

1928
(SECOND SESSION.)

LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

REPORT

OF THE

DEPARTMENT OF PUBLIC WORKS

FOR THE

YEAR ENDED 30TH JUNE, 1928,

Together with Photographs and Diagrams.

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THE DEPARTMENT OF PUBLIC WORKS.

(ANNUAL REPORT FOR THE YEAR 1927-28.)

The Under-Secretary for Public Works to The Honorable Secretary for
Public Works and Minister for Railways.

Department of Public Works, N.S.W.,
Sydney, 30th September, 1928.

Dear Sir,

Report upon the operations of the Public Works Department for the financial year ended 30th June, 1928, is submitted hereunder :—

FINANCIAL.

The expenditure for the year amounted to £5,015,642 13s. 11d.; the total receipts were £454,139 3s. 6d., making a turnover for the year of £5,469,781 17s. 5d. Supervision costs totalled £325,837 16s. 2d. Details of these figures are shown in the accompanying report by the Accountant. Statement showing total transactions and costs of supervision, with District Construction and other offices in detail, and embodying a comparison with the similar information for last year, may also be seen on reference to the Accountant's report.

WATER SUPPLY AND SEWERAGE BRANCH.

Public water supplies constructed at a capital cost of £2,921,673 are now in operation in seventy-four towns. Twelve towns are sewered, whilst stormwater channels have been constructed in sixteen towns. The total capital cost of sewers and stormwater channels amounts to £756,785. The cities of Sydney and Newcastle are not included in these figures.

With few exceptions the rainfall during the first quarter of the year was below the average. From October to April, however, the greater part of the State benefited by good rainfalls, but May and June were again below the average.

The Avon Reservoir was completed at a cost of £1,107,179 to 30th June, 1928, and handed over to the Metropolitan Water, Sewerage and Drainage Board.

Construction work continued on the Nepean Reservoir, the excavations in river bed being nearly completed, and the upstream diversion weir being in place.

The Engineering Experts Committee have submitted their report on the proposed duplication of the Chichester Gravitation Pipe-line in connection with the Hunter District Water Supply Amplification Scheme. The carrying out of this work would involve an approximate expenditure of £1,750,000.

Several country towns water supply works were brought to conclusion, the principal being complete schemes for Canowindra, Molong, and Taree-Wingham.

A new reinforced concrete reservoir was constructed at Leura; and electrically-driven pumping machinery installed at Balranald, Cowra, Condobolin, Casino, Dubbo, Hay, and Nyngan.

A duplicate Hathorn-Davey plant is being installed at UMBERUMBERKA for the Broken Hill Water Supply.

Investigations were carried out for complete new schemes in twenty-three towns and for augmentation of the existing supply in thirteen towns.

Good progress was maintained on the northern suburbs ocean outfall sewer construction work; No. 4 section is practically completed; sections 5, 6, and 7 in course of construction. The West Middle Harbour submain has been completed and handed over to the Metropolitan Water, Sewerage and Drainage Board and the East Middle Harbour submain is well in hand.

The work on the Canterbury-Campsie-Belmore-Bankstown main sewer is completed, and The Cup and Saucer Creek and Wolli Creek submains are well in hand.

The sewerage scheme for Tamworth has been completed and handed over to the Council. The works at Dubbo are approaching completion, and low-level extensions have been carried out at Lismore. Additions to existing system at Albury and Goulburn are in hand. Investigations were carried out for complete new schemes in six towns, and for additions to existing schemes in seven towns. Schemes were also prepared for eight public institutions.

Construction of additional works in connection with the Newcastle and Suburbs sewerage system has been sanctioned by Parliament, providing for pumping stations, rising mains and reticulation sewers.

RIVER MURRAY WATERS AGREEMENT.

Work at the Hume Reservoir has progressed satisfactorily. The quantity of excavation taken out was 96,419 cubic yards, and concrete placed during the year amounted to 92,073 cubic yards, making the total to date 206,573 cubic yards.

At No. 10 Lock 2,017 cubic yards of concrete were put in, making a total of 26,927 cubic yards to date.

Construction work was commenced at No. 15 Lock, and sites located for Locks Nos. 16, 17, and 18. Exploratory work is in progress for Locks Nos. 19 and 20.

Expenditure from River Murray Commission funds amounted to £567,976, making a total to 30th June, 1928, of £1,959,337.

HARBOURS, ROADS AND BRIDGES BRANCH.

The total expenditure amounted to £898,083, as compared with £870,242 for last year; the expenditure on harbour works, including dredging, being £429,970, and on roads, bridges, ferries and public watering-places, £468,113.

Harbours.

Major improvement works were continued by day labour at Coff's Harbour, Port Kembla, and Newcastle. At Byron Bay the new ocean jetty is being constructed by contract. General repairs were carried out to the jetty and moorings at Woolgoolga and Coff's Harbour; and at Cape Hawke repairs were effected to the training wall. Spur wall construction has taken place at Moruya, and amongst other works carried out at Newcastle were mooring dolphins for Carrington, repairs to the lower end of the Dyke Wharf, extension of Lee Wharf by 540 feet, and road and rail connection Lee Wharf to Wickham Wharf; a start was made on the widening of Hannell-street to 80 feet.

Dredging.

The quantity of material lifted during the year totalled 4,259,664 tons, carried out at a cost of 11·8d. per ton, as compared with 12·4d. per ton for previous year.

A valuable addition to the plant is the "Fibronia," a self-propelling suction dredge, which was placed in commission on 1st May, 1928.

The river entrances were kept fairly free by the bar dredges, arrangements in this regard being difficult owing to shortage of plant.

A start was made with the dredging necessary for the Floating Dock at Newcastle, work commencing in the approach channel, swinging basin and dock site.

Roads.

An amount of £23,895 has been expended on roads in the Western Division, mainly on short lengths of formation and general maintenance. It will be possible in future to arrange for a more extensive programme by reason of the assistance forthcoming from the Federal Aid Roads Vote.

Further progress has been made on the road from Woodenbong to the Queensland border, but work has been held up somewhat owing to the abnormally wet season.

It has been necessary owing to the early impounding of waters above the Hume Reservoir to construct 20 miles of new road to serve the Sydney-Melbourne and Upper Murray River traffic. This work is in hand, some 6½ miles of clearing and 4½ miles of forming having been carried out, whilst tenders have been accepted for two bridges.

The first section of the new road to the Abercrombie Caves was practically completed during the year.

Bridges.

Bridges at Mildura and Abbotsford—constructed under the Border Railways Agreement Act—were completed and opened for traffic during the year.

A bridge over the Murray River at Euston, which was erected by the Victorian Railway Department, was also finished.

The George's River Bridge, which is being constructed by the State Monier Pipe and Reinforced Concrete Works for the Sutherland Shire Council, is proceeding, and it is expected the work will be completed during 1928-29. Construction of the piers which caused considerable trouble has now advanced to above water line.

Satisfactory progress has been made with the Bethanga Bridge, which is being erected in connection with the construction of the Hume Reservoir. The piers are almost completed; a contract has been let for the supply of the steel superstructure at £71,890, and a further contract entered into for the erection of the steelwork and completion of the bridge at £43,473.

Punts, Ferries and Launches.

A new punt to carry twenty-four to thirty cars was constructed by contract at the Government Dockyard, Newcastle, for £21,823. This punt is for immediate use on relief work at George's River and for transfer elsewhere upon completion of the bridge there. The new ferry over the Parramatta River between Mortlake and Putney was completed, and is now in service. The cost to the Department for immediate approaches and installation was £2,496, the roads in approach having been constructed by the respective Councils.

Public Watering-places.

Several new Public Watering-places were completed throughout the Western Division and have been greatly appreciated.

Improvements have been carried out to other Public Watering-places wherever possible and to the full extent of funds available. There is a very extensive programme in this connection which it is necessary to limit to the extent of moneys provided.

Miscellaneous.

The operations of other Departments have been facilitated in various directions. Inquiries—numbering sixty-nine in all—have been conducted on behalf of the Department of Local Government, including applications from councils for loans totalling approximately £1,063,950. Road work has been supervised for the Department for Lands, Local Government, and Labour and Industry, and the Forestry Commission. Inspections in connection with water right applications and the supervision of the sinking of shallow bores in the Western Division have been carried out for the Water Conservation and Irrigation Commission.

ELECTRICAL ENGINEERING BRANCH.

It is my pleasure to report the inauguration of the electricity supply to the districts served by the hydro-electric power station at Burrinjuck. This station was put into service early in the calendar year and the various towns connected to the system quickly changed over to bulk supply.

Negotiations for the supply of power to the Federal Capital have been practically brought to finality. Authority has been given to proceed with the construction of the transmission line.

There is a satisfactory increase in the consumption of electricity in those districts served by the Port Kembla system, the most important addition being the town of Nowra, which became a consumer in May.

Satisfactory arrangements have been made between the Department and Australian Iron & Steel Ltd. for the interchange of power. The agreement which has been completed is to the mutual advantage of the Department and the Company. By being able to draw on the power generated by the Company the Department is able to shut down the power station at times of light load; on the other hand the Company has now a satisfactory stand-by service from the Department which could not otherwise have been obtained without duplication of plant.

In connection with the investigation of the water power resources of this State, particular attention has been directed to the preparation of a definite scheme for the further development of the Clarence River.

