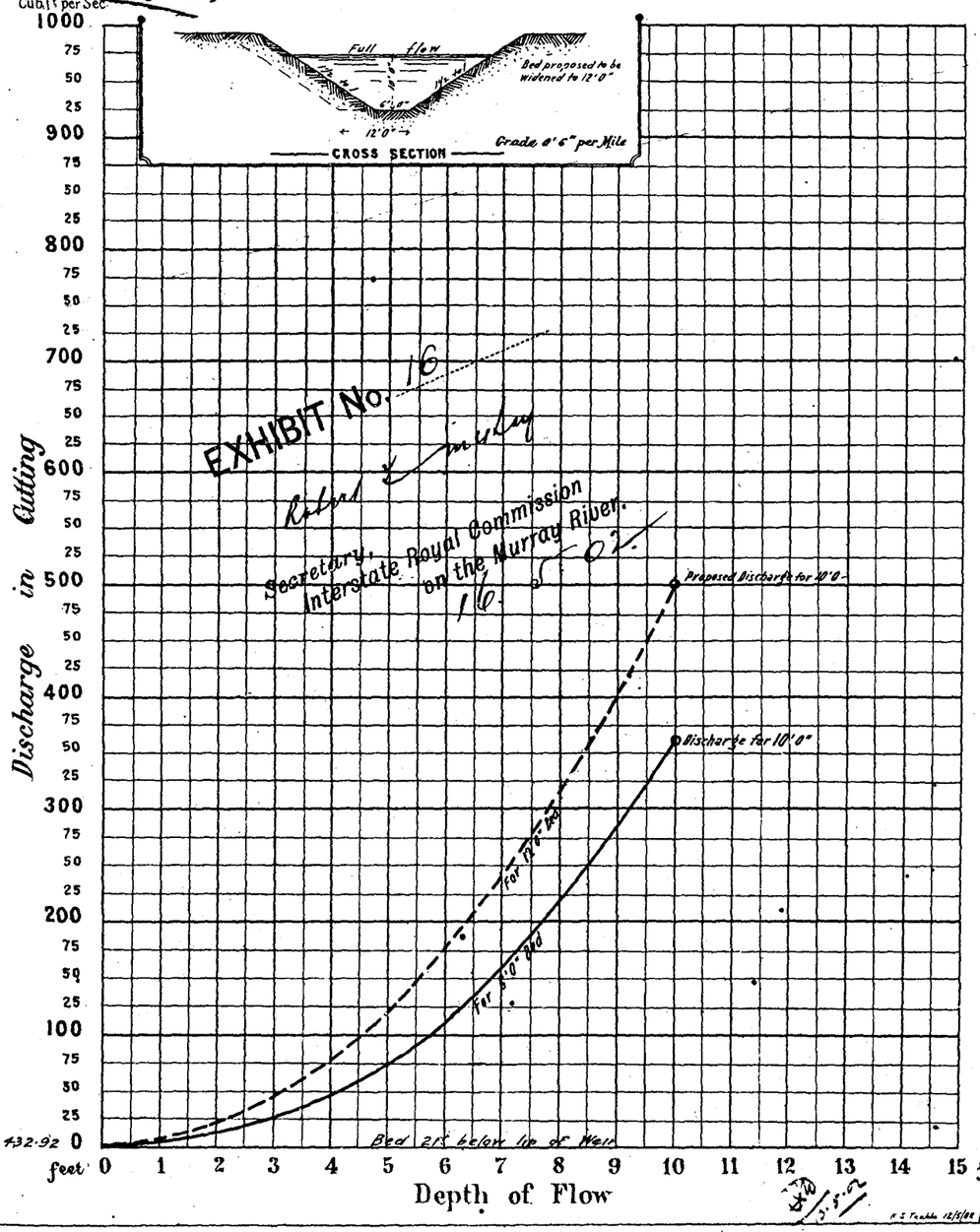


EXHIBIT No. 16

Retd by Secretary, Interstate Royal Commission on the Murray River. 5/6/02.

H. S. Trebble 12/5/02

99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Lachlan RIVER DISTRICT

Discharge Curve at Middle Billabong Cutting

L. Dowie, Assoc. M. Inst. C.E., Resident Engineer, Hay.

L. A. Bidwell 12/5/02
Principal Engineer
Water Supply & Sewerage

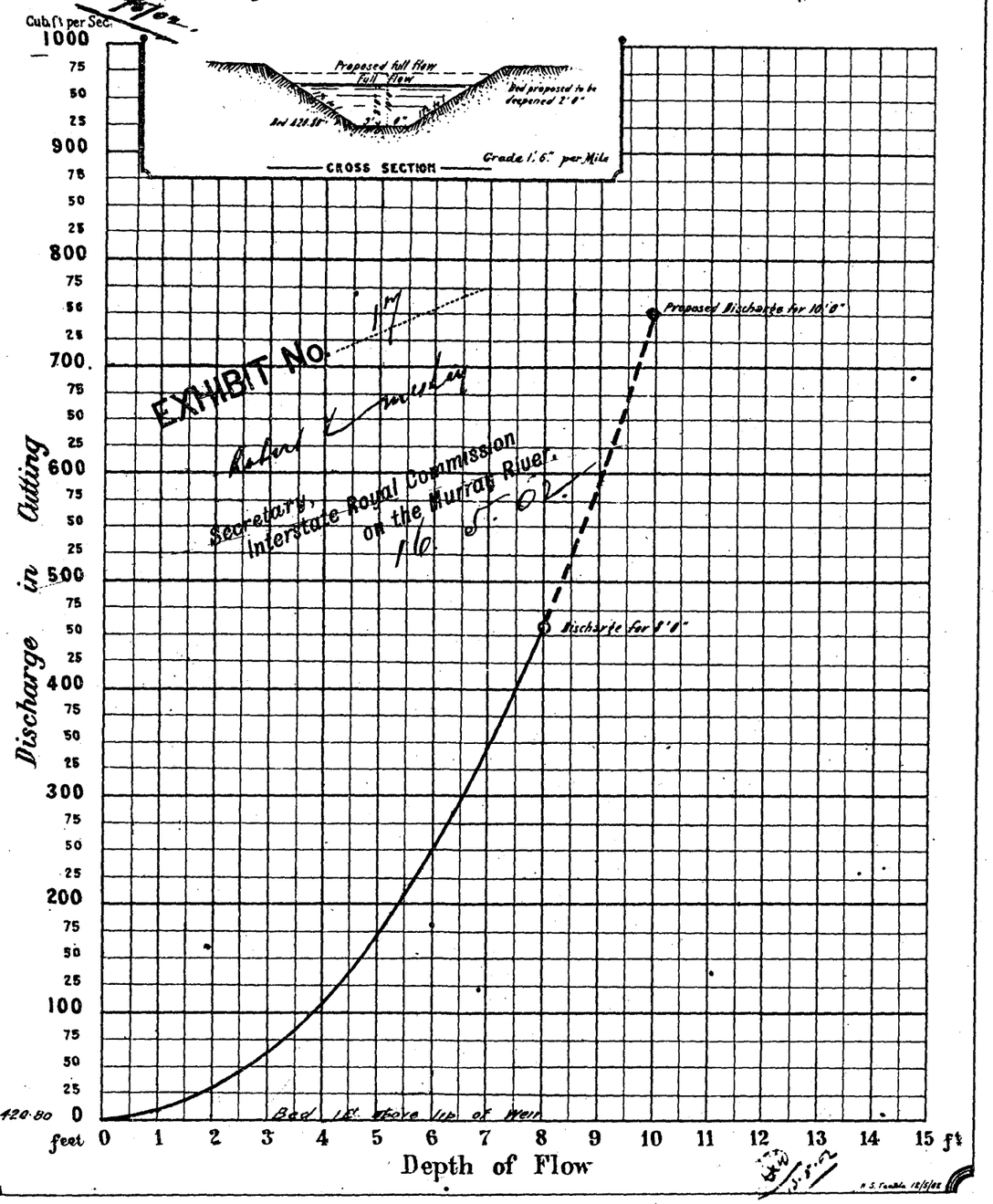


EXHIBIT NO. 17
Secretary, Interstate Royal Commission on the Murray River.

99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

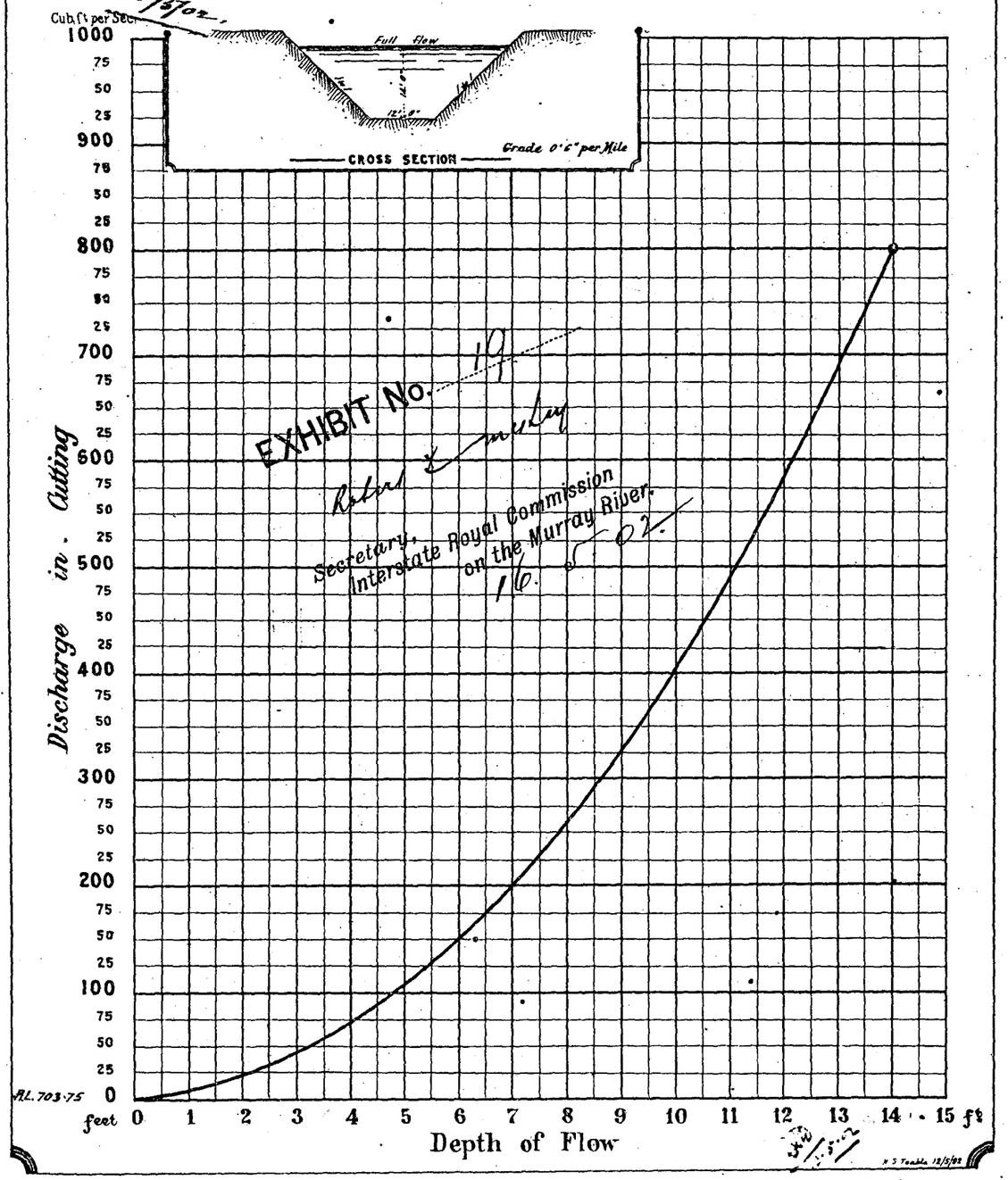
Macquarie RIVER DISTRICT

Discharge Curve at Crooked Ck Cutting

Davis, Mc Inst. C.E. above Gin Gin Weir

Rundle. 15/5/02.