Hydro-electric investigations were carried out both at Swampy Plains River on the Upper Murray, and in connection with a proposal for a dam just below the junction of the Clarence and Mitchell Rivers.

Various Government activities have been assisted during the year.

For the Local Government Department loan proposals and franchise agreements for various country towns and villages have been investigated, and in this connection an endeavour has been made to standardise the system of supply throughout the State. Efforts have been made to secure wherever possible a supply of alternating current at standard frequency and voltage and a continuous service throughout the twenty-four hours.

In accordance with previous arrangements the Water Conservation and Irrigation Commission have been advised in connection with electricity supply in its areas, the main feature of the year's operations being negotiations with the Municipality of Narrandera for the supply in bulk.

Work has been carried out also for the Departments of Public Health, Agriculture, Education, and Chief Secretary.

The preparation of official statistics has been undertaken in regard to the supply of electricity in New South Wales. With the co-operation of the various electrical concerns statistics are being annually compiled and tabulated for the whole of the Electricity Supply Undertakings of the State.

SYDNEY HARBOUR BRIDGE BRANCH.

In connection with the construction of the northern approach 771 cubic yards of concrete were poured in completing the concrete lining of the down Mosman tunnel flyover.

The principal excavation works were the abutments for the Burton-street and Fitzroy-street arch bridges, foundations for retaining walls, &c. The total quantity of excavation work carried out on this approach was 21,832 cubic yards.

A large amount of concreting was carried out, the total quantity placed in position being 31,680 cubic yards; the number of bags of cement used was 112,420. The arch ring of the Fitzroy-street arch contained 2,122 cubic yards of concrete, and was poured in nine working days.

As regards the contract of Messrs. Dorman, Long and Co., the construction of the southern approach spans was completed, and on the northern side of the Harbour the whole of the approach spans, except the steelwork for Span No. 10.

At Dawes Point the anchorage tunnel has been concreted and the reinforced concrete saddles for the change of direction of the anchorage cables at the entrances are in course of construction. At Milson's Point the tunnel is completed, and shortly the concreting will commence.

The following are the quantities of excavation, concreting, and masonry carried out during the year:—

Earth excavation	805 cubic yards.
Rock excavation	1,826 „
No. 1 concrete	36,791 „
No. 2 concrete	666 „
Granite masonry	3,639 „
Four cut work on granite masonry	22,215 sq. feet.

Apart from the Contract, although carried out at schedule rates, the retaining wall around Hickson-road on the eastern side of the southern approach spans was completed during the year.

Steelwork on the south pylon was completed ready for the creeper crane ramp on the 28th April.

In the construction of the southern approach, work is now proceeding over the whole section from the south end of Dorman, Long and Company's Contract to the north end of Wynyard Station.

The double track tunnel for the shore local tracks under Jamieson-street was completed, while the double track tunnel for the shore tracks was partly excavated and a commencement made with the concreting.

Both tunnels are in poor rock having little cover, consequently heavy timbering was necessary.

Excavation totalling 86,136 cubic yards was carried out during the year, the principal items being the Jamieson-street to Grosvenor-street cutting, Grosvenor-street to Essex-street cutting, and between Argyle-street and the end of the Contract,

The cut and cover work on the new Scots' Church site was completed and the site was ready for the Church authorities on 30th June, 1928, as promised.

The total expenditure to 30th June, on bridge and approaches is £3,348,908 6s. 5d. This includes land resumptions, interest during construction, and all expenditure prior to 1st July, 1923.

GOVERNMENT ARCHITECT'S BRANCH.

The expenditure of the Branch for the year amounted to £479,811 17s. 5d., as compared with £377,390 6s. 2d. for the immediately previous period.

The following are the most important works for which contract drawings, estimates, and specifications were prepared:—Crown-street Women's Hospital—New Isolation Block and Laundry, estimated cost, £50,000; Manly Peace Memorial Hospital—Men's Quarters, Boiler-house, Laundry, and Isolation Blocks, £17,500; Orange Mental Hospital—Operating Block, Sewing-room Block, Mortuary and Chapel, and Blocks for Unrecovered Patients, £49,000; Junee Hospital—Main Ward Block, Children's Ward, Kitchen, Operating and Laundry Blocks, £23,000; Royal North Shore Hospital—Nurses' Quarters (providing bedrooms for Nurses and Staff to the number of 167), £67,300; Parramatta District Hospital—New Ward for Children, £10,500; Griffith Court House—Erection, £13,000; Newcastle Mental Hospital—Additions to Nurses' Quarters, £11,200; Yass District Hospital—Remodelling, £15,000.

Amongst the works completed or in course of construction during the year were the following:—Central Police Barracks—Alterations and Additions, £12,380; Callan Park Mental Hospital—New Pavilion, £11,550; Sydney Hospital—Casualty Ward and Operating Block, £70,000; Manly Peace Memorial Hospital—Administrative Ward, Kitchen, and Operating Blocks, £61,800; Royal Prince Alfred Hospital—Isolation Block, £11,336; Canterbury District Memorial Hospital—Erection of First Block of Buildings, £21,273; National Library—Additions, £60,000; Kurri Kurri Hospital—Alterations, &c., £17,466; Young Court House—Erection, £12,082; Maitland District Hospital—Nurses' Quarters, £17,500; Orange Mental Hospital—Sick and Infirm Blocks, £39,500; Newcastle Hospital—Nurses' New Quarters, £27,994; Griffith Court House—New Building, £13,125; Orange Mental Hospital—Nurses' Quarters and Wards, £46,000.

Mainly owing to the general application of all sources of power and heat in Hospitals and State Institutions, there has been a phenomenal growth in the work of the Engineering Division of this Branch, and advice and guidance in the operation and maintenance of plant is being increasingly sought by the various departments and managers of institutions.

The undertaking of annual boiler inspections over all Crown boilers within the State has in like manner added to the usefulness of this activity.

TESTING BRANCH.

The operations of this Branch exceeded the records created during the previous year.

There were 3,028,700 bags of cement sampled and tested, as compared with a total of 2,436,340 bags handled last year.

Steelwork inspections and miscellaneous investigations were carried out as usual.

The fees charged for work carried out amounted to £7,359 9s. 6d., an increase of £2,030 9s. 6d. on last year's figure.

The total expenditure amounted to £9,154 14s. 5d., of which £8,065 0s. 11d. represented salaries, &c. It will be appreciated that there was not any charge for work carried out for departmental purposes.

SURVEY DRAFTING BRANCH.

The report of the Chief Survey Draftsman also indicates a year of increased activities.

Besides the drawings, plans and descriptions, and detail sheets prepared, 41,997 helios were printed and 3,055 maps mounted. New plans to the number of 2,036 were registered, as against 1,900 last year.

GOVERNMENT DOCKYARD, NEWCASTLE.

It is gratifying to report that the gross profit from the working of the establishment, after meeting all charges—including maintenance, depreciation, and interest on bank overdraft has been £42,690. The cost of good conduct and statutory holidays amounting to £20,525 has been met as an appropriation from this profit, leaving a net credit balance for the year of £22,165.

The construction of the floating dock with a lifting capacity of 15,000 tons has been well advanced, the main or middle section being practically completed.

The manufacture of steel railway carriages has been firmly established as an industry, and deliveries can now be maintained at the rate of one carriage per working day as compared with one per week in the earlier stages. The local construction of these carriages, besides providing extensive employment, has actually been the means of considerably cheapening the cost to the Railway Department.

The pilot steamer "Birubi" was completed during the year and handed over to the Navigation Department.

A large vehicular ferry for George's River was constructed and delivered.

There were up to 2,300 men employed, and the turnover for the year totalled approximately £900,000.

STATE INDUSTRIAL UNDERTAKINGS.

These undertakings are dealt with in a separate report by the Auditor-General.

The operations for the year were again satisfactory, the respective profits being as follow:—

	£	s.	d.
State Brickworks	37,833	0	9
State Monier Pipe and Reinforced Concrete Works	21,925	8	10
State Metal Quarries	19,415	12	3
Building Construction	15,263	19	1

ANNUAL CONFERENCE OF SUPERVISING ENGINEERS.

In 1926 the first annual conference of supervising engineers was held under Ministerial approval when, in collaboration with the departmental heads, matters of interest to the Department and to the officers were discussed. This was followed by conferences in 1927 and 1928. At these conferences officers located in the country have the opportunity once a year of meeting their brother officers and consulting with their chiefs on matters of departmental interest. Good work has been done by these conferences and officers, both country and metropolitan, appreciate the opportunity of conferring on subjects of mutual interest.

GENERAL.

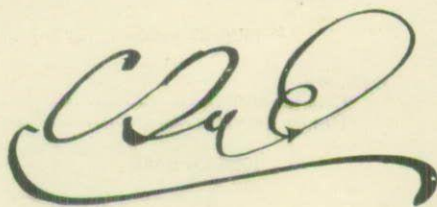
During the period under review Mr. A. J. Purdue, Deputy Government Architect, retired after forty-four years' excellent service. He was responsible for the supervision of many of the State's biggest buildings, and was also the officer selected to carry out the decoration of the city and public buildings on special occasions, such as the visits of His Royal Highness, the Prince of Wales, Their Royal Highnesses, the Duke and Duchess of York, &c., which duties were performed with marked success.

Four old officers of the Field Staff retired during the year in Messrs. H. A. O. Moriarty, District Engineer at Goulburn, M. Mactaggart, District Engineer at Wollongong, S. Archer, District Engineer at Lismore, and H. T. Evans, District Engineer at Hay. These officers had forty-seven, forty-five, thirty-seven and thirty-seven years' service respectively, almost the whole of which was in the country.

I regret to record the death after a long illness of Mr. John Tonkin, Clerk-in-Charge at Newcastle. Mr. Tonkin had thirty-seven years' service.

I desire to express thanks and appreciation of the generally good service rendered to the Department by all officers under my jurisdiction.

The reports of the heads of the several branches are incorporated in full with this report.



Under-Secretary.

Accountant's Report

For the Year ended 30th June, 1928.

The Staff of the Department as at the 30th June, 1928, the annual salary charge for 1927-28, and the comparison of those with the similar particulars of the two previous years will be found in the following:—

Year.	Permanent Officers.		Temporary Officers.		Total.	
	No.	Salary.	No.	Salary.	No.	Salary.
1927-28—		£		£		£
General Staff	428	179,340	307	92,646	735	271,986
Dredge Service	149	47,859	151	39,568	300	87,427
1927-28 totals	577	227,199	458	132,214	1,035	359,413
1926-27—		£		£		£
General Staff	418	170,109	344	107,874	762	277,983
Dredge Service	90	29,025	213	56,862	303	85,887
1926-27 totals	508	199,134	557	164,736	1,065	363,870
1925-26—		£		£		£
General Staff	433	175,994	293	86,761	726	262,755
Dredge Service	106	33,319	179	47,054	285	80,373
1925-26 totals	539	209,313	472	133,815	1,011	343,128

NOTE.—The foregoing does not include Industrial Undertakings and Government Dockyard staffs.

The accounts for the year ended 30th June, 1928, reveal an increase in the Departmental activities over those of previous years.

The total transactions were represented by:—

	£	s.	d.	per cent.
Expenditure	5,015,642	13	11	86.54
Receipts	454,139	3	6	7.84
Turnover	5,469,781	17	5	94.38
Supervision	325,837	16	2	5.62
Total	£5,795,619	13	7	100.00

Compared with the 1926-27 total of £4,873,549 15s. 8d., there was an increase of £922,069 17s. 11d., equivalent to 18.9 per cent.

The following summary indicates the nature of the year's operations:—

Nature of Work.	Expenditure.		Receipts.		Total.
	£	s. d.	£	s. d.	£ s. d.
Architectural	479,141	11 0	19,651	15 8	498,793 6 8
Electrical	282,879	19 7	52,454	0 2	335,333 19 9
Roads	144,384	16 5	3,143	12 6	147,528 8 11
Bridges	208,871	14 3	14,393	15 7	223,265 9 10
Punts and Ferries	73,496	12 1	332	17 2	73,829 9 3
Public Watering-places	31,161	12 0	924	19 3	32,086 11 3
Dredge Service	240,016	19 7	4,129	11 11	244,146 11 6
Harbours and Rivers	183,851	2 3	37,685	2 7	221,536 4 10
Water Supply	478,766	5 7	100,406	0 4	579,172 5 11
Sewerage and Stormwater Channels.....	431,533	7 3	2,598	19 11	434,132 7 2
River Murray Agreement	578,214	7 2	35,286	16 4	613,501 3 6
Sydney Harbour Bridge	1,504,964	19 3	41,116	2 11	1,546,081 2 2
Leichhardt Depot	66,334	2 0	67,861	15 7	134,195 17 7
Education Department—Country	209,552	6 8			209,552 6 8
Miscellaneous	102,472	18 10	74,153	13 7	176,626 12 5
	£5,015,642	13 11	454,139	3 6	5,469,781 17 5
Supervision					325,837 16 2
			Total		£5,795,619 13 7

A comparison, by Branches, of the foregoing figures with those of the previous year is afforded by the following:—

Branch.	1927-28.		1926-27.	
	Turnover.	Per cent.	Turnover.	Per cent.
	£ s. d.		£ s. d.	
Architectural	498,793 6 8	8.61	385,711 14 5	7.91
Electrical	335,333 19 9	5.78	314,792 9 7	6.46
Harbours, Roads and Bridges	942,392 15 7	16.26	928,244 14 3	19.05
Water Supply and Sewerage	1,626,805 16 7	28.07	1,480,940 10 4	30.39
Sydney Harbour Bridge.....	1,546,081 2 2	26.68	927,968 1 7	19.04
Miscellaneous	520,374 16 8	8.98	531,138 18 3	10.90
Turnover	5,469,781 17 5	94.38	4,568,796 8 5	93.75
Supervision	325,837 16 2	5.62	304,753 7 3	6.25
Totals	5,795,619 13 7	100.00	4,873,549 15 8	100.00

The increased turnover in the Architectural Branch is due to increased expenditure on hospitals carried out on behalf of the Health Department and the Sydney Hospital Committee. The increased turnover in the Electrical Branch is due to increased expenditure in connection with the Port Kembla Electricity Undertaking. The Harbours, Roads and Bridges Branch shows a slight increase owing to greater expenditure on unemployed relief works—mainly road works. The increased turnover of the Water Supply and Sewerage Branch is due to greater activity in respect of works being carried out under the River Murray Agreement.

In terms of total turnover, the total supervision cost during 1927-28 was equivalent to 5.96 per cent., as compared with 6.67 per cent. in 1926-27. The total supervision cost of each of the Branches and the percentage cost to the turnover of each Branch were as follows:—

Branch.	Turnover.	Cost of Supervision.	Percentage of Supervision to Turnover.	1926-27 Percentage.
	£ s. d.	£ s. d.		
Architectural	498,793 6 8	41,302 5 3	8.28	10.30
Electrical	335,333 19 9	22,000 10 3	6.56	6.51
Harbours, Roads, and Bridges	942,392 15 7	68,837 2 5	7.30	7.87
Water Supply and Sewerage	1,626,805 16 7	137,465 17 0	8.45	8.70
Sydney Harbour Bridge.....	1,546,081 2 2	38,537 19 11	2.49	2.57
Miscellaneous	520,374 16 8	17,694 1 4	3.40	3.55
Totals	£5,469,781 17 5	£325,837 16 2	5.96	6.67

It should be noted that the supervision costs discussed herein include the salaries, allowances, and expenses of all architects, engineers, engineering assistants, engineers' chainmen, inspectors, foremen, clerks, timekeepers, storekeepers, storemen, clerical labourers, motor-car drivers and cleaners; the salaries and expenses of the whole of the Head Office administrative officers, whether professional, clerical, or general; and motor car running costs, stamps, telephones, cleaning, lighting, heating, rent of offices, purchase of instruments, &c., &c.

A further interesting dissection of the supervision cost in terms of the total turnover is the following:—

	1927-28.		1926-27.	
	Amount.	Per cent.	Amount.	Per cent.
	£ s. d.		£ s. d.	
Local Supervision—				
Direct Local Supervision	129,407 16 11	2.37	111,999 1 7	2.45
General District Supervision ...	58,786 2 11	1.07	58,780 14 2	1.29
	£188,193 19 10	3.44	£170,779 15 9	3.74
Head Office Administration—				
Construction Branches	82,127 4 3	1.50	77,350 3 6	1.69
General Administration	55,516 12 1	1.02	56,623 8 0	1.24
	£137,643 16 4	2.52	£133,973 11 6	2.93
Totals	£325,837 16 2	5.96	£304,753 7 3	6.67

As bearing on the lower total cost and lower percentage cost of Head Office General Administration, it is satisfactory to record that the work of the Accounts Branch was performed at a total cost of £18,261 18s. 2d., equivalent to .347 per cent. of the turnover. The corresponding figures for 1926-27 were £17,075 16s. 7d. and .391 per cent. Thus, despite a 18.9 per cent. increase in the Departmental activities there was only a 6.95 per cent. increase in the cost of this Branch, in so far as its Head Office organisation is concerned. The true comparison will be better realised when it is stated that the cost of the Accounts Branch in 1927-28 was only 83 pence in respect of each £100 of Departmental turnover, whereas in 1926-27 and 1925-26 the cost was 94 pence and 104 pence per £100 respectively.