L. Abbott 12/5/02
Principal Engineer
Water Supply & Sewerage



99294

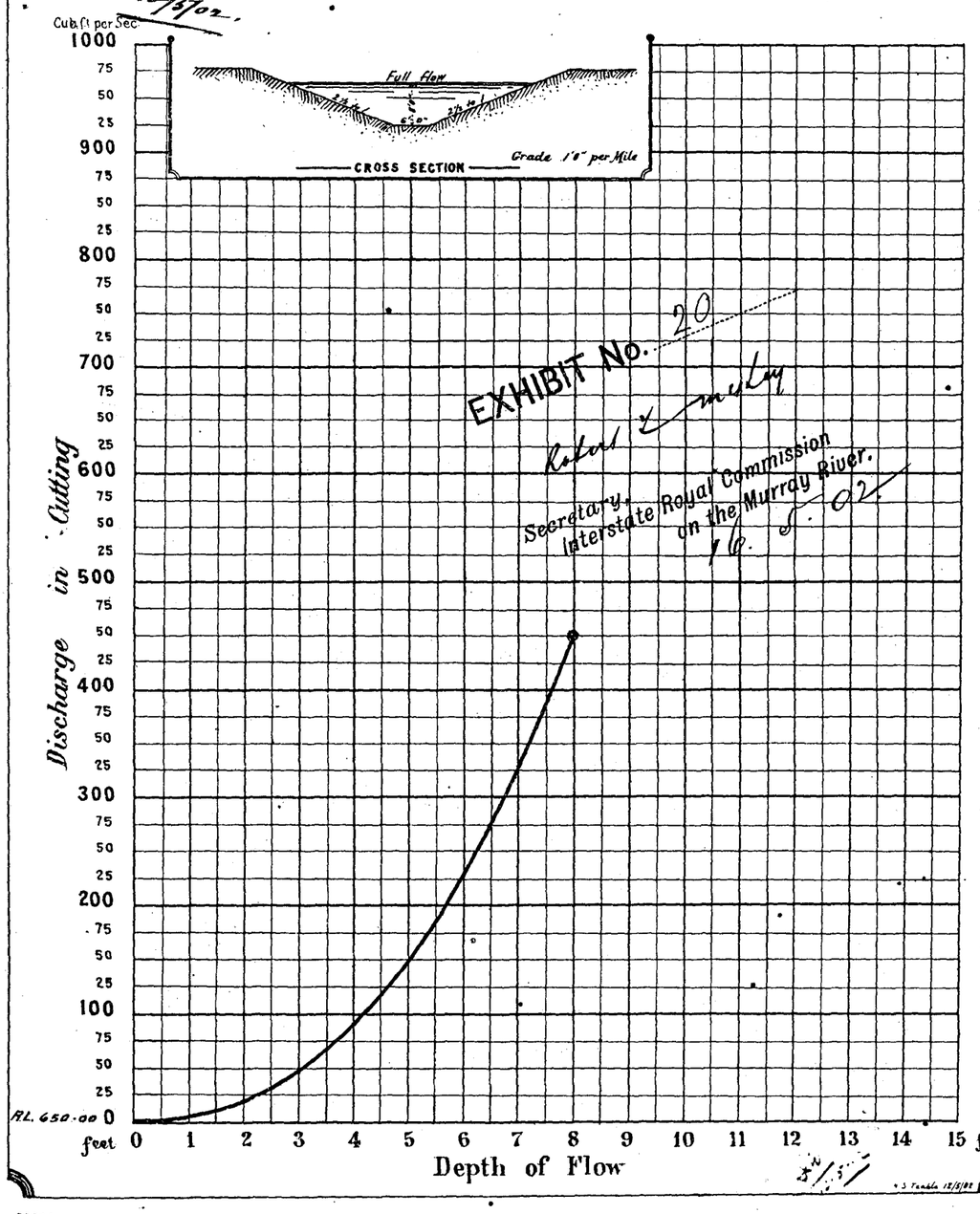
Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Macquarie RIVER DISTRICT

L. Dain. Discharge Curve at Murrays Break Cutting

L. A. B. Wade 12/5/02
Principal Engineer
Water Supply & Sewerage

Mabol. C.E.
Prepared.
16/5/02.



99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Macquarie RIVER DISTRICT

Discharge Curve at Gunningbar Ck Cutting near Warren

L. Dain. M. Inst. C.E. Principal Engineer Water Supply & Sewerage

Broadmeadow 16/5/02.

L. Abbott 14/5/02

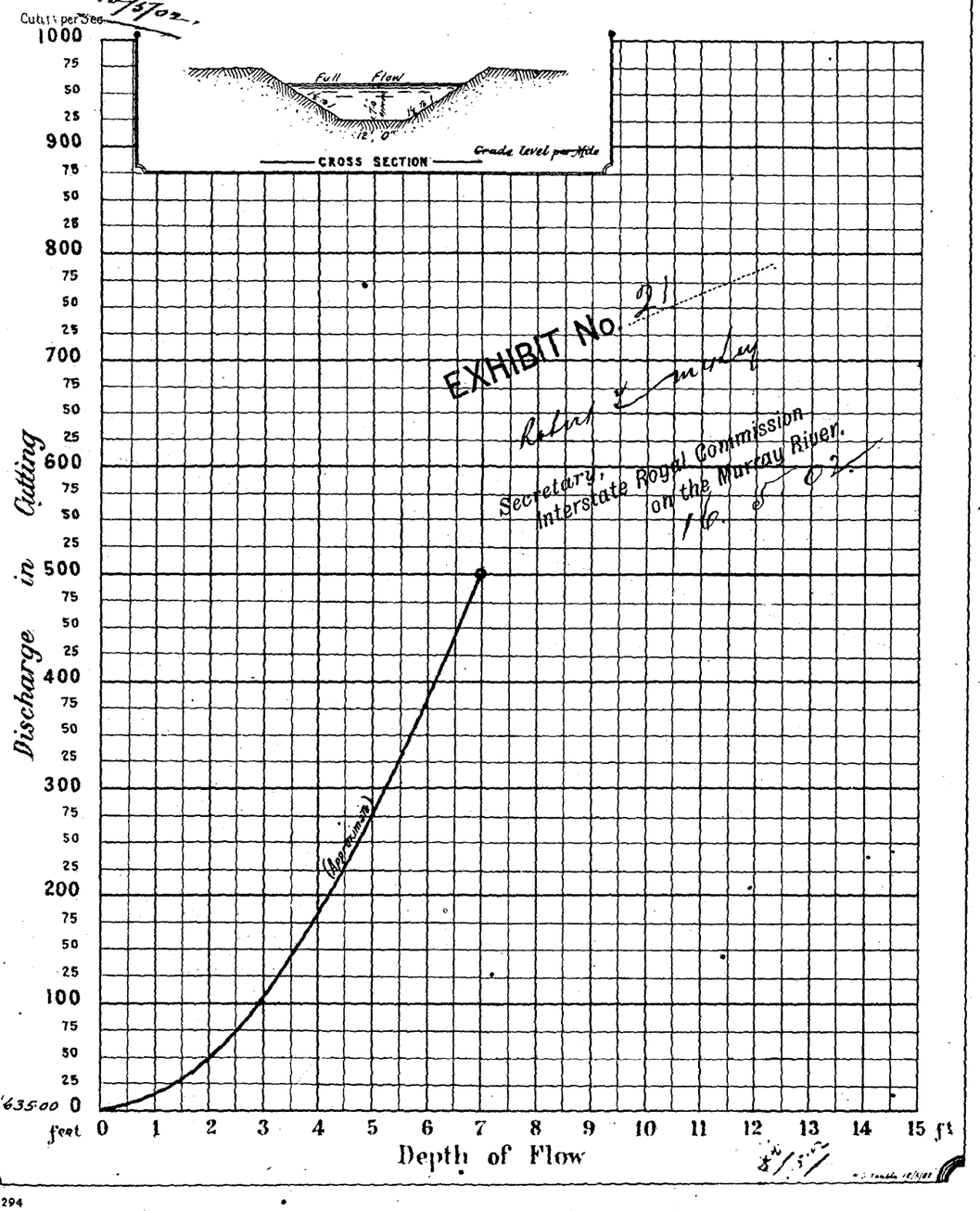


EXHIBIT No. 21

Secretary, Interstate Royal Commission on the Murray River.

99294

Photo-lithographed by W. A. Gullick, Government Printer, Sydney, N.S.W.