The following statement shows the total transactions and costs of supervision for all District, Construction and other local offices, and similar information for the previous year;—

District Office. or Work.	Expenditure.			Receipts.			Turnover.			Cost of Supervision.			Percent- age of Super- vision to Turnover.	1926-27 Turnover.			1926-27 Supervision.			1926- Perce- age
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	per cent.	£	s.	d.	£	s.	d.	per cent.
Armidale	65,892	14	3	105	7	3	65,998	1	6	2,833	2	6	4.29	32,721	10	8	2,135	6	6	6.2
Bathurst	115,002	1	7	1,043	10	9	116,045	12	4	6,512	19	8	5.61	182,177	18	2	4,891	10	1	2.6
Bourke	33,400	13	1	530	16	5	33,931	9	6	2,470	15	5	7.28	33,378	0	2	2,495	8	6	7.4
Broken Hill	46,646	7	3	399	14	8	47,046	1	11	3,410	5	7	7.25	34,084	1	3	2,843	15	5	8.4
Coff's Harbour	30,458	2	6	221	7	4	30,679	9	10	2,062	19	0	6.72	18,123	10	10	1,142	7	7	4.6
Cootamundra	123,904	11	10	1,099	8	8	125,004	0	6	4,540	0	5	3.63	93,773	6	10	4,325	13	3	4.4
Dubbo	52,468	8	8	664	13	11	53,133	2	7	3,133	4	6	5.9	26,605	18	5	2,244	18	0	8.8
Goulburn	55,552	13	3	280	15	8	55,833	8	11	4,324	17	11	7.75	98,960	10	9	5,797	4	8	5.5
Hay	22,624	6	4	821	16	8	23,446	3	0	3,219	18	5	13.73	29,209	8	9	3,302	2	4	11.1
Kempsey	49,403	11	8	385	11	3	49,789	2	11	3,542	6	11	7.11	107,939	16	5	4,166	3	11	3.3
Lismore	116,693	0	7	693	18	4	117,386	18	11	6,754	6	7	5.75	161,518	12	7	7,750	3	7	4.4
Moree	32,111	10	6	600	15	8	32,712	6	2	2,303	11	1	7.04	21,914	15	11	2,534	9	9	11.1
Newcastle	368,418	14	10	10,093	1	7	378,511	16	5	13,979	8	8	3.69	297,056	4	2	12,684	19	5	4.4
Port Kembla	268,694	2	7	106,173	1	1	374,867	3	8	11,154	9	10	2.98	331,085	3	1	9,982	8	7	3.3
Tamworth	35,324	1	2	173	13	0	35,497	14	2	3,106	0	5	8.75	55,534	15	10	5,119	16	4	9.9
Metropolitan	106,478	1	4	1,100	18	4	107,578	19	8	4,189	2	10	3.89	71,120	1	6	4,316	19	6	6.6
Total District Offices	£1,523,073	1	5	124,388	10	7	1,647,461	12	0	77,537	9	9	4.71	1,595,203	15	4	75,733	7	5	4.4
Avon and Nepean	172,046	4	9	6,313	11	8	178,359	16	5	16,840	2	2	9.44	204,890	8	8	17,178	8	11	8.5
N.S.O.O. Sewer	250,294	13	10	451	15	0	250,746	8	10	13,088	0	0	5.22	252,217	3	7	13,396	14	11	5.5
Canterbury-Bankstown	16,420	13	7	25	0	0	16,445	13	7	1,692	16	0	10.29	30,760	11	5	3,585	16	4	11.1
Sydney Harbour Bridge	1,504,964	19	3	29,054	11	6	1,534,019	10	9	22,220	12	4	1.45	927,968	1	7	11,829	19	1	1.1
Coff's Harbour Im- provements.	30,605	12	6	56	1	2	30,661	13	8	2,052	0	11	6.69	28,195	7	1	2,374	17	7	8.8
Dubbo Sewerage	27,264	9	6	19	4	6	27,283	14	0	1,753	15	8	6.43	29,449	1	6	1,904	10	8	6.6
Hume Reservoir	406,743	19	3	19,553	19	6	426,297	18	9	17,039	12	11	4.00	329,229	1	5	12,267	4	0	3.3
No. 10 Lock, Went- worth.	122,251	2	10	4,032	0	11	126,283	3	9	9,038	5	11	7.16	77,861	9	3	8,379	2	3	10.0
No. 15 Lock, Euston ...	27,783	4	1	357	3	0	28,140	7	1	4,661	8	11	16.57	.....	.....	.....	.....	.....	.....	...
West Bunnerong Relief Works.	24,328	8	9	.....	.....	.....	24,328	8	9	787	13	2	3.24	.....	.....	.....	.....	.....	.....	...
Randwick Rifle Range	24,814	18	4	.....	.....	.....	24,814	18	4	1,146	15	6	4.62	.....	.....	.....	.....	.....	.....	...
Ten Minor Works .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	137,263	8	1	10,604	10	4	...
Nineteen Minor Works	87,488	8	5	2,712	16	6	90,201	4	11	7,573	13	11	...	.....	.....	.....	.....	.....	.....	...
Total—Construction Offices.....	£2,695,006	15	1	62,576	3	9	2,757,582	18	10	97,894	17	5	3.55	2,017,834	12	7	81,521	4	1	4.4
*Electrical Branch ...	170,647	14	1	944	14	1	171,592	8	2	13,178	14	3	...	207,284	6	6	12,708	4	8	...
*Architect's Branch ...	286,125	17	3	2,444	4	9	288,570	2	0	29,802	18	1	...	176,886	16	11	28,718	19	8	...
*Dredge Service	108,197	6	10	4,183	12	3	112,380	19	1	2,416	5	0	...	70,801	10	8	2,540	13	11	...
Head Office L.O.	52,223	13	2	57,889	8	2	110,113	1	4	93,741	12	2	...	114,232	4	11	92,287	12	4	...
*State Telephones	21,462	15	1	412	2	7	21,874	17	8	127	1	0	...	22,557	7	10	.....	.....	.....	...
Leichhardt Depot	66,424	10	7	66,912	14	8	133,337	5	3	5,275	6	0	3.96	162,719	19	0	5,169	15	7	3.3
Broken Hill W.S.	60,240	0	6	73,575	0	0	133,815	0	6	4,775	17	4	3.57	128,801	4	4	4,927	17	9	3.3
Junee Water Supply ...	11,654	10	10	12,045	4	1	23,699	14	11	243	19	10	1.03	21,980	11	4	331	3	9	1.0
*River Murray Com- mission (Loan).	5,928	13	4	.....	.....	.....	5,928	13	4	170	14	6	...	18,888	12	1	31	5	10	...
*Working Account ...	4,670	5	10	40,799	12	6	45,469	18	4	.....	.....	.....	...	23,726	2	9	783	2	3	...
Burrinjuck Hydro- electric Undertaking	4,255	11	7	4,938	5	5	9,193	17	0	673	0	10	7.32	.....	.....	.....	.....	.....	.....	...
Three Other Offices ...	5,731	18	4	3,029	10	8	8,761	9	0	.....	.....	.....	...	7,879	4	2	.....	.....	.....	...
Total—Other Offices...	£797,562	17	5	267,174	9	2	1,064,737	6	7	150,405	9	0	...	955,758	0	6	147,498	15	9	...
Grand Total ...	£5,015,642	13	11	454,139	3	6	5,469,781	17	5	325,837	16	2	5.96	4,568,796	8	5	304,753	7	3	0.0

NOTE.—* The figures for these offices exclude expenditures recorded in District Offices.

The total expenditure for the year—£5,341,480 10s. 1d, inclusive of supervision costs—was made from the following votes, accounts, &c.

£	s.	d.	
782,044	14	2	from 37 Consolidated Revenue votes.
323,151	4	9	from 20 Public Works Fund votes.
2,722,810	19	7	from 64 General Loan votes.
478,569	18	2	from 19 Special Deposit Accounts.
606,903	8	5	from funds of the River Murray Commission.
209,552	6	8	paid direct by the Education Department.
160,635	8	10	paid direct by the Department of Public Health.
55,403	18	6	paid by 38 other Departments.
2,408	11	0	paid on behalf of the Government Insurance Office.
£5,341,480	10	1	

The following dissection has been made of the foregoing expenditures; the corresponding figures for 1926-27 are also shown for purpose of comparison:—

	1927-28.		1926-27.	
	Amount.	Per cent.	Amount.	Per cent.
(a) Capital Expenditure	£ s. d.		£ s. d.	
On revenue-producing utilities	3,396,656 1 6	63.59	2,678,241 18 6	59.74
On non-revenue producing utilities	823,282 7 6	15.41	682,148 3 6	15.21
(b) Working and Maintenance Expenditure—				
Running Expenses, &c., of revenue-producing utilities	136,442 19 8	2.56	102,309 10 6	2.28
Maintenance of non-revenue producing services and utilities	571,202 4 9	10.69	569,253 16 7	12.70
(c) Sundry Disbursements—other than (a) or (b)	413,896 16 8	7.75	451,228 19 8	10.07
Total Expenditure for the year	£ 5,341,480 10 1	100.00	4,483,182 8 9	100.00

The systematic review has been maintained of the accounts of all local governing bodies indebted to the Crown for the capital cost of country towns water supply, sewerage and stormwater drainage schemes. The good results arising from this attention must again be emphasised. The following summary indicates the considerable total amounts represented by the capital expenditure on the services, and also demonstrates the heavy increase in recent years in the work involved in the compilation and gazettal of the debts of the various Municipal and Shire Councils:—

Year.	No. of debts Gazetted.		Amount.			
	Water Supply.	Sewerage and S.W. Drainage.	Water Supply.	Sewerage and S.W. Drainage.	Total.	
			£ s. d.	£ s. d.	£ s. d.	
1893-94	1	.....	13,660 8 0	.....	13,660 8 0	
1894-95	12	.....	293,384 19 6	.....	293,384 19 6	
1895-96	3	.....	21,078 6 5	.....	21,078 6 5	
1896-97	4	.....	49,580 5 1	.....	49,580 5 1	
1897-98	1	.....	7,600 11 0	.....	7,600 11 0	
1898-99	3	.....	60,160 1 3	.....	60,160 1 3	
1899-00 .....	.....	.....	.....	.....	.....
1900-01	4	.....	34,033 0 6	.....	34,033 0 6	
1901-02	2	.....	16,384 10 10	.....	16,384 10 10	
1902-03	1	.....	17,029 13 11	.....	17,029 13 11	
1903-04	2	2	36,305 11 10	4,646 13 3	40,952 5 1	
1904-05	3	1	35,065 5 9	429 5 3	35,494 11 0	
1905-06	13	3	28,485 5 4	27,995 0 4	56,480 5 8	
1906-07	7	3	42,505 11 7	19,055 13 0	61,561 4 7	
1907-08	5	.....	32,975 13 10	.....	32,975 13 10	
1908-09	5	.....	17,148 7 8	.....	17,148 7 8	
1909-10	8	3	39,484 10 4	2,423 8 10	41,907 19 2	
1910-11	12	1	69,587 12 2	3,986 9 7	73,554 1 9	
1911-12	6	1	9,703 17 4	17,299 2 1	27,002 19 5	
1912-13	10	3	36,761 14 9	28,228 3 9	64,989 18 6	
1913-14	5	2	24,987 6 8	4,118 4 9	29,105 11 5	
1914-15	3	3	15,591 16 8	82,724 16 2	98,316 12 10	
1915-16	20	3	86,945 8 10	81,828 0 2	168,773 9 0	
1916-17	14	3	127,829 14 1	3,825 12 2	131,655 6 3	
1917-18	8	1	61,794 16 3	47,555 3 8	109,349 19 11	
1918-19	5	1	23,158 14 3	183 12 7	23,342 6 10	
1919-20	6	3	129,345 5 4	85,074 8 1	214,419 13 5	
1920-21 .....	.....	.....	.....	.....	.....
1921-22	9	5	84,153 1 11	96,587 18 10	180,741 0 9	
1922-23	12	.....	71,330 15 6	.....	71,330 15 6	
1923-24	18	2	145,899 16 4	37,717 16 2	183,617 12 6	
1924-25	18	4	91,027 13 9	100,547 18 6	191,575 12 3	
1925-26	16	1	90,625 7 3	964 11 0	91,589 18 3	
1926-27	25	.....	239,870 12 6	.....	239,870 12 6	
1927-28	27	5	382,582 15 4	111,592 19 9	494,175 15 1	
	288	50	£2,436,058 11 9	£756,784 17 11	£3,192,843 9 8	

As against the foregoing figures of total capital expenditure it is to be noted that at the 30th June, 1928, there were current:—

Two hundred and twenty-three water supply debts, totalling £2,370,525 11s. 8d., of which £2,265,907 15s. 6d. is still outstanding due to the Treasury and on which instalments totalling £119,098 1s. 5d. per annum are payable.

Forty-one sewerage and stormwater drainage debts, totalling £743,821 10s. 11d., of which £713,758 5s. 11d. is still outstanding, and on which instalments totalling £36,224 10s. 8d. per annum are payable.

The foregoing figures do not embrace the Broken Hill, Junee or Medlow water supplies which are administered wholly by this Department—at Broken Hill and Medlow water rates and charges are collected direct from the individual consumers, at Junee the water is sold to the Junee Council and the Railway Department. The annual trading, &c., accounts of these three services were, as usual, compiled by the Accounts Inspection Branch after careful examination of the local accounts and records.

During the year a number of detailed investigations and reports were made in regard to the financial aspect of certain proposed new water supply schemes and of certain extensions to existing services. The principal investigations in this regard were Grenfell, Tenterfield, Blackheath, Bourke and Wentworth in respect of water supply proposals, and Katoomba and Glen Innes in respect of sewerage proposals. Each of these cases involved a visit to the town concerned, an investigation and review of the complete financial aspect and a determination of the rate levy necessary to successfully run the proposed scheme.

The inauguration during the year of the Burrinjuck Hydro-electric Undertaking and the continued growth of the Port Kembla Electricity Undertaking have materially increased the work of this Branch. The further expansion of the two services, more especially in the direction of retail distribution of energy, will mean considerably more work on the Accounts side. As from the 1st July, 1928, for the Port Kembla concern, and as from its inception on the 1st February, 1928, for the Burrinjuck concern, the services have been given Working Accounts for the financing of their operations; this fact, and the expected passing, by Parliament, of Administration Acts for the two undertakings, will allow of proper statements of accounts being embodied in the 1928-29 and succeeding annual reports.

Also as from the 1st July, there have been placed on a commercial basis the accounts covering the operations of the Port Kembla Coal Loading and Shipping Undertaking, the Leichhardt Depôt and the Testing Branch. The transactions of these concerns will, therefore, be suitably presented in future reports.

The payments made for the year from the Head Office Drawing Account totalled £4,156,382 18s. 10d. and involved the issue of 9,343 cheques, as compared with £3,620,829 15s. 5d. paid in 1926-27 by 10,033 cheques. The vouchers handled totalled 62,876, as against 62,271 in the previous year. In addition, 1,826 cheques representing an expenditure of £572,817 11s. 7d. in 5,811 vouchers were issued from the River Murray works (Head Office) section of the Accounts Branch.

The floating advances to local offices for payment of wages and urgent claims numbered sixty and totalled in amount £97,645 as at the 30th June, 1928. The total number of cheques drawn on the floating advances during the year was 31,257 and the amount so disbursed totalled £1,605,668.

The total number of employees on the pay roll of the Department as at the 30th June, 1928, was 6,297, viz. :—

Public Service Board Appointees (including Dredge Service) :—

Permanent	...	...	...	...	...	...	...	...	...	577	
Temporary	...	...	...	...	...	...	...	...	...	458	
											1,035
<i>Casual Employees :—</i>											
Supervisory	...	...	...	...	...	...	...	...	...	274	
Workmen	...	...	...	...	...	...	...	...	...	4,833	
Part time	...	...	...	...	...	...	...	...	...	155	
											5,262
											6,297

The salaries and wages paid by the Department during 1927-28 totalled £1,631,104 7s. 11d. The returns kept in connection with Workers' Compensation Insurance Act disclose that net premium to the amount of £28,914 7s. was paid on salaries and wages totalling £1,488,305 2s. 9d. The nature of these insurable salaries and wages and the comparison with the figures of the preceding year are indicated in the following table :—

					1927-28.		1926-27.	
					£	s. d.	£	s. d.
Managerial and clerical	...	...	...	...	182,861	12 5	163,126	8 3
Travelling	...	...	...	...	76,007	11 6	67,654	4 2
General	...	...	...	...	1,218,301	17 1	973,245	5 11
Cleaners and caretakers	...	...	...	...	9,838	0 6	9,167	3 6
Timber contracts	...	...	...	...	1,296	1 3	2,120	8 2
					£1,488,305	2 9	£1,215,313	10 0

It will be appreciated that "insurable" salaries and wages exclude salaries at the rate of over £750 per annum, salaries of officers on leave, and good conduct and holiday pay to workmen.

The staff under the control of the Accountant as at the 30th June, 1928, comprised 216 officers, distributed as follows :—

	Permanent.	Temporary.	Total.
Head Office	47	7	54
District Offices	37	37	74
Construction Offices	17	48	65
Other Local Offices	16	7	23
	117	99	216

JAMES ROBERTSON,

Accountant.

Under-Secretary.

Water Supply and Sewerage Branch.

Report for year ended 30th June, 1928.

A.—GENERAL REPORT.

- (1) Water Supply and Sewerage Generally.
- (2) Water Supplies Administered by the Department.
- (3) Expenditure for Year.
- (4) Legislation.
- (5) River Murray Waters.
- (6) Staff and Administration.

I have the honor to submit my report of the operations of the Water Supply and Sewerage Branch generally, including works under the River Murray Agreement, for the year ended 30th June, 1928.

(1) WATER SUPPLY AND SEWERAGE GENERALLY.

At the end of the year public water supplies constructed at a capital cost of £2,921,673 were in operation in seventy-four towns. Twelve towns are now sewered, while stormwater channels have been constructed in sixteen towns. The total capital cost of the sewers and stormwater channels amounts to £756,785. The cities of Sydney and Newcastle are not included in these figures.

The rainfall during the first three months of the financial year was with few exceptions below the average. From October to April, however, the greater part of the State benefited by good rainfalls, but during the months of May and June these again fell below the average.

The existing country towns water supplies generally were adequate to meet requirements during the drier portion of the year with the exception of Cootamundra. This town is one of the objectives of the South-west Tablelands Water Supply Scheme, the construction of which has been sanctioned by Act of Parliament. It was found necessary during the drought to convey water by train to some of the towns which are not served by reticulated systems.

The Avon Reservoir was completed and handed over to the Metropolitan Water, Sewerage and Drainage Board on 20th January, 1928, the total cost of the work being £1,107,179 to the 30th June, 1928. At the Nepean Reservoir the construction work was continued, the excavations in river bed being nearly completed and the upstream diversion weir being in place. The progress of these two dams is described in detail in Part B of this report.

The Engineering Experts Committee for the Hunter District Water Supply Amplification Scheme have recently forwarded their report on the proposed duplication of the Chichester Gravitation Pipe-line, a work involving an outlay of approximately one and three-quarter million pounds (£1,750,000).