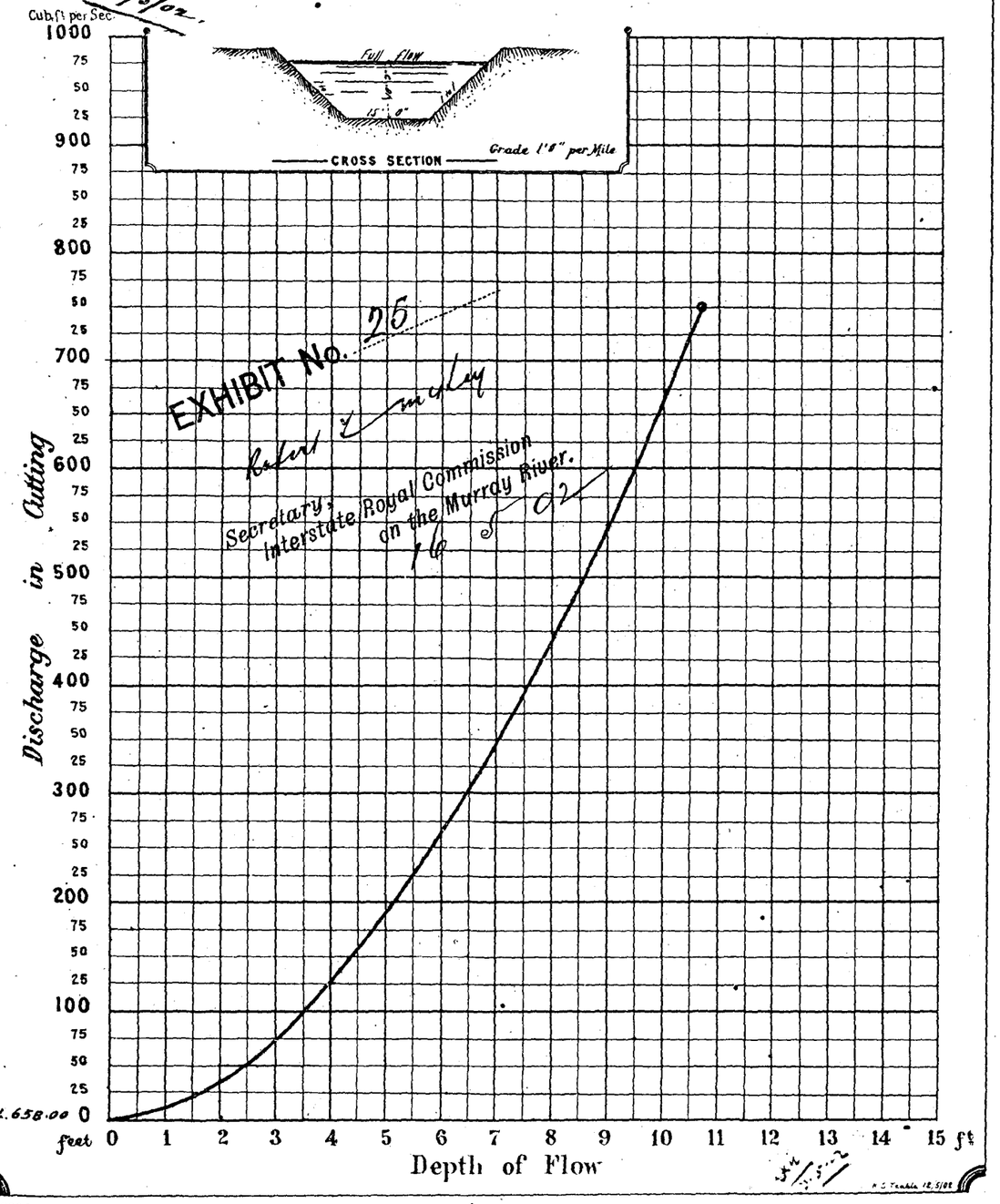
Gwydir RIVER DISTRICT

Discharge Curve at Greenbah Creek

Cutting No 1

L. Davis, Dep. Asst. C.E. Inverell. 16/5/02.

L. Abbwad 12/5/02 Principal Engineer Water Supply & Sewerage



99294

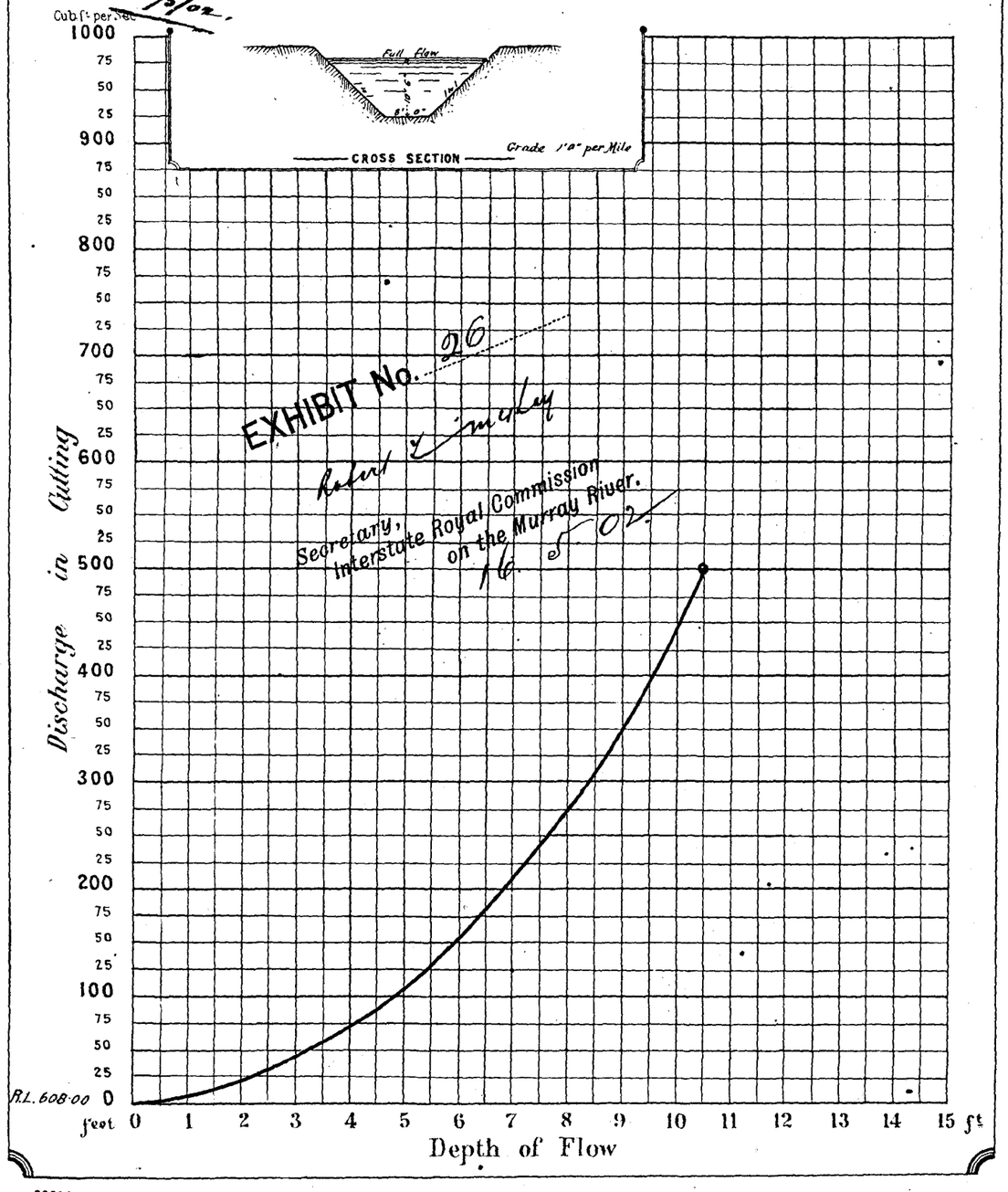
Photo-lithographed by W. A. Gullick, Government Printer, Sydney, N.S.W.

Gwydir RIVER DISTRICT

Discharge Curve at Moomin Creek

L. Davis, M. Inst. C.E. Cutting No 2
Resident.
16/5/02.

L. Abbott 17/5/02
Principal Engineer
Water Supply & Sewerage



99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Gwydir RIVER DISTRICT

Discharge Curve at Thalaba Creek

Cutting No 3

L. Davis, M. Inst. C.E. Resident. 16/5/02.

L. Aldwell 17/5/02
Principal Engineer
Water Supply & Sewerage

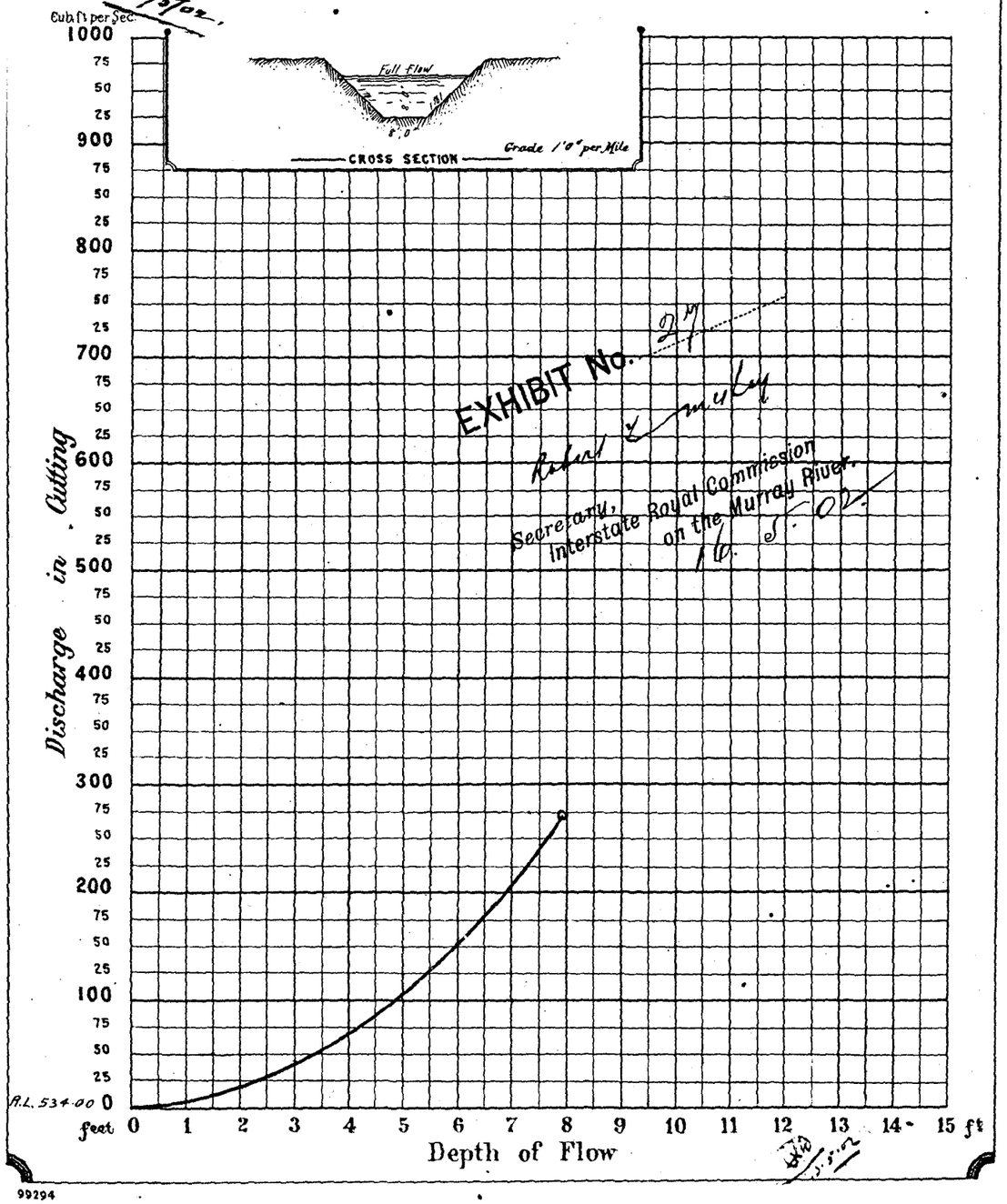


EXHIBIT No. 24
Robert Smuckey
Secretary, Interstate Royal Commission on the Murray River.
16. 5. 02.

99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Gwydir RIVER DISTRICT

Discharge Curve at head of Mechi Cutting

L. Davis, Assist. C.E. Inverell. 16/5/02.

L. Abbott 17/5/02
Principal Engineer
Water Supply & Sewerage

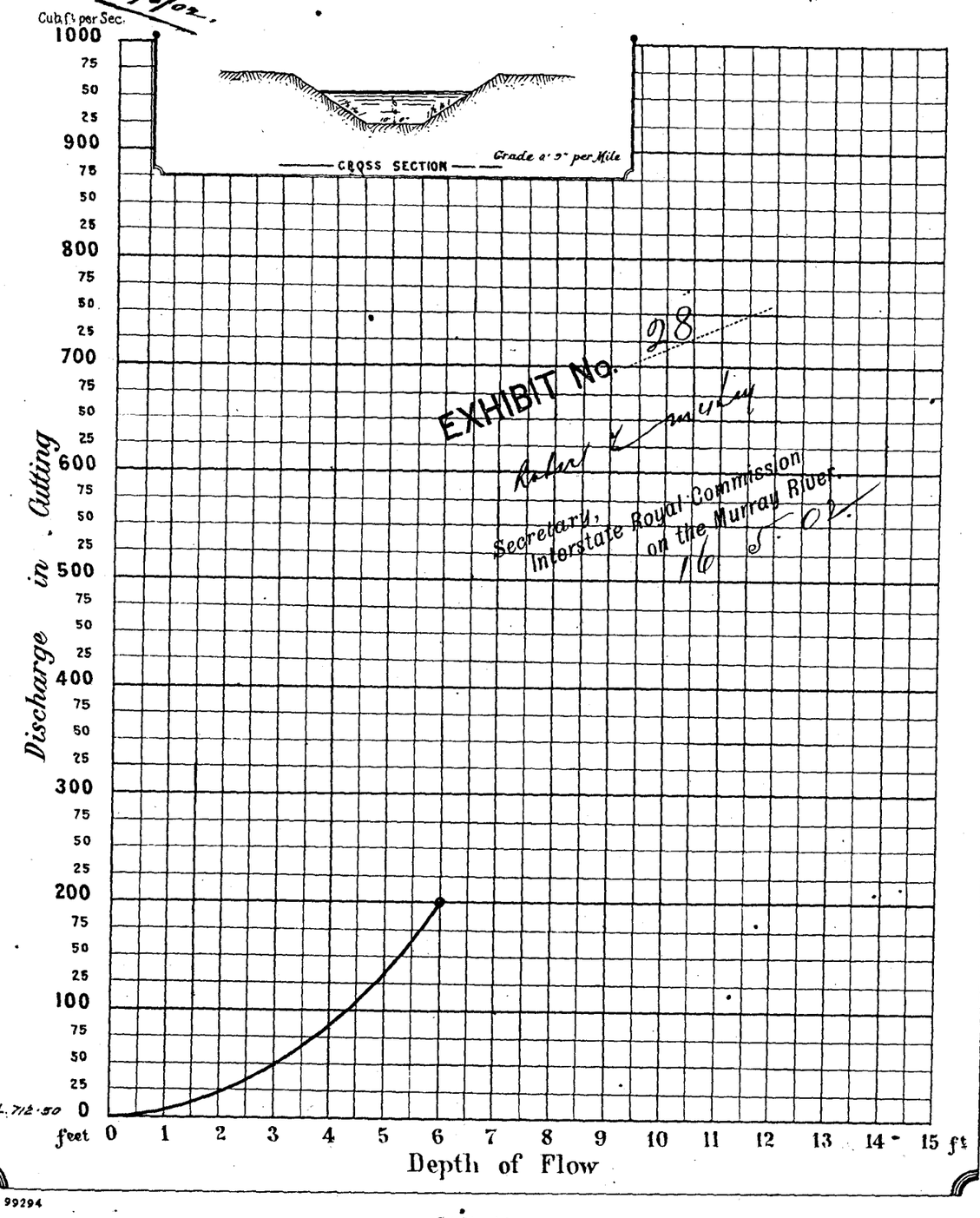


EXHIBIT No. 28
Robert L Murray
Secretary, Interstate Royal Commission on the Murray River.
16 5 02.

99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Gwydir RIVER DISTRICT

Discharge Curve at Carore Ck Cutting

L. Davis. M. Inst. C.E. Inverell. 16/6/02.

L. Abbott 12/5/02
Principal Engineer
Water Supply & Sewerage

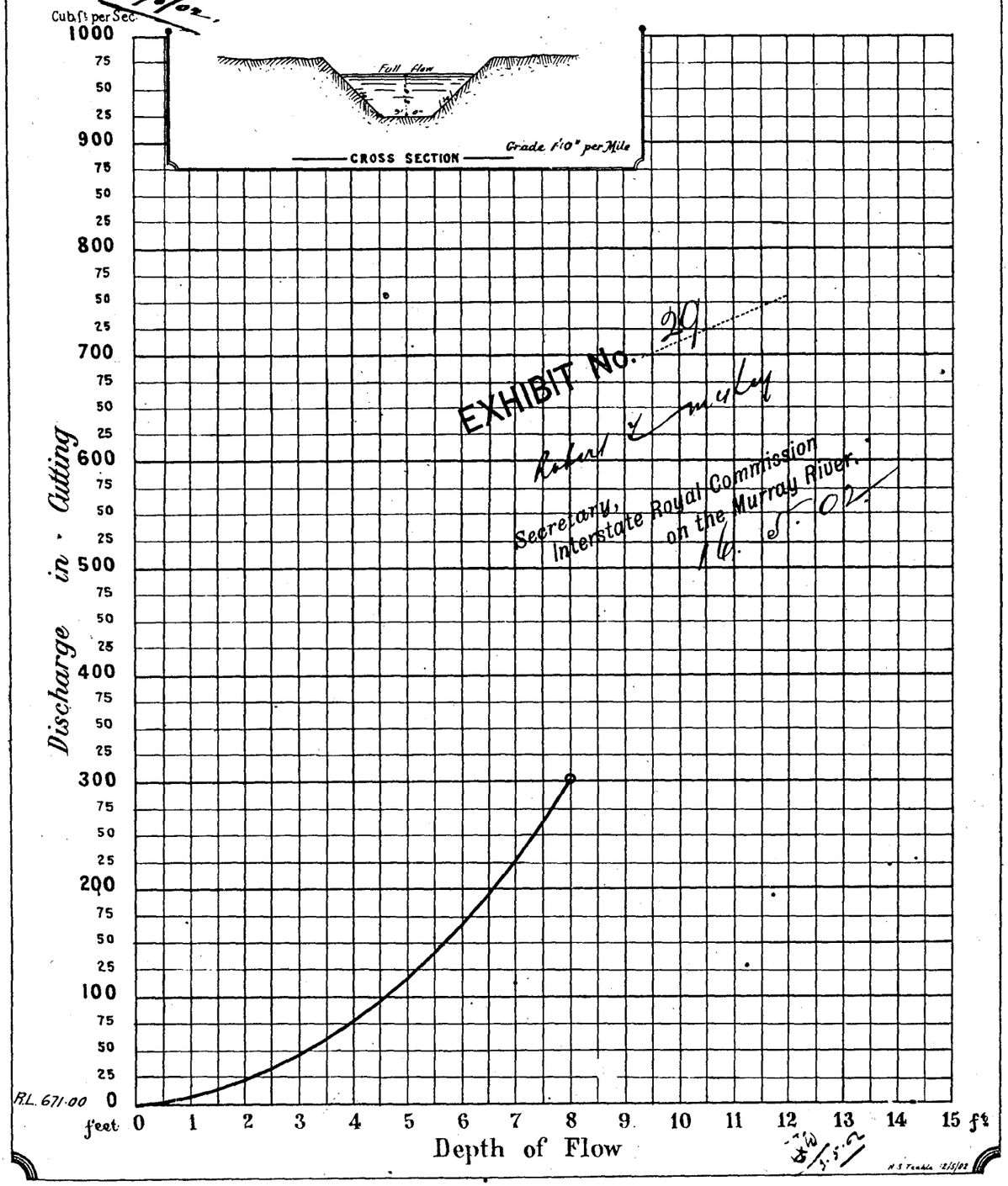


EXHIBIT No. 29

Robert Murray

Secretary, Interstate Royal Commission on the Murray River. 16. 5. 02.

H. S. Trouble 12/5/02

99294

Photo-lithographed by
W. A. Gullick, Government Printer,
Sydney, N.S.W.

Appendix 17.

Statement of Diversions from the Murray River and its Tributaries.

[*This Statement applies only to the State of Victoria, and the Tributaries dealt with are confined to those contributing to the flow of the Murray—i.e., the Avoca, Richardson, and Wimmera Rivers are omitted.*]

AUTHORISED DIVERSIONS.

Important Diversions.

Name.	Volume of Diversion.	Authority.
	MURRAY RIVER.	
	Irrigation Trusts.	
First Mildura Irrigation Trust...	(The details of the authorised diversions are given in Appendix A.)	
Swan Hill	1st July to 30th November, 900 cub. ft. per min.; 1st December to 30th June, 1,500 cub. ft. per min.	Order-in-Council.
Benjeroop and Murrabit.....	No definite volume (5,000 cub. ft. per min. recommended) ...	do
Koondrook and Myall.....	1,600 cub. ft. per min. throughout the year.....	do
Cohuna	1st June to 31st October, 11,000 cub. ft. per min.; 1st November to 31st May, 12,000 cub. ft. per min.	do
	Kow Swamp National Works.	These volumes have been allocated Departmentally. In addition, there are 600 cub. ft. per min. for compensation, and 2,793 cub. ft. per min. in winter and 1,692 cub. ft. per min. in summer, held in reserve for extensions or new Trusts. The total supplies by the Kow Swamp Works are 10,000 cub. ft. per min. in winter and 6,300 cub. ft. per min. in summer.
Gunbower West	Winter, 748 cub. ft. per min.; summer, 454 cub. ft. per min.	
Kerang East	do 1,498 do ; do 909 do	
Macorna North.....	do 2,028 do ; do 1,230 do	
Dry Lake	do 109 do ; do 66 do	
Kerang South	do 93 do ; do 56 do	
Twelve-mile (portion)	do 69 do ; do 42 do	
Wandella (portion)	do 926 do ; do 562 do	
Marquis Hill...	do 1,136 do ; do 689 do	
Pine Hills	1st July to 31st October, 344 cub. ft. per min.; 1st November to 30th April, 733 cub. ft. per min.	Order-in-Council. This Trust has not proceeded with its works.
Torrumberry North.....	1,800 cub. ft. per min. throughout the year.....	do
Millewa	625 do do	do
	National Works.	
Kow Swamp National Works ...	Diversion into head of Gunbower Creek. Maximum volume, 40,000 cub. ft. per min.; no diversion possible until the Murray flow is over 200,000 cub. ft. per min.	Water Act, 1890
	LODDON RIVER.	
	Irrigation Trusts.	
	Loddon River National Works.	
Tragowel Plains	·70169 Proportion of volume of water discharged from the National Works which the Trusts are entitled to, and liable to take after allowance made for compensation water, and loss by evaporation, &c., from 1st January to 31st May, and from 1st August to 31st December in each year; the whole available balance being taken as unit.	Order-in-Council.
North Boort	·03637	
East Boort.....	·10796	
Leaghur and Meering	·03747	
Twelve-mile	·03285	
Wandella	·08366	
	Waterworks Trusts Supplying Rural Districts.	
Loddon United	No defined volume by Order-in-Council. 560 cub. ft. per min. of the waters of the Loddon River, regulated by National Works.	Departmental allocation.
	National Works.	
Loddon River National Works ...	Weir at Laanecoorie impounding 610,000,000 cubic feet; weir at Bridgewater diverting water for Loddon United Waterworks Trust; weir at Kinypanial diverting water for the Loddon United, East Boort, and North Boort Trusts.	Water Act, 1890.
Kerang Lakes National Works...	Diverting into head of Sheepwash Creek; maximum volume, 20,000 cub. ft. per min.; compensation allowance, 500 cub. ft. per min. (flood waters only).	do

Important Diversions—*continued.*

Name.	Volume of Diversion.	Authority.
	CAMPASPE RIVER.	
	Irrigation Trust.	
Campaspe	1st July to 30th November, 4,500 cub. ft. per min., after allowing 750 cub. ft. per min. to pass; 1st December to 30th June, 750 cub. ft. per min., after allowing 150 cub. ft. per min. to pass.	Order-in-Council.
	State Works.	
Coliban Scheme	Storage reservoirs at Malmsbury, 520,000,000 cubic feet, and Upper Coliban, 648,000,000 cubic feet, on the Coliban River. Compensation water, 20 cub. ft. per min. Ten towns—Bendigo, Castlemaine, Maldon, Eaglehawk, Chewton, Taradale, Raywood, Sebastian, Huntly, and Fryers (total population, 160,000)—are supplied by reticulation. Approximate maximum diversion, 500 cub. ft. per min. for town supplies, and 1,500 cub. ft. per min. for sluicing, irrigation, &c.	Water Act, 1890.
	GOULBURN RIVER.	
	Irrigation Trust. *Goulburn National Works.*	
Rodney	11th June to 15th November, 19,700 cub. ft. per min.; 16th November to 15th April, 11,500 cub. ft. per min.	Order-in-Council.
	Waterworks Trusts Supplying Rural District.	
Echuca and Waranga	No defined volume by Order-in-Council. 4,000 cub. ft. per min. from the National Works.	Departmental allocation
	National Works.	
Goulburn National Works	Weir diverted into Western Main Channel. Maximum volume, 103,000 cub. ft. per min. Compensation allowance, 5,000 cub. ft. per min.	Water Act, 1890.
	State Works.	
Melbourne and Metropolitan Board of Works.	12,000,000 gallons per day from the Silver Creek, and 21,000,000 gallons per day from the Wallaby Creek.	Act of Parliament.
	BROKEN RIVER.	
	Waterworks Trusts Supplying Rural Districts. *Broken River National Works.*	
Tungamah	No defined volume by Order-in-Council. 2,000 cub. ft. per min. from Casey's Weir.	Departmental allocation.
Numurkah	do do do ...	do
Shepparton	No defined volume by Order-in-Council. 2,000 cub. ft. per min. from Gowangardie Weir.	do
	National Work.	
Broken River National Works	Casey's Weir, diverting into Broken Creek, 4,000 cub. ft. per min.; Gowangardie Weir, diverting into Pine Lodge Creek, 2,000 cub. ft. per min. Compensation allowance, 270 cub. ft. per min.	Water Act, 1890.

Unimportant Diversions.