During the year several water supply works for country towns were brought to a conclusion, the principal of which consisted of complete schemes for Canowindra, Molong, and Taree-Wingham. A new reinforced concrete reservoir was constructed at Leura and electrically-driven pumping machinery was installed at Balranald, Cowra, Condobolin, Casino, Dubbo, Hay and Nyngan. A new pump well was constructed at Moree and a small catch dam was erected for the Portland Water Supply. Complete schemes are in course of construction at Bega, Gloucester and Inverell, and concrete storage reservoirs are being erected at Armidale and Goulburn to supplement the present town supplies, the former being nearly completed. A new service reservoir is in progress at Albury and reticulation extensions and renewals are in progress at Albury, Bourke, Forbes, Gunnedah, Lismore, Mittagong, Narrandera and Quirindi. A filtration plant is being constructed for Bowral Water Supply, and repairs to earth dams at Parkes and Nyngan are being carried out, a new earth dam being almost completed at the latter place. A duplicate Hathorn-Davey plant is being installed at Umberumberka for the Broken Hill Water Supply. Investigations were carried out during the year for complete new schemes in twenty-three towns and for the augmentation of existing supplies in thirteen towns.

Good progress was maintained on the construction of the Northern Suburbs Ocean Outfall Sewer. No. 4 section is practically completed. Nos. 5, 6 and 7 are in course of construction. The West Middle Harbour submain has been completed and handed over to the Metropolitan Water, Sewerage and Drainage Board, and the East Middle Harbour submain is well in hand. The total cost of these works is £704,071. The work on the Canterbury-Campsie-Belmore-Bankstown main sewer is completed and the Cup and Saucer Creek and Wolli Creek submains are well in hand. The total expenditure to date is £273,401.

On the country towns sewerage the progress has been good. The Tamworth Scheme has been completed and handed over to the Council. The works at Dubbo are approaching completion, the Lismore Low-level Extension has been completed and the sewage ejectors are being installed in the pump well. Extensive additions to the existing systems at Albury and Goulburn are in progress. Investigations were carried out for complete new schemes of sewerage in six towns and for additions to existing schemes in seven towns. Schemes were also prepared for eight public institutions.

(2) WATER SUPPLIES ADMINISTERED BY THE DEPARTMENT.

For the two supplies administered by the Department the accounting period is the twelve months ending 31st December in each year.

(a) BROKEN HILL WATER SUPPLY.

The total quantities of water pumped from the two storage reservoirs were:—

	Gallons.
Umberumberka	432,675,000
Stephens Creek	260,921,000
Total	693,596,000

The average cost of pumping was approximately: Umberumberka, 5·234d. per 1,000 gallons, and Stephens Creek 11·5d. per 1,000 gallons. The average for the two was about 7·591d. per 1,000 gallons.

(b) JUNEE WATER SUPPLY.

Pumped at Tenandra, Gallons.	Railway Commissioners. Cost per 1,000 gallons.	Junee Council. Cost per 1,000 gallons.	Supplied from Bethungra to Railway Commissioners. Gallons.	Cost per 1,000 gallons, 8d.
134,343,500	36.097d.	9.694d.	9,567,495	

(3) EXPENDITURE FOR YEAR.

	£
Water Supply Works	507,227
Sewerage Works	451,164
River Murray Works (including plant purchased and expenditure on hydro-electric work)	613,002
Total	£1,571,393

(4) LEGISLATION.

During the year Act No. 2, 1928, was passed to sanction the construction of additional works in connection with the Newcastle and Suburbs Sewerage System. This act provides for the construction of pumping stations, rising mains and reticulation sewers for the Municipality of Carrington.

(5) RIVER MURRAY WATERS AGREEMENT.

Further good progress has been made on the construction of the Hume Reservoir. The quantity of excavation taken out for the year was 96,419 cubic yards. The concrete placed during the year was 92,073 cubic yards, making a total to date of 206,573 cubic yards. At No. 10 Lock, 2,017 cubic yards of concrete were placed during the year, making a total of 26,927 cubic yards to date. Construction work was commenced at No. 15 Lock, and sites for Locks Nos. 16, 17 and 18 have been located. Exploratory work is in progress for the location at Locks Nos. 19 and 20. The requisite survey data has been obtained in respect of site for Locks Nos. 12, 13, 14 and 15. The expenditure by the Department from River Murray Commission funds for the year amounted to £567,976, making a total expenditure to 30th June, 1928, of £1,959,337.

A detailed report of operations of the New South Wales Constructing Authority for year ended 30th June, 1928, is given in the Annual Report of the River Murray Commission, and is attached as Appendix A.

In terminating this report I desire to record my appreciation of the zealous co-operation of the officers in the work of the Branch during the period under review.

T. E. BURROWS, M.Inst.C.E., M.I.E.Aust.,

Chief Engineer for Water Supply and Sewerage,
Chief Engineer, N.S.W. Constructing Authority, River Murray Waters Act.

B.—DETAIL REPORT.

(I) WATER SUPPLY.

(a) Sydney Water Supply—

- (1) Avon Reservoir.
- (2) Nepean Reservoir.

(b) Country Towns Water Supply—

- (1) Works completed.
- (2) Works under construction.
- (3) Works proposed and investigations.

(II) SEWERAGE.

(a) Metropolitan Sewerage and Stormwater Channels—

- (1) Northern Suburbs Ocean Outfall Sewer.
- (2) Canterbury-Campsie-Belmore-Bankstown Sewer.
- (3) Lidcombe Drainage.

(b) Newcastle Sewerage and Stormwater Channels.

(c) Country Towns Sewerage and Stormwater Channels

- (1) Works completed.
- (2) Works under construction.
- (3) Works proposed and investigations.

(III) WATER SUPPLY AND SEWERAGE.—Treatment and filtration.

(I) WATER SUPPLY.

(a) Sydney Water Supply.

(i) AVON RESERVOIR.

Work on this reservoir has now been completed, and the structure was handed over to the Metropolitan Water, Sewerage and Drainage Board on 20th January, 1928. During the twelve months work has consisted principally in construction of the roadway and entrance pylons, completing the approach roads to the dam, dismantling the plant, and removing the plant buildings to Nepean Dam, also demolishing the buildings on the township and construction area. The total expenditure to 30th June was £1,107,179.

(ii) NEPEAN RESERVOIR.

Good progress was made on these works, the main features being the completion of excavation for both abutments, excavation and grouting of foundations and cut-off trench, and extensive developmental work in the quarry.

During the year the following main items have been under construction:—A standard gauge track has been completed, giving access to cement shed, sand dump, blue metal bin, workshops, store, &c. The road of access is in a satisfactory condition. An additional private cottage has been built, making a total of nineteen private cottages in addition to eighty-five departmental cottages. A 3-inch rising main and a 14,000-gallon service tank have been installed on the south bank, and an electrically-driven three throw pump is being installed on the existing runway. The total available storage is 57,000 gallons. An experimental chlorination plant to supplement the existing filter bed for the treatment of township drainage is being installed. An additional junior staff cottage is being erected for the engineering draftsmen. The transmission line from Avon was deviated in the bywash gully early in the year, and on completion of the ropeway loading terminal the final span was erected over the top of that structure. The substation is completed with the exception of wiring for additional plant as it is brought into operation. Electric light and power distribution has been completed, including the installation of trolley system for the cableways. A telephone service now links the works with Avon Dam, Cordeaux Dam, and Bargo Post Office, and the automatic exchange which has thirty lines in operation is rendering excellent service. Head and tail towers have been erected, anchorages completed and machinery re-conditioned and installed. Both cableways are giving satisfactory service. Machine shop equipment has been amplified by the installation of the following new machines:—A 24-inch horizontal cold sawing machine, a 15-inch s.s. and s.c. lathe, a heavy floor type double ended grinder, and a 3 ft. 6 in. radial drilling machine. A bulk storage system for convenience in handling and distribution is in operation in the oil store. A garage with accommodation for three motor lorries has been erected. A petrol pump operating from a 500-gallon underground tank has been installed. Bulk supplies of benzine are obtained from Bowral, and a bulk petrol store has been erected which provides an emergency reserve storage of 500 gallons. A cement shed with a storage capacity of 25,000 bags has been completed, and a Morris overhead runway gear has been installed for convenience in handling cement ex trucks. Also an 18-inch gravity conveyor, 260 feet long, has been erected for the conveyance of cement from cement shed to mixer house. Mixer house has been completed and mixers installed. A sand dump has been completed and provides a storage of approximately 1,500 cubic yards, and a belt conveyor for handling sand from dump to mixer house has been installed. A blue metal bin is completed and in use and an aerial ropeway for transport of stone from crushers to mixer bins has been erected. Foundations have been built and one unit of spalls washing plant has been assembled. The erection of a crusher building has been commenced, and excavation for bucket elevators is almost completed. The ropeway loading bin for quarry has been erected and is ready for use. Drill shop has been completed and is in use for the re-conditioning of all air drills, and a blacksmith's shop has been completed and is equipped with two forges and a Leyner drill sharpener.