Name.	Volume of Diversion.	Cub. feet per min.
	MURRAY RIVER.	
	Waterworks Trusts Supplying Towns.	
Swan Hill	No defined volume by Order-in-Council. Population, 1,200; approximate diversion...	6
Echuca	Do do do 4,000; do ...	20
Yarrawonga	Do do do 1,500; do ...	8
Rutherglen	Do do do 1,700; do ...	9
	Under Sections 277-281, Water Act, 1890.	
C. K. Hodges, Nyah	Pumping site lease; approximate diversion, 50 cub. ft. per min. No express authority.	
Thwaites and Heath, Nyah	License to divert from lagoon, 300 cub. ft. per min.	
Z. Burton, Little Murray	30 cub. ft. per min.	
J. Ah Chung, Gunbower Ck.	3 do	
	LODDON RIVER.	
	Local Bodies Supplying Towns.	
Clunes	No defined volume by Order-in-Council. Population, 2,400; approximate diversion...	12
Creswick	Do do do 3,000; do ...	15
Dunolly	Do do do 1,400; do ...	2
Inglewood	Do do do 1,500; do ...	5
Talbot	Do do do 800; do ...	4
Tarnagulla	Do do do 100; do ...	1

Unimportant Diversions—*continued.*

Name.	Volume of Diversion.	Cub. feet per min.
	LODDON RIVER—*continued.*	
	Waterworks Trusts Supplying Towns.	
Kerang	No defined volume by Order-in-Council. Population, 1,200; approximate diversion...	10
Maryborough	Do do do 5,000; do ...	25
Boort	Do do do 500; do ...	3
Carisbrook	Do do do 1,150; do ...	4
Daylesford	Do do do 3,700; do ...	18
	Under Sections 277-281, Water Act, 1890.	
Kerang Flour-mill Co.	1 cub. ft. per min.	
	CAMPASPE RIVER.	
	Waterworks Trusts Supplying Towns.	
Rochester	No defined volume by Order-in-Council. Population, 1,200; approximate diversion...	6
Elmore	Do do do 700; do ...	4
Heathcote	Do do do 1,600; do ...	5
Kyneton	Do do do 3,800; do ...	19
Woodend	Do do do 1,000; do ...	5
	Under Sections 277-281, Water Act, 1890.	
Ah Kong, Echuca	2 cub. ft. per min.	
	GOULBURN RIVER.	
	Waterworks Trusts Supplying Towns.	
Shepparton	No defined volume by Order-in-Council. Population, 2,500; approximate diversion ..	12
Mooroopna	Do do do 500; do ...	3
Murchison	Do do do 500; do ...	3
Seymour	Do do do 1,100; do ...	6
Yea	Do do do 500; do ...	3
Alexandra	Do do do 500; do ...	3
Mansfield	Do do do 500; do ...	3
Nagambie	Do do do 500; do ..	3
Avenal	Do do do 400; do ...	2
Euroa	Do do do 1,100; do ...	6
Kilmore	Do do do 1,600; do ...	8
Longwood	Do do do 300; do ...	2
Violet Town	Do do do 300; do ...	2
Kyabram	Do do do 350; do ...	2
Tatura	Do do do 800; do ...	4
Rushworth	Do do do 500; do ...	3
	Under Sections 277-281, Water Act, 1890.	
C. Ah Hoe, Shepparton	2 cub. ft. per min.	
Lloyd Bros. and Maginnis, Sunday Creek.	1 do	
	BROKEN RIVER.	
	Waterworks Trust Supplying a Town.	
Benalla	No defined volume by Order-in-Council. Population, 3,000; approximate diversion...	15
	OVENS RIVER.	
	Local Bodies Supplying Towns.	
Wangaratta	No defined volume by Order-in-Council. Population, 2,600; approximate diversion...	13
Chiltern	Do do do 1,000; do ...	2
Beechworth	Do do do 3,000; do ...	15
	Waterworks Trust Supplying a Town.	
Bright	No defined volume by Order-in-Council. Population, 500; approximate diversion...	3
	Under Sections 277-281, Water Act, 1890.	
B. K. Smart, Morse Creek	One-third natural volume; approximate diversion, 100 cub. ft. per min.	
W. Williams, Ovens River	Pumping-site lease; approximate diversion, 10 cub. ft. per min. No express authority.	
	KIEWA RIVER.	
	Under Sections 277-281, Wa Act, 1890.	
J. Haig, Kiewa	80 cub. ft. per min.	
	MITTA RIVER.	
	Waterworks Trust Supplying a Town.	
Omeo	No defined volume by Order-in-Council. Population 900; approximate diversion ...	
	Under Sections 277-281, Water Act, 1890.	
J. W. Wilson, Mitta	800 cub. ft. per min.; the whole to be returned.	

UNAUTHORISED DIVERSIONS.

No record is kept of unauthorised divisions, nor are all of them known officially.

Along the Murray River, and along the contributing streams, almost every homestead has a diversion of some sort, effected in most cases by pumping, by means of windmills, horse-works, or engines. In a few cases diversions are made for irrigation on a somewhat extensive scale, for areas of some hundreds of acres.

Along the Murray frontage, in particular, engines and centrifugal pumps are regularly hired out for irrigation of crops.

The total volume diverted from the Murray and its tributaries, without authority, is not, however, of great extent. A fair estimate, making all allowances, would be 400 cubic feet per minute throughout the year.

DIVERSIONS FOR MINING PURPOSES UNDER AUTHORITY OF THE MINES ACT, 1890.

Locality.	Volume in cub. ft. per min.	Locality.	Volume in cub. ft. per min.
Woolshed Falls, Beechworth	110	Snowy Creek, Mitta	1,110
Bethanga	40	Stanley	20
Clear Creek	80	Beechworth	40
Stanley	70	Yackandandah Creek	200
Dry Creek	70	Yackandandah and Stanley	330
Stanley	130	Wollonaby	350
Do	110	Wombat	40
Beechworth	170	Maharatta	330
Stanley	50	Do	330
Do	90	Sailor's Creek, Wombat	40
Do	80	Chiltern West	330
Beechworth	60	Beechworth	1,110
Stanley	120	Glenlyon	250
Beechworth	60	Axedale	20
Stanley	440	Bethanga	40
Do	40	Rocky Point, Beechworth	100
Beechworth	80	Tallangalook	130
Spring Creek, Beechworth	110	Sebastopol, Beechworth	1,110
Stanley	90	Long Gully, Beechworth	170
Bright	170	Omeo	220
Three-mile Creek, Beechworth	40	Stanley	80
Do do	90	Beechworth	110
Deep Creek, Beechworth	80	Eldorado	330
Spring Creek, Beechworth	40	Eskdale	10
Beechworth	80	Beechworth	30
Do	60	Yackandandah	560
Koetong	110	Beechworth	40
Beechworth	90	Little Snowy Creek, Mitta	1,110
Deep Creek, Beechworth	10	Stanley	50
Three-mile Creek, Beechworth	110	Yackandandah	330
Beechworth	30	Gobur	280
Dorchap and Majorca	360	Beechworth	60
Beechworth	90	Daylesford	30
Do	60	Clonbinane	890
Chinaman's Flat, Beechworth	60	Stanley	210
Back Creek, Creswick	220		

The above diversions do not include rights acquired under the Mining By-laws of the several mining districts.

In all cases of diversion for mining purposes the volumes diverted are returned to the streams.

PROPOSED DIVERSIONS UNDER WATER SUPPLY SCHEMES PROJECTED AND BEING CONSIDERED.

Irrigation Trusts.

East Goulburn ..... Source of supply, the Goulburn River through the National Works; suggested volumes of diversion, 20,000 cub. ft. per min. in the winter, and 10,000 cub. ft. per min. in the summer.

Waterworks Trusts supplying Towns.

Broadford	Population, 400;	approximate diversion,	3	cub. ft.	per min.
Cobram	Do 700;	do	4	do	
Jamieson	Do 300;	do	2	do	
Pyramid Hill	Do 300;	do	2	do	

State Works for the Supply of the Mallee Country.

Tooleybuc Channel ..... To divert from the Murray River at Tooleybuc, 25 miles below Swan Hill; maximum diversion, 16,000 cub. ft. per min.; no diversion possible until the Murray flow is over 250,000 cub. ft. per min.

Murray-Goulburn Scheme ... To divert from the Murray River at Bungowannah, 9 miles below Albury, 40,000 cub. ft. per min.; compensation allowance, 40,000 cub. ft. per min. To divert from the Goulburn River at Goulburn Weir, 63,000 cub. ft. per min., into the Waranga Basin.

Goulburn-Waranga Scheme To divert from the Goulburn River at Goulburn Weir, 103,000 cub. ft. per min.; compensation allowance, 5,000 cub. ft. per min. To supply Echuca and Waranga Trust with an additional volume of water, and to supply the plains westward and the mallee country.

Lake Boga Pumping Scheme To pump from Lake Boga, or a similar lake, filled by the overflow of the Little Murray, for the supply of portion of the eastern mallee; suggested diversion, 200 cub. ft. per min. for 200 days.

SUMMARY.

SUMMARY.

	Number.	Winter.	Summer.	Remarks.
Murray River—		cub. ft. per min.	cub. ft. per min.	
Irrigation Trusts	16	89,000	42,000	
Town supplies	4	43	43	
Licenses	4	383	383	
National Works	1	.....	.....	Included in Irrigation Trusts.
		89,426	42,426	
Loddon River—				
Irrigation Trusts	6	16,000	5,000	
Town supplies	11	99	99	
Rural district	1	.....	.....	Included in Irrigation Trusts.
License	1	1	1	
National Works	2	20,000	20,000	Flood waters only.
		36,100	25,100	
Campaspe River—				
Irrigation Trust	1	4,500	750	
Town supplies	5	39	39	
License	1	2	2	
State Works	1	2,000	2,000	
		6,541	2,791	
Goulburn River—				
Irrigation Trust	1	19,700	11,500	
Town supplies	16	65	65	
Rural district	1	4,000	4,000	
Licenses	2	3	3	
National Work	1	.....	.....	Included in Irrigation Trusts and Rural Districts.
		23,768	15,568	
Broken River—				
Town supply	1	15	15	
Rural districts	3	6,000	6,000	
National Works	1	.....	.....	do do
		6,015	6,015	
Ovens River—				
Town supplies	4	33	33	
Licenses	2	110	110	
		143	143	
Kiewa River—				
License	1	80	80	
Mitta River—				
Town supply	1	5	5	
License	1	.....	.....	Diversion wholly returned.

Totals.

	Number.	Winter.	Summer.	Remarks.
		cub. ft. per min.	cub. ft. per min.	
Irrigation Trusts	22	129,200	59,259	Two Trusts draw from both Murray and Loddon Rivers.
Town supplies	42	299	299	
Rural districts	5	10,000	10,000	Partly included in Trusts.
Licenses	11	579	579	
National and State works	6	22,000	22,000	Partly included in Trusts and partly flood waters only.
		162,078	92,128	

The total possible diversions in winter may be greater than 162,070 cub. ft. per min. In the case of the Kow Swamp works, the gross diversion may be, at times, 40,000 cub. ft. per min., although the Trusts' supplies amount to 10,000 cub. ft. per min. only, the remainder going into storage. The actual possible effects upon the flow of the river and its contributing streams would be more correctly stated as 200,000 cub. ft. per min. in winter, and 70,000 cub. ft. per min. in summer.

It must also be borne in mind that the full authorised volumes are not always diverted, while it may be assumed that portion of the water actually diverted is returned. And the volumes diverted do not represent (owing to losses if they had been allowed to pass) corresponding diminutions in the flow of the Murray in its lower reaches.

A. S. KENYON, 20th May, 1902.

APPENDIX A.

First Mildura Irrigation Trust.

(Extract from Messrs. Chaffey Bros.' Agreement with Government of Victoria.)

The licensees, their executors, administrators, and assigns, shall be entitled to divert water from the River Murray for irrigation, &c., as follows: —

Cubic Feet per Minute.

January.	February.	March.	April	May.	June.	July.	August.	September.	October.	November.	December
Compensation water to pass down the river.											
30,000	24,000	20,000	24,000	30,000	60,000	60,000	100,000	200,000	240,000	150,000	60,000
Maximum supply, subject to compensation.											
30,000	24,000	20,000	24,000	30,000	40,000	48,000	48,000	60,000	60,000	60,000	40,000
Number of acres in respect of which only, under Irrigated Culture, each cubic foot per minute may be taken.											
8	10	12	10	8	6	5	5	4	4	4	6

Appendix 17a.

Statement of Diversions from the Non-contributing Streams within the Watershed of the Murray River in the State of Victoria.

AUTHORISED DIVERSIONS.

WIMMERA RIVER.

Irrigation Trust.

Western Wimmera	No defined volume by Order-in-Council. Storage at Wartook, on the McKenzie River, 1,037 millions cubic feet; pumping plants on the Wimmera, at Dimboola for urban supply, and at Dooen. Weir at Longerenong.

Local Body supplying Town.

Stawell Borough	No defined volume by Order-in-Council. Population, 5,200; approximate diversion, 26 cubic feet per minute.

Waterworks Trusts supplying Towns.

Horsham	No defined volume by Order-in-Council. Population, 2,300; approximate diversion, 12 cubic feet per minute.
Warracknabeal..... ...	No defined volume by Order-in-Council. Population, 1,800; approximate diversion, 9 cubic feet per minute.