Main Wall Excavation: Both abutments have been completed and work in the river bed is rapidly nearing completion. The cut-off trench has been excavated for practically its full length, and a section at the north end was grouted and ready for concrete when the river came down in flood. Extensive boring and grouting has been carried out over the rest of the foundations. About 118,000 cubic yards have been excavated to date, including 10,000 cubic yards from cut-off trench. The upstream diversion weir was completed, pipe-lines laid and river diverted through in November, 1927. Quarrying operations were commenced in January, 1928, and at the present time the full face of the entrance to the spillway basin is being worked for displacers. Two 15-ton loco. cranes are in use on this section. Stripping of the downstream section of the spillway channel is proceeding rapidly, and a third loco. crane is now being erected for this work. Quarry figures to date are as follows:—Excavation, 70,000 cubic yards, displacers cut (included in first figure) 2,300 cubic yards, spillway and spillway energy dissipator have been investigated by means of a working scale model and a design has been selected after extended experiment. A film record is now being taken of the model in operation. Upwards of 400 trees were obtained from the Botanic Gardens and have been planted along the road of access and at various points in the township. Clearing operations were suspended on 15th June, 1928, when approximately 15 acres remained to be stacked and burnt. Although so near completion the unfavourable weather conditions and heavy undergrowth precluded economical burning off, and the work was shut down until later in the year when this work, together with the brushing of new growth, can be put in hand with a small gang. The position at date is as follows:—Area felled, 808 acres, area burnt, 793 acres.

The number of men employed at 30th June, 1928, was 485. A second shift on the main wall foundations was started in July, 1927.

Expenditure for the twelve months ended 30th June, 1928, was £266,054, making a total expenditure to date of £550,535.

(b) Country Towns Water Supply.

(i) WORKS COMPLETED.

Albury.—The Albury Council completed improvements to the present supply with material supplied by the Department, consisting of laying a new 15-inch rising main from the pumping station to the existing service reservoir and the taking up and re-laying as an auxiliary service main of one of the existing 10-inch rising mains.

Balranald.—Reticulation extensions were carried out by the Council with material supplied by the Department.

Cowra.—An electrically-driven pumping plant consisting of two units each having a capacity of 20,000 gallons per hour was installed in the existing brick pump well at a cost of £4,095.

Condobolin.—An electrically driven pumping plant consisting of two units, one having a capacity of 13,200 gallons per hour, and the other 7,200 gallons per hour, was installed in a new pump house and well. A 6,600-volt transmission line and two transformers form part of the new work. The total cost was £4,640.

Casino.—An additional electrically-driven pumping unit having a capacity of 18,000 gallons per hour was installed in No. 2 Well at a cost of £480.

Canowindra.—This contract was completed during the year and consists of a pump well and engine house in which have been installed electrically-driven centrifugal pumps in duplicate, each with a capacity of 9,000 gallons per hour. A reinforced concrete service reservoir with a capacity of 200,000 gallons has been constructed by the State Monier Pipe Works, and a rising main from pumps and the necessary reticulation pipes have been laid. The total cost of the work was £18,901 to 30th June, 1928.

Dubbo.—The installation of two electrically-driven three throw deep well pumps one in No. 1 Well and the other in No. 3 Well was completed. Each set has a capacity of 15,000 gallons per hour, and the total cost was £6,920.

Hay.—An electrically-driven pumping plant consisting of two units each having a capacity of 15,000 gallons per hour was installed in a new pump well and engine house at a cost of £2,440 to 30th June, 1928.

Katoomba.—The reinforced concrete reservoir to supply Leura was completed at a cost of £5,247. This reservoir has a capacity of 500,000 gallons and was constructed by the State Monier Pipe Works.

Molong.—This contract was completed during the year and consists of the following:—A storage on Borenore Creek, with a holding capacity of 67,000,000 gallons formed by a concrete dam with a height of 45 feet from creek bed, a 6-inch cast-iron gravitation main $9\frac{1}{2}$ miles long, a concrete service reservoir with a diameter of 65 feet and a capacity of 300,000 gallons and the necessary town reticulation. The storage, full of water, was handed over to the Council, and the scheme is in operation. The total cost was £57,778 to 30th June, 1928.

Moree.—The contract for the new concrete lined pump well was completed at a cost of £2,601. The well consists of an outer cylinder 20 ft. in diameter sunk to a depth of 52 feet, and an inner cylinder 10 feet in diameter sunk from this depth for a further 12 feet into the drift, the total depth of well being 64 feet.

Portland.—A small concrete catch dam was erected by day labour during the year below the toe of earth dam on Back Creek to collect the leakage therefrom, at a cost of £1,415.

Taree-Wingham.—This scheme was completed during the year and consists of the following works:—A pump well and suction staging located on Dingo Creek, an engine house in which are installed three throw deep well pumps in duplicate, each with a capacity of 25,500 gallons per hour, driven by a suction gas plant; a 12-inch cast-iron rising main leading from the pumps to settling tanks in duplicate, each with a capacity of 300,000 gallons; a 9-inch gravitation main from the tanks passing through the town of Wingham and on to a service reservoir with a capacity of 350,000 gallons on the outskirts of the town of Taree; a 14-inch service main from the service reservoir to Taree and the necessary reticulation for each town. The pumping machinery was manufactured and installed by the Government Dockyard, the pumping station and engine foundations were carried out by day labour, the balance of the work being done by contract. The total cost was £89,966 to 30th June, 1928.

(ii) WORKS UNDER CONSTRUCTION.

Albury.—The Albury Council is carrying out extensive additions to the reticulation system with material supplied by the Department and a contract has been let for a new service reservoir with a capacity of 1,000,000 gallons.

Armidale.—Work which was commenced in 1926 has now been almost completed on the Puddledock Creek Dam which is to augment the present supply to the town. The full height of 55 feet has been reached and the gangway on top of the wall is now approaching completion. The dam is practically full of water and should be a valuable acquisition to the town during the coming summer.

Balranald.—The installation of the electrically-driven pumping plant is not yet completed owing to the pumps having failed to meet the Department's requirements.

Broken Hill.—A duplicate Hathorn-Davey pumping plant has been installed at Umberumberka and is now awaiting duty tests. The plant has a capacity of 96,000 gallons per hour against a total head of 548 feet.

Bourke.—Work was commenced on the relaying of the whole of the 3-inch and 4-inch mains and the cleaning of the 6-inch main by day labour.

Bowral.—A tender was accepted for the construction of the filtration plant which will treat the water by means of aeration, coagulation, mechanical agitation, sedimentation, and filtration through rapid sand mechanical filters. The ultimate capacity of the plant will be equal to 430,000 gallons daily.

Blue Mountain Villages.—The Railway Department commenced this work during the year but to date only excavation has been carried out. Owing to the much greater depth of excavation necessary to obtain suitable foundations the cost has far exceeded the estimate, and the whole question is now under consideration by the Public Works Department before proceeding further.

Bega.—A contract has been let and is now in progress for a complete scheme for the town consisting of two pump wells, suction and rising mains and reticulation. A reinforced concrete reservoir with a capacity of 350,000 gallons is to be constructed by the State Monier Pipe Works, and tenders will shortly be invited for an engine house and the necessary pumping machinery.

Culcairn.—This work, consisting of a brick lined pump well 150 feet deep, was during the year constructed to a depth of about 100 feet when, owing to difficulties met with, the Contractor failed to continue work, and the contract was taken over by the Department and is now being completed by day labour.

Forbes.—Additional reticulation is being carried out by the Council with material supplied by the Department.

Gloucester.—A contract was let for the construction of a complete scheme consisting of a pump well and engine house, rising main and reticulation for the town.

Goulburn.—A tender was accepted for the construction of a concrete storage reservoir on Sooley Creek to supplement the existing supply to the town. The storage area at the lower reservoir is being fenced, and reinforced concrete troughs are being erected to supply landowners who will be cut off from water.

Gunnedah.—Additional reticulation is being put down by the Council with material supplied by the Department.

Inverell.—Work is being carried out by the Council, with material supplied by the Department, with the object of completing a water supply system for the town which was commenced in 1916 but was terminated owing to greatly increased prices for pipes, &c. Sub-artesian water has been struck in satisfactory quantities and pumping is to be carried out from two bores in the town. The reticulation system is also being completed.

Junee.—The manufacture and cement lining of the 18 miles of 12-inch diameter cast-iron pipes for the new gravitation main have been commenced and the laying and jointing will shortly be carried out by day labour.

Lismore.—The work of extending the reticulation system by the Council commenced in the previous year is still in progress, with material supplied by the Department, and a new pumping unit is being installed to supply Eastwood having a capacity of 3,000 gallons per hour. The existing pumping plant is being replaced by a plant using the Council's a.c. power. The plant, which will consist of two units having a combined capacity of 108,000 gallons per hour, will be installed in a larger well taking the place of the existing 12-ft. diameter well.

Lithgow.—The two pipehead weirs on Middle River which form an auxiliary supply to the town are being built to a greater height by day labour. The additional storage thus obtained will be of great benefit, as the system has in the past been at times overloaded.

Kempsey.—An additional reinforced concrete service reservoir with a capacity of 250,000 gallons is in course of construction by the State Monier Pipe Works.

Mittagong.—Larger mains are being laid to improve the supply to the town.

Narrandera.—Reticulation extensions are being carried out by the Council with material supplied by the Department.

Nowra.—This work which consists in the raising of the earth dam on Bangalow Creek and the laying of an additional 6-inch main from the service reservoir to the town is almost completed. The work is being carried out by day labour.

Nyngan.—This work, consisting of a new earth weir faced with concrete scabbling, was carried out by day labour, and is completed with the exception of the new trunnion staging and suction pipe. These should be ready very shortly.

Parkes.—Repairs are being carried out to the earth dam on Beargamil Creek and the bywash is being lengthened. The work is being done by the Parkes Council by day labour under departmental supervision.