Waterworks Trusts supplying Rural Districts.

Wimmera United.....	No defined volume by Order-in-Council. Weirs with off-take channels at Glenorchy, Ashens, and Longerenong, on the Wimmera River. Urban supplies by pumping at Rupanyup, Murtoa, and Minyip.

Under Sections 277-281, Water Act, 1890.

D. G. McKellar	1 cubic feet per minute, Wimmera River at Kirkella.

National Works.

Lake Lonsdale	Storage of 2,000,000,000 cubic feet.

Note.—In an ordinary year practically the whole of the Wimmera flow is diverted for domestic and stock supply.

AVON OR RICHARDSON RIVER.

Waterworks Trusts supplying Towns.

Donald	No defined volume by Order-in-Council. Population, 1,000; approximate diversion, 5 cubic feet per minute.
St. Arnaud	No defined volume by Order-in-Council. Population, 3,500; approximate diversion, 18 cubic feet per minute.

State Works.

Glynwylln Scheme	Weir at Donald, and channel diverting 4,000 cubic feet per minute of flood-waters.

AVOCA RIVER.

Waterworks Trusts supplying Towns.

Charlton.....	No defined volume by Order-in-Council. Population, 1,200; approximate diversion, 3 cubic feet per minute.
Wycheproof	No defined volume by Order-in-Council. Population, 700; approximate diversion, 2 cubic feet per minute.

Waterworks Trusts supplying Rural Districts.

Avoca United	No defined volume by Order-in-Council. Weirs at Coonooer, Charlton, Boort-road, and Quambatook for storage, and a diversion to Sand Hill Lake of flood-waters.

Note.—In an ordinary year practically the whole of the Avoca flow is diverted for domestic and stock supply.

PROPOSED DIVERSIONS UNDER WATER SUPPLY SCHEMES PROJECTED AND BEING CONSIDERED.

Glynwylln	Construction of a storage on the Upper Wimmera to conserve 2,000,000,000 cubic feet, to be diverted into the Richardson River at Glenorchy Weir, by Swede's Creek. Approximate diversion, 700 millions cubic feet annually.

Appendix 18.

SOUTH AUSTRALIA.—ENGINEER-IN-CHIEF'S DEPARTMENT.

Schedule A, showing Existing Waterworks on the River Murray, as shown on General Plan No. 1.

Reference Number in General Plan No. 1.	Locality.	Description of Work.	Power of Present Pumping Plant.
4	Tailem Bend Pumping Station; Hd. of Seymour.	The water is pumped from the River Murray for locomotive and other railway purposes on the Adelaide and Melbourne Railway Line.	3,000 gallons per hour.
5	Murray Bridge Waterworks; Hd. of Mobilong.	This is a pumping supply from the River Murray for domestic supply, stock, and the irrigation of gardens for the townships of Murray Bridge, Mobilong, Bridgeport, and suburbs, which are reticulated, and for supply for railway purposes. The Water District is under "The Water Conservation Acts," 392 of 1886 and 463 of 1889. (Plan of District and reticulation hereto, No. 3.)	10,000 gallons per hour.
7	Mannum Waterworks; Hd. of Finniss.	A pumping supply from the River Murray for domestic supply, stock, and irrigation of gardens for the township of Mannum and suburbs, which are reticulated. The Water District is under "The Waterworks Act," No. 269 of 1882. (Plan of Water District and reticulation hereto, No. 4).	About 10,000 gallons per hour.
13	Morgan Waterworks; Hd. of Eba.	A pumping supply from the River Murray for domestic supply, stock, and irrigation of gardens, for the township of Morgan and suburbs, which are reticulated, and for railway purposes. The Water District is under "The Water Conservation Acts," 392 of 1886 and 463 of 1889. (Plan of Water District and reticulation hereto, No. 5.)	About 10,000 gallons per hour.
17	New Era; Hd. of Cadell. (Now unleased Crown Lands, formerly Village Settlements).	A pumping supply from the River Murray for stock and irrigation purposes. Area open for lease, 2,095 acres.	About 18,000 gallons per hour; 120 acres under irrigation.
18	Gillen, Co. of Young. Crown lease (formerly Village Settlement).	A pumping supply from the River Murray for stock and irrigation purposes. Area of lease, 7,179 acres.	About 9,000 gallons per hour; 75 acres under irrigation.
19	Ramco; Hd of Waikerie (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in the settlement, 3,680 acres. Under "The Village Settlement Act," No. 768 of 1901.	About 36,000 gallons per hour; 150 acres under irrigation.
20	Waikerie; Hd. of Waikerie (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in the settlement, 3,330 acres. Under "The Village Settlement Act," No. 768 of 1901.	About 72,000 gallons per hour; 290 acres under irrigation.
21	Holder; Hd. of Holder. (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in settlement, 7,560 acres. Under "The Village Settlement Act," No. 768 of 1901	About 30,000 gallons per hour; 220 acres under irrigation.
23	Kingston; Hd. of Moorook. (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in the settlement, 3,901 acres. Under "The Village Settlement Act," No. 768, of 1901.	About 40,000 gallons per hour; 180 acres under irrigation.
24	Moorook; Hd. of Moorook. (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in the settlement, 3,200 acres. Under "The Village Settlement Act," No. 768, of 1901.	About 40,000 gallons per hour; 160 acres under cultivation.
25	New Residence; Hds. of Moorook and Pyap. Crown lease (formerly Village Settlement).	A pumping supply from the River Murray for stock and irrigation purposes. Area of lease, 4,070 acres.	About 20,000 gallons per hour; 120 acres under irrigation.
24	Pyap; Hd. of Pyap. (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in the settlement, 9,132 acres. Under "The Village Settlement Act," No. 768 of 1901.	About 32,000 gallons per hour; 210 acres under cultivation.
27	Lyrup; Hd. of Paringa. (Village Settlement).	A pumping supply from the River Murray for domestic supply, stock, and irrigation purposes. Area of land in the settlement, 14,049 acres. Under "The Village Settlement Act," No. 768 of 1901.	About 144,000 gallons per hour; 500 acres under cultivation.
28	Renmark Town Waterworks, county of Hamley.	A pumping supply from the River Murray for domestic supply, stock, and irrigation of gardens for the township of Renmark. The Water District is under "The Water Conservation Acts," 392 of 1886, and 463 of 1889 (Plan of Water District hereto, No. 7).	10,000 gallons per hour.
29	Renmark Irrigation Colony, county of Hamley.	This is the irrigation scheme under the Chaffey Brothers Irrigation Works Act, No. 397, of 1887. The irrigation works are now administered by the Renmark Irrigation Trust under "The Renmark Irrigation Trust Act," No. 578 of 1893. The works comprise one pumping station on the River Murray and one on the Ral Ral Creek, an anabranch of the Murray, and other pumping stations to higher levels and the distributing irrigation channels. The area under the Act of 1887 is 250,000 acres. The area commanded by present channels is about 3,670 acres. (A plan of the Irrigation Colony hereto, No. 8).	The maximum quantity of water for the entire Renmark Colony under the original agreement, which is still in force, is about 60,000 cubic feet per minute. The power of present pumping plant is about 20,000 galls. per minute.
30	Murtho. Hd. of Murtho. Crown lease (formerly village settlement).	A pumping supply from the River Murray for stock and irrigation purposes. Area of lease, 2,998 acres.	About 48,000 gallons per hour; 250 acres under irrigation.

In addition to the above there are a large number of small private water supplies on Lakes Alexandrina and Albert and the River Murray between Goolwa and the eastern boundary of the State.

The River Murray water being either taken by gravitation to low-lying lands for irrigation purposes, or by pumping by steam and windmill power for domestic supply, stock, and irrigation.

SCHEDULE B, SHOWING PROJECTS FOR WATER SUPPLY OR IRRIGATION ON THE RIVER MURRAY, OR TRIBUTARY CREEKS, WHICH HAVE BEEN UNDER CONSIDERATION.

Reference Number on General Plan No. 2	Locality.	Description of Work.	Power of Present Pumping Plant.
1	Near sea mouth of the River Murray; Hds. Nangkita and Baker.	Weir on the Goolwa, Mundoo, and Coorong channels. For details see the Report of A. B. C. Moncrieff, M.I.C.E, Engineer-in-Chief. *Vide* Parliamentary Paper No. 144 of 1890.	
2	Navigation Canal. Goolwa to Victor Harbour; Hd. of Goolwa.	For details see Mr. Lindon Bates' Report in Parliamentary Paper No. 50 of 1901.	
3	Milang; Hd. of Bremer	A preliminary examination was made some years ago of a project for pumping water from Lake Alexandrina for the supply of the town of Milang, and for irrigating a considerable area of land in the Hd. of Bremer. No definite report or estimate was prepared.	

REEDY CREEK SCHEME.—No. on General Plan, 6.

This project originated with Messrs. Derry, Long, and Sando, and was proposed to be carried out under Part X of the Water Conservation Act No. 392 of 1886.

By proclamation dated 10th December, 1890, gazetted 11th December, 1890, page 1617, Messrs. J. D. Derry, C. N. Long, and W. R. Sando were authorised to carry out the scheme, details of which are as follows:—

1. *Catchment Area*=107 square miles in the hundred of Tungkillo and part South Rhine, all private land, for the most part hilly and used for pasture chiefly; the water to be obtained from Reedy Creek and its tributaries.

Rainfall.—From 15 to 30 inches per annum.

2. *Headworks.*—Earthen dam on reserve and section 330, hundred Finnis, 1,188 feet long by 77 feet high. Capacity, 4,674 million gallons.

3. *Area Commanded.*—It was contemplated to irrigate about 20,000 acres of land in hundreds of Finniss and Mobilong, near Mannum.

The proposal was to purchase the land from present owners, and resell it in small blocks with water rights.

Distribution Works.—Twenty and a-half miles open channelling.

4. *Estimated Cost.*—£94,160.

The promoters failed to commence the work, and the concession lapsed.

PELLARING FLAT SCHEME.—No. on General Plan, 8.

In 1890 a small irrigation scheme from the River Murray was contemplated at Pellaring Flat, hundred Finniss, from 10ft. to 40ft. above level of river.

Area to be supplied = 120 acres. Estimated cost, £1,661. It was estimated that the water could be supplied at about 1½d. per 1,000 gallons.

The work was deferred and the land subsequently let in small blocks to private persons, who are, to some extent, irrigating part of it.

The carrying out of Messrs. Chaffey's scheme obviated the necessity of any such experimental scheme as Pellaring Flat.

MILLENDELLA CREEK SCHEME.—No. on General Plan, 9.

[For previous reports, see P.P. 185/91.]

1. *Catchment Area.*—Seven square miles = 4,480 acres in the hundreds of Tungkillo and South Rhine; for the most part hilly pasture land.

2. *Rainfall.*—Maximum, 30 inches ..... = 3,040,000,000 gallons on catchment area.
Minimum, 12 ,, ... = 1,216,000,000 ,, ,,
Mean, 20 ,, ... = 2,027,000,000 ,, ,,
2½ per cent. of minimum ..... = 30,000,000 gallons.
5 ,, ,, ... = 60,000,000 ,,
2½ ,, of mean ..... = 51,000,000 ,,
5 ,, ,, ... = 102,000,000 ,,

Gaugings taken for four months in 1889 gave the phenomenal result of 576 million gallons; this was due to exceptionally heavy rainfall. The permanent spring flow is about one and a half million gallons per annum of brackish water, only fit for stock.

3. *Headworks.*—A small off-take weir on the creek, with a service reservoir of four and a half million gallons capacity on Government reserve, hundred Finniss, to receive flood water.

4. *Area Commanded.*—Forty-eight thousand six hundred acres in hundred of Finniss, to be reticulated with thirteen miles of mains.

5. *Estimate.*—Headworks £4,000
Reticulation 6,000
Total £10,000

6. *Revenue.*—By rating the land commanded on the Beetaloo principle and scale the revenue from rates would be about £350.

The amount required to pay 5 per cent. on capital cost and working expenses would be about £550 per annum.

A charge of 2s. per 1,000 gallons on a consumption of five and a half million gallons would suffice to meet interest and working expenses.

This is one of several very feasible small schemes capable of giving a permanent supply of water to the Murray Flats, now so destitute of water in bad seasons. It remains for the people concerned to decide whether they can pay the required revenue.

SAUNDERS' CREEK SCHEME—No. on General Plan, 10.

[For previous report, see P.P. 185/91.]

1. *Catchment Area* = 25 square miles = 16,000 acres in hundred South Rhine, chiefly hilly pasture land.

2. *Rainfall.*—Maximum, 30 inches ..... = 10,858,000,000 gallons on catchment area.
Minimum, 12 ,, ... = 4,343,000,000 ,, ,,
Mean, 20 ,, ... = 7,239,000,000 ,, ,,
2½ per cent. of minimum ..... = 108,000,000 gallons.
5 ,, ,, ... = 216,000,000 ,,
2½ ,, of mean ..... = 181,000,000 ,,
5 ,, ,, ... = 362,000,000 ,,

Gaugings taken for eleven months in 1888-9 gave a flood discharge of 5,256 million gallons, and a spring flow, rather brackish, of about forty million gallons per annum. There was exceptionally heavy rain at the time of flood-gauging, and this accounts for the remarkably high percentage of discharge—about 50 per cent. of the rainfall.

3. *Headworks.*—A small off-take weir 12 feet high, of about 500,000 gallons capacity, on reserve near section 74, hundred Angas.

4. *Area Commanded.*—27,500 acres in the hundred of Angas, all occupied and used for grazing and cultivation. About twelve and three-quarter million gallons estimated for to reticulate this area.

5. *Estimate.*—Headworks £1,600
Mains, &c. 6,000
Total £7,600

6. *Revenue.*—On the basis of the Beetaloo principle and scale of rating the revenue from rates would be about £260.

The amount required to return 5 per cent. on the estimated cost and working expenses would be about £400, and to make up this would require the sale of four million gallons per annum at 2s. per 1,000 gallons, or double the quantity at half the cost. The permanent supply, as previously shown, is considerably over these quantities.

The scheme is one that would supply a considerable area now badly off for water, and could be readily carried out if the residents interested will agree to rating in an amount sufficient to give the required revenue. An average rate of 4d. per acre per annum over the area commanded as above would suffice, which I have reason to believe, would be very much less than is at present being paid for carting water.

NORTH AND SOUTH RHINE SCHEME—No. on General Plan, 11.

[For previous reports, see P.P. 185/91.]

1. *Catchment Area.*—85 square miles = 54,400 acres in hundreds of North Rhine, South Rhine, and Angas. Chiefly hilly pasture land.

2. *Rainfall.*—Maximum, 30 inches ..... = 36,919,000,000 gallons on catchment area.
Minimum, 12 ,, ... = 14,768,000,000 ,, ,,
Mean, 20 ,, ... = 24,616,000,000 ,, ,,
2½ per cent. of minimum ..... = 368,000,000 gallons.
5 ,, ,, ... = 738,000,000 ,,
2½ ,, of mean ..... = 615,000,000 ,,
5 ,, ,, ... = 1,230,000,000 ,,

Gaugings taken for eleven months in 1888-9 gave a flood discharge of 14,800 million gallons. There is generally a small spring flow of brackish water.

3. *Headworks.*—A masonry dam 40 feet high and 265 feet long, near section 29, hundred of South Rhine, capacity fifty million gallons.

4. *Area Commanded.*—Such a scheme would be capable of supplying an area of 88,000 acres in hundreds of Bagot, North Rhine, Fisher, Angas, and Ridley, and the town of Rhine Villa.

About twenty-two miles of mains are estimated for, which would bring the water to the frontage of most of the holdings, and be nowhere more than four miles from any of the land referred to. The land is all occupied for grazing and cultivation.

5. *Estimate.*—Headworks £35,000
Reticulation works 17,000
Total £52,000

6. *Revenue.*—By rating the land concerned on the Beetaloo principle and scale the revenue from rates would be about £640.

The amount required to pay 5 per cent. on capital cost and working expenses would be about £2,800 per annum.

It would require a consumption of twenty-eight million gallons, at 2s. per 1,000 gallons, to meet the required interest and working expenses, and there would be this quantity of water available each year, and also a large surplus.

To put it in another way: It would require an average rate of 9d. per acre per annum on the whole 88,000 acres to give the required revenue to make the scheme a paying one to the Government; it seems highly improbable, therefore, that this land could bear such a burden. This is an instructive illustration of the fact that for such comparatively small schemes the revenue will not meet interest on comparatively costly headworks. Where the item for headworks is small and the chief outlay goes in reticulation a moderate rate will meet the required interest and maintenance expenses.

This scheme is worthy of further consideration as to the possibility of designing cheaper headworks.

HUNDRED PAISLEY SCHEME (Near Blanchetown, River Murray)—No. on General Plan, 12.

A proposal in 1894 to irrigate the land above the cliff in this hundred was examined into and levels taken to determine the elevation of the land above the river

The level was found to be from 80 feet to 115 feet above low water in the river.

The soil, while not first-class, was found similar to some of the land being cultivated in the village settlements. No works were designed or estimate of cost made.

MORGAN, HUNDRED OF EBA—No. on General Plan, 14.

A pumping supply from the River Murray for irrigating an area of 2,000 acres adjacent to the township of Morgan, in the hundred of Eba.

The proposed works comprise a pumping station on the River Murray at Morgan.

The area commanded includes 2,000 acres of land, portions of sections 180, 181, 182, 151, 152, and 153, hundred of Eba.

BURRA CREEK SCHEME.—No. on General Plan, 15.

1. *Catchment Area*=121 square miles=77,440 acres, 92 square miles being on the Burra Creek watershed in the hundreds of Kingston and Kooringa, and 29 square miles on the watershed of Logan's Creek in the hundreds of Kooringa and Apoinga; part very hilly, and, on the whole, very favourable for discharging a good proportion of the rainfall. A very small part of the catchment under cultivation, the bulk being pasture land. The fact is well known that periodic floods occur in the Burra Creek about Mount Bryan and Burra townships, and this water would reach the proposed reservoir by an aqueduct channel from Burra Creek valley to the storage basin in Logan's Creek.

Rainfall.—The Burra recording station, almost in the centre of the catchment, shows:—

Maximum, 28 inches ..... = 49,051,735,000 gallons on catchment area.
Minimum, 10 ,, ... = 17,518,000,000 ,, ,,
Mean, 18 ,, ... = 31,534,000,000 ,, ,,

It would take 8½ per cent. of the mean or 15 per cent. of the minimum to give the 2,700 million gallons required to fill the reservoir.

Gaugings.—Taken continuously in 1887-8, for twelve months, gave the discharge of the Burra Creek as 2,700 million gallons, which includes Logan's Creek. As gauge was below the Junction, this represents about 8 per cent of the rainfall. In very dry periods, therefore, the flood water would not nearly fill the reservior, probably not supply quite one-quarter of the quantity. The reservoir, as designed, is, however, of immense capacity (almost as large as Happy Valley reservoir), and would probably have a reserve storage to tide over bad seasons.

2. *Headworks.*—An earthern embankment with puddle core in a large natural basin on Logan's Creek, section 13, hundred Apoinga. Elevation above the sea, 1,350 ft.

Capacity, 2,700 million gallons; length of embankment forming dam, 1,300 ft.; height from bed of creek, 75 ft. There is suitable material in locality for such an embankment.

Storage basin, 390 acres. Ample by-wash provided to pass the excess flood water of Logan's Creek. Greatest depth of water in reservoir, about 68 feet.

Reservoir designed large to tide over dry cycle. As already shown, the reservoir could not be filled by each year's rainfall.

3. *Area Commanded.*—The land proposed to be supplied with water is from 400 feet to 1,000 feet below the reservoir level, and, therefore, most favouraly situated for pressure.

Area shown on plan to be commanded by the length of main estimated for 500,000 acres. The reservoir would probably be capable of supplying an even larger district. The 500,000 acres comprise hundreds of King and Lindley, and parts of hundreds of Baldina, Bright, Bundey, Schomurgk, Krichauff, Eba, and about 240 square miles (153,600 acres) out of hundreds east of hundred of King, now occupied for pastoral purposes. The whole of the land to be served is occupied, part for agriculture and largely for pasture and grazing and cultivation combined. The townships of Lapford, Florieton, Krichauff, and Eba Siding would be reached.

The trunk and reticulation mains estimated for are 18-inch, 12-inch, 8-inch, 4-inch, and 3-inch pipes, aggregating a length of 176 miles, capable of discharging three-quarters of the capacity of reservoir in twelve months.

Five reducing tanks provided for, rendered necessary by the great fall. No part of land shown would be over 4 miles from a main as now designed.

4. *Estimate.*—Headworks, including viaduct from Burra Creek £202,900
Mains, &c. 225,778

Total £428,000
Say, £430,000.

5. *Revenue.*—On the basis of the present Beetaloo rating the rates of the 500,000 acres would amount to about £3,800 per annum.

To secure 5 per cent. on the estimated cost of £430,000 and working expenses would require a sum of about £23,000 per annum. To meet this, it would be necessary to sell about 400 million gallons at 1s. per 1,000, in addition to the amount received from rates and for which rebate would have to be allowed, and the quantity of water required each year to do this would be about 450 million gallons, or about one-sixth of the capacity of the reservoir.

This scheme has some strikingly good features, and, from an engineering point of view, would, no doubt, be very successful, and if the area commanded on the Murray flats can bear the burden of the rates mentioned, and utilise the quantity of excess water stated, the scheme is one deserving further careful consideration.

HUNDRED STUART SCHEME (River Murray, near Morgan)—No. on General Plan, 16.

This scheme was reported on in July, 1895 (*vide* P.P. 73/85). The proposal was to irrigate about 1,000 acres of land near the North-west Bend of the River Murray in above hundred, the elevation of the land being about 65 feet to 110 feet above river, summer level.

It was estimated that the water could be lifted and distributed and interest paid on the complete outlay at a price of about seven-eighths of a penny per 1,000 gallons—the whole 1,000 acres to be supplied with 24 inches per acre per annum.

Estimated cost of the above scheme £7,880.

The scheme is not one that can be recommended to be carried out by the Government.

12th. LAKE BONNEY SCHEME—No. on General Plan, 22.

The following Parliamentary papers refer to this scheme:—P.P. 86/92—Mr. Porter's report, with plan of survey of 10,000 acres block north and east of Lake Bonney; date of report, January 9th, 1891. P.P. 135/93.—The Engineer-in-Chief's report, dated March 16th, 1893.

Synopsis of Engineer-in Chief's Report.

Area 10,000 acres, 76 feet to 86 feet above low water of lake. Character of soil generally good, leading to the conclusion that there is an area of 10,000 acres of good irrigable land available at Lake Bonney. Proposed to supply a quantity of water equal to 18 inches in depth per annum=407,000 gallons per acre—at an estimated cost (approximate) of ¾d. per 1,000 gallons.

Estimated that £1 5s. 5d. per acre per annum average on 10,000 acres would meet working expenses and 5 per cent. on capital cost.

Rainfall.—Average, 11½ inches per annum.

This scheme has much to commend it, but cannot be a success unless most of the 10,000 acres are taken up. Very large and favorable natural storage. Area of lake surface, 4,340 acres; contents at 25 feet deep = 20,000 million gallons.

Estimate.—For 10,000 acres, £82,917 9s. = about £8 6s. per acre, capital outlay. The land to be subdivided into 1,000 blocks of ten acres each.

The Lake Bonney Settlement Act, No. 599/94, assented to December 21st, 1894. Section 2 defines the purpose as follows:—

(1) To provide for the establishment of a settlement at Lake Bonney whereon
(2) Irrigation works and improvements will be undertaken by the Commissioner of Public Works, and
(3) Land may be acquired on
(4) Terms which will recoup with interest the public expenditure.

A block of 153,000 acres has been set apart for the settlement, extending from Lake Bonney to Renmark settlement.

The Act has been inoperative because the applications as "paying members" did not reach the number required by the sixth section of the Act, viz., 250 ten-acre blocks.

This is one of our very best irrigation schemes, and if anything is to be done in that direction demands most careful consideration.

The following additional particulars are given concerning Lake Bonney:—

When the lake contains about 3 feet depth of water, the area is about 2,800 acres.
,, ,, 10 ,, ,, 3,885 ,,
,, ,, 15 ,, ,, 4,173 ,,

The central portion of Lake Bonney is about 1 ft. 3 in. above zero at Overland Corner gauge. The chief entrance of Chambers' Creek (the channel from the River Murray to Lake Bonney) is about 4 miles above Overland Corner, and the fall of the river is about 3½ inches per mile.

The capacity of Lake Bonney is as follows—

Capacity when water is 3 feet deep in lake ..... 160,000,000 cubic feet.
,, ,, 10 ,, ,, ... 1,199,520,000 ,,
,, ,, 15 ,, ,, ... 2,080,000,000 ,,
,, ,, 20 ,, ,, ... 3,018,000,000 ,,

The level of the River Murray, at the entrance of Chambers' Creek, when the river is at zero of the Overland Corner gauge is about 14 inches above the said zero. There are bars of sand in Chambers' Creek about 10 feet above the zero of the Overland Corner gauge.

ALEX. B. MONCRIEFF,
Engineer-in-Chief.

May, 1902.

G
rather bi
gauging, a

Appendix 19.

Irrigation Trusts in Victoria.

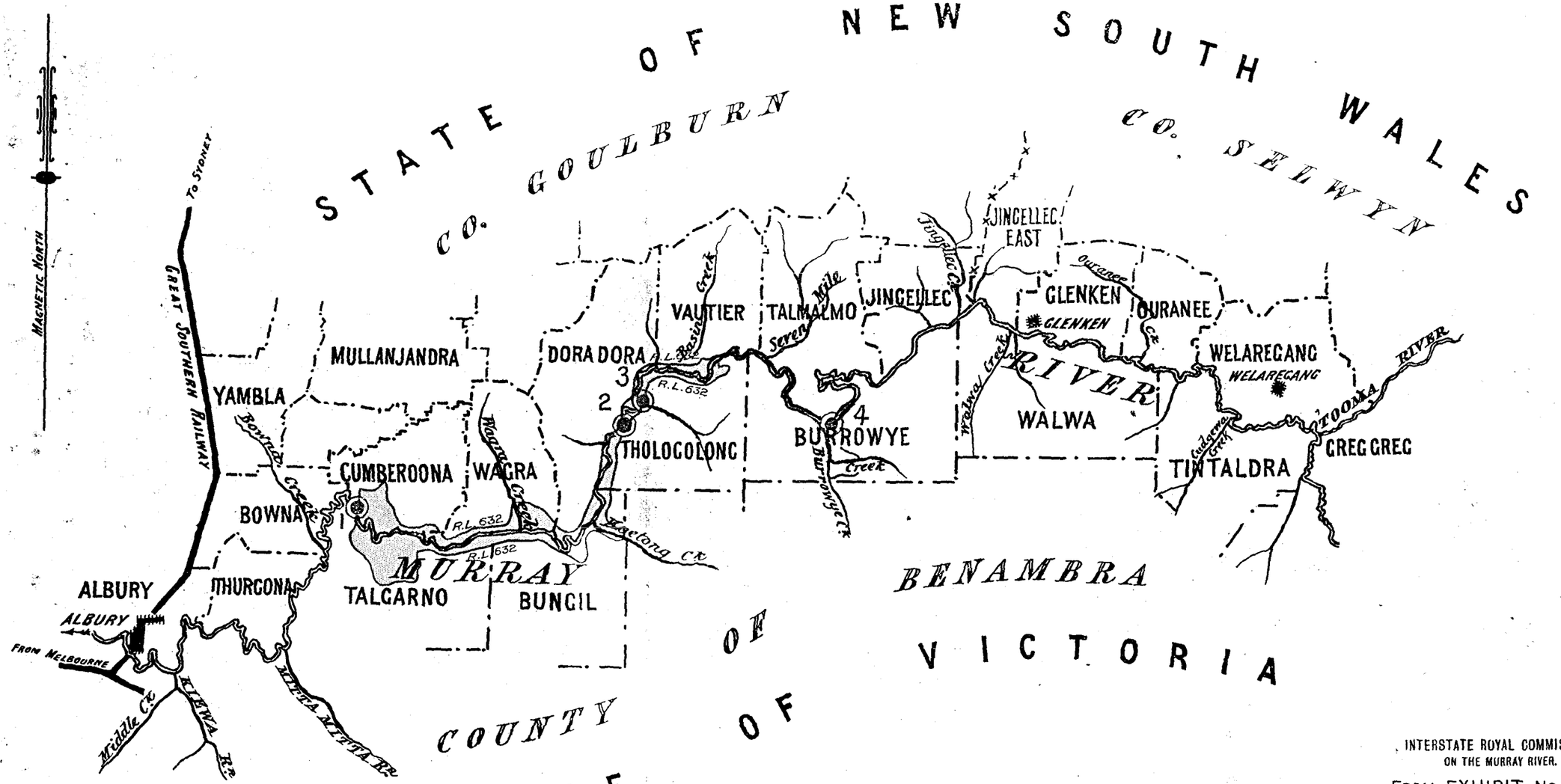
Name of Trust.	Area of Trust.	Cost of Works.	Amount written off, Principal and Interest.	Present Liability.	Annual Revenue.	Lengths of Channels.	Area irrigated.	Number of Waterings.
	Acres.	£	£	£	£	m. c.	Acres.	
Benjeroop and Murrabit	20,560	12,690	7,200	5,491	545	Main ..... 12 0 Branch 20 0	7,000	
Campaspe	46,447	62,000	52,685	9,315	734	Main ..... 22 72 Branch 8 12	1,100	
Cohuna	98,160	145,347	94,139	51,208	4,373	Main and principal branches .....100 21 Branch 95 44	42,600	
Dry Lake	1,513	1,939	961	978	236	Main ..... 4 0 Branch 1 45	1,400	
East Boort	32,340	21,566	14,958	6,608	285	Main .... 49 56 Branch 3 57	4,700	
Gunbower West	9,660	5,268	.....	5,268	311	Main ..... 13 20 Branch 7 0	2,500	
Kerang East.....	18,100	13,985	7,001	6,983	388	Main ..... 13 0 Branch 22 0	13,500	
Koondrook and Myall..	13,112	13,581	2,088	1,493	668	Main ..... 16 30 Branch 18 0	3,100	
Leaghur and Meering...	12,400	5,043	2,568	2,475	52	Main ..... 15 25 Branch 40 75	3,100	
Macorna North	27,300	18,477	8,082	10,395	686	Main ..... 28 40 Branch 8 60	19,200	
Marquis Hill	13,060	14,477	9,076	5,401	195	Main .... 9 23 Branch 19 62	9,100	
North Boort.....	12,000	6,978	4,888	2,090	77	Main .. .. 19 14 Branch 0 45	1,600	
Rodney	278,400	221,160	148,934	72,225	5,242	Main ..... 90 0 Branch 200 0	49,800	
South Kerang	1,378	319	.....	320	60	Main .... Branch	1,500	
Swan Hill.....	15,000	24,800	19,799	5,001	853	Main ..... 7 20 Branch 20 0	7,400	
Torrumberry North ...	19,387	12,300	6,300	6,000	.....	....	.....	
Tragowel Plains	224,200	159,036	123,773	35,263	2,678	Main ..... 91 0 Branch 267 0	39,300	
Twelve Mile.....	9,920	5,050	3,264	1,787	68	Main ..... 11 7 Branch 3 0	3,500	
Wandella	98,231	30,754	19,772	10,982	627	Main .. .. 28 40 Branch 28 0	53,800	
Western Wimmera	1,643,776	213,465	134,449	79,016	7,846	Main ..... 153 0 Branch 151 0	1,800	
Mildura	45,070	370,000	Nil	57,225	12,200	Main..... 69 0 Branch 100 8	10,000	
						Total	276,000	

CHARGES FOR WATER.

Name of Trust.	
Benjeroop and Murrabil.	All crops, 8d. per inch acre, first watering. ,, 4d. ,, ,, second watering Grass, 2d. per inch acre, second watering. Fallow, 3 inches a watering.
Campaspe	Gravitation supply— Crops, 4d. per inch acre, 2-inch watering. Grass, 3d. ,, ,, 2 ,, ,, Pumping supply—6d. per inch acre, 3-inch watering.
Cohuna ...	Gravitation supply— Grass land, 4d. per inch acre. Fodder crops, 9d. per inch acre. Cereal crops, 1s. 6d. per inch acre. Fallow land, 1s. per inch acre. Pumping—Crops, 10d. per inch acre, 3-inch watering.
Dry Lake..	No separate charges beyond rates.
East Boort	All lands, 6d. per inch acre, 1st April to 31st December. ,, 9d. ,, ,, 1st January to 31st March. First watering, 3 inches per acre. Second watering, 2 inches per acre.
Gunbower West.	Cereal crops, 6d. per inch acre, first watering. ,, 4d. ,, ,, second ,, Fodder crops, 4d. ,, ,, first ,, ,, 2d. ,, ,, second ,, Grass land, 3½d. ,, ,, second ,, (3-inch watering.)
Kerang East.	Cereal crops, 4d. per inch acre. Fodder crops, 4d. per inch acre. Grass land, 4d. per inch acre. 3 inches a watering, crops, first. 1½ ,, grass, winter. 2¼ ,, ,, summer.
Koondrook and Myall.	Gravitation supply— Cereal crops, 8d. per inch acre, 3-inch watering. Grass land, 2d. ,, ,, 3 ,, ,, Pumping supply— Cereal and fodder crops, 8d. per inch acre, 3-inch watering. Grass land, 3d. per inch acre, 3-inch watering.
Leaghur and Meering.	All crops, 6d. per inch acre, 3-inch watering.
Macorna North.	All crops, 1s. per inch acre. Grass land, 4d., July to November. ,, 6d., December to April.
Marquis Hill.	All crops, 1s. per watering. Grass land, 3d. ,, ,,
North Boort.	All lands, 6d. per inch acre, April to December. ,, 9d. ,, ,, January to March. First watering, 3 inches per acre. Second watering, 2 inches per acre.
Rodney	Lucerne, crop, orchard, stubble— 8d. per inch acre, first watering. 6d. ,, ,, second watering. 4d. ,, ,, third watering. Grass land, 4d. per inch acre.
South Kerang.	Grass, lucerne, sorghum, 6d. per inch acre. Cereal crops, 1s. per inch acre, first watering.
Swan Hill	Pumped supply—1s. per inch acre, 3-inch watering. Gravitation supply— 8d. per inch acre, first watering 3 inches. 4d. ,, ,, second watering. Grass land 3d. per inch acre, surplus water.
Torrumberry North.	Works not sufficiently advanced to afford any supply.
Tragowel Plains.	All lands, 6d. per inch acre.
Twelve Mile.	Crops, 6d. per inch acre, 2-inch watering. Grass, 6d. ,, ,, ,,
Wandella.	Cultivated land, 1s. per inch acre. Lucerne, 6d. ,, ,, Grass land, 6d. ,, ,, Sorghum, 1s. ,, ,, first watering. ,, 6d. ,, ,, second watering. Pumping from Lakes— License 10-inch pump, £2 10s. All lands, 4d. per inch acre.
Western Wimmera.	Gravitation supply, 1s. per inch acre. Pumping ,, 2s. ,, ,, Tanks, 1,000 cubic yards, £4.

From original Ex, according to season and quantity of water available, and kind of crops.
31288

Sydney: William Applegate Gullick, Government Printer.—1902.



Note:- SUGGESTED DAM SITES SHEWN THUS:- ◎ 2

No 1. Cumberoona Site.
No 2. Thologolong Lower Site.
No 3. Thologolong Upper Site.
No 4. Talmalmo Site.

L. Davis M. Inst. C.E.
President 1/12/02

SKETCH PLAN
Shewing Suggested Dam Sites

Scale of Miles

0 1 2 4 6 8 10 15 20

INTERSTATE ROYAL COMMISSION
ON THE MURRAY RIVER.
FROM EXHIBIT No. 188.
Robert Lindsay
Secretary.
1/12/02

SANDS & McDOUGALL LIMITED, MELB.