South West Tablelands.—Surveys for land resumption and easements for pipe-lines were completed, and designs and specifications prepared so that tenders may be called for the first section of the work comprising 11 miles of steel rising main.

Rabbit and Milson Island Mental Hospital.—An improved scheme for this institution is being installed by the Hospital authorities with material supplied by the Department.

Quirindi.—Additional reticulation is being carried out by day labour and is almost completed.

(III) WORKS PROPOSED AND INVESTIGATIONS.

Proposals were investigated for the augmentation or improvement of supplies in the following towns:—Bathurst, Blayney, Broken Hill, Deniliquin, Grafton and South Grafton, Katoomba, Mittagong, Moree, Moss Vale, Mudgee, Nowra, Orange, Parkes, Quirindi, and Wagga.

Investigations of proposals for complete supplies for the following towns were dealt with:—Ardlethan, Barellan District, Barraba, Boggabri, Bombala, Boorowa, Coonabarabran, Gerringong, Gosford, Hillston, Kyogle, Leura and Wentworth Falls, Lawson and Hazelbrook, Lockhart District, Macksville, Scone, Shellharbour, Uralla, Walcha, and Wauchope. Contract plans are in hand for complete schemes or extensions for Cowra, Gosford Farm Home, Lake Cargelligo, Narromine, Singleton, Tenterfield, Werris Creek, and Wyong.

(II) SEWERAGE.

(a) Metropolitan Sewerage and Stormwater Channels.

(1) NORTHERN SUBURBS OCEAN OUTFALL SEWER.

No. 4 Section, Cammeray to Berry's Creek.—This section is complete with the exception of the concrete lining of West-street and Hayberry-street shafts. The quantity of rock excavated in shaft chambers and tunnels amounted to 883 cubic yards, the total quantities being 2,606 cubic yards in shafts and 25,766 cubic yards in tunnels. The concrete placed in shafts and tunnels for the year was 4,027 cubic yards, and to date 7,887 cubic yards. The length of this section is 8,374 lineal feet. The expenditure for the year has been £27,036, and to date £122,483.

No. 5 Section, Berry's Creek to Lane Cove River.—This section is well advanced. Shaft sinking and tunnelling are completed, the total quantities of excavation being 1,823 cubic yards and 37,472 cubic yards respectively; 11,270 lineal feet of tunnel lining, equal to 9,692 cubic yards of concrete, have been completed, leaving 1,700 lineal feet to construct; 7,777 cubic yards of concrete were placed during the year. The completed portion of the sewer will serve Northwood, Greenwich, and Longueville. Two aqueducts are being constructed in this section at Gore Creek and Burns Bay respectively. Contracts have been placed with the State Pipe and Reinforced Concrete Works for their construction. Work on the Burns Bay aqueduct has commenced and good progress has been made with the pier foundations. Preliminary arrangements have been made in connection with Gore Creek aqueduct. The length of this section is 12,970 lineal feet. The expenditure for the year has been £50,847, and to date £153,996, including £2,000 on the Burns Bay aqueduct.

No. 5A Section, Lane Cove River Crossing.—The shafts at either end of the syphon have been excavated and the tunnel under the river is in progress from each end. The shafts were extremely wet and the work has been slow, but the difficulty as regards the inflow of water has been overcome and satisfactory progress is being made. Diamond drill bores were put down in order to determine the depth and nature of the sandstone. Ultimately two 4 ft. 6 in. diameter reinforced concrete pipes will be laid in the tunnel and surrounded with concrete, the total length being 873 feet. The spoil from the excavation, by arrangement with the Harbour Trust, is being used for reclamation on both sides of the river. The expenditure for the year has been £7,077, and to date, £12,105.

No. 6 Section, Lane Cove River to Ryde Railway Station.—Good progress has been made on this section with the shaft sinking and tunnelling. The shafts were completed, with the exception of the chambers, 621 cubic yards were excavated during the year, making a total to date of 3,316 cubic yards. The excavation in tunnels is well advanced, the total quantity amounting to 39,000 cubic yards, or 34,200 cubic yards for the year. Total length driven is 14,300 lineal feet. The open cut at Ryde was completed and the sewer concreted, the total quantities being 708 cubic yards of rock, 2,867 cubic yards other than rock, and 556 cubic yards of concrete. The concreting of tunnels is progressing at three points near the Lane Cove River. 200 feet of lining has been completed, 150 cubic yards of concrete being placed. The length of this section is 21,195 lineal feet. The expenditure for the year has been £90,781, and to date £137,796.

No. 7 Section, Ryde Railway Station to Dundas.—During the year an additional compressor station was erected at Brush-road where two compressors were installed. Plant erection is complete at all shafts. The shaft excavation with the exception of the chambers is complete. The total quantity excavated to date is 3,400 cubic yards, and for the year 92 cubic yards. Tunnelling is progressing throughout the section. A short length near Ryde has been completed and is being prepared for concreting. The length driven is 11,272 lineal feet for 30,769 cubic yards of excavation, 24,469 cubic yards being excavated during the year. The section is 17,496 lineal feet in length. The expenditure for the year was £63,640, and to date £122,866.

West Middle Harbour Submain, Cammeray Park, North Sydney, to Gordon Creek, Lindfield.—This section was completed and handed over to the Metropolitan Water, Sewerage and Drainage Board. It is now in use. The cost amounted to £258,281.

Temporary Connection between East and West Middle Harbour Submain at Gordon Creek.—This work, consisting of an aqueduct with a length of 250 lineal feet of 3-foot diameter steel pipes and 208 lineal feet of 3 ft. 3 in. x 2 ft. 2 in. reinforced concrete pipes laid in tunnel, was completed. The expenditure to date is £7,381.

East Middle Harbour Submain, Gordon Creek, Lindfield, to Rocky Creek, Killara.—Shaft sinking and tunnelling on this extension were completed during the year, the excavated quantities amounting to 2,560 cubic yards and 5,140 cubic yards respectively; 2,400 lineal feet of tunnel lining consisting of 1,000 lineal feet of concrete *in situ*, and 1,400 feet of reinforced concrete pipes 4-foot diameter, in tunnels, have been completed. The concrete lining of one of the five shafts has been completed. The length of this section is 14,670 lineal feet. The expenditure to date is £38,649.

(II) CANTERBURY-CAMPSIE-BELMORE-BANKSTOWN SEWERAGE.

Main Sewer.—This work is now complete and the sewer is in use as far as Campsie. Portions of Earlwood, Canterbury, and Campsie have been reticulated by the Metropolitan Water, Sewerage and Drainage Board.

Cup and Saucer Creek Submain.—This submain has been completed for a distance of 5,206 feet, and it is not proposed to extend it further for the present. As constructed this submain serves a large part of Canterbury, and is about to be put into use by the Metropolitan Water, Sewerage and Drainage Board. During the year 595 feet of 21-inch diameter reinforced concrete pipes have been laid and 133 cubic yards of concrete were used in the construction of the necessary manholes.

Wolli Creek Submain.—This submain which is intended to serve portions of Earlwood and Bexley, and ultimately part of Hurstville, has been completed as far as Wolli Creek, two shafts have yet to be concreted and about 720 feet of 3 ft. 6 in. diameter pipes to be laid. It is proposed to construct a reinforced concrete aqueduct for crossing over Wolli Creek. The second section extending in a westerly direction from Wolli Creek is now under construction. During the year 3,688 cubic yards of excavation in trench and tunnel,

mainly in sandstone, have been taken out, 1,101 feet of 4-foot diameter and 442 feet of 3 feet 6 inches diameter reinforced concrete pipes have been laid, and 30 cubic yards of concrete placed in manholes and shafts. The expenditure for the year was £14,374, the total cost to date being £15,344.

(III) LIDCOMBE DRAINAGE, JOSEPH-STREET STORMWATER CHANNEL EXTENSION.

This work has been completed, making a total extension to the existing channel of 1,764 feet. The completion of this channel has removed a serious menace to health and will make possible the closer settlement of this area. The total cost was £6,253.

(b) Newcastle Sewerage and Stormwater Channels.

Newcastle Sewerage Augmentation.—The scheme of sewerage amplification for Newcastle and suburbs which has now been approved by Parliament has been put in hand. A number of shafts between James-street and Gosford-road are being sunk. The power house for the deeper shafts between James-street and the pumping station is being erected. The cost to date is £22,292, a great deal of which has been expended on stores and material.

Access Road to Treatment Works.—The access road to the treatment works was started as an unemployment relief work in December last. It is about three-quarters completed. The cost to date is £3,583.

Stockton Sewerage.—The Parliamentary Standing Committee on Public Works has in hand an inquiry into the expediency of constructing the scheme of sewerage proposed by this Department.

Wallsend Sewerage.—An investigation is in hand to provide a reticulation scheme with separate sewage treatment works for the sewerage of Wallsend.

Cardiff Sewerage.—An investigation is in hand for a scheme of sewerage for the suburb of Cardiff.

Maitland Sewerage.—This investigation, which has been held in abeyance for some time, is now being further proceeded with.

Cessnock Sewerage.—The scheme of sewerage prepared by this Department has now been recommended for construction by the Parliamentary Standing Committee on Public Works, and the necessary survey work is being expedited to allow of construction being commenced.

Newcastle Stormwater Drainage—Cottage Creek Scheme.

No. 1 Section, Parry-street to Wickham Basin.—This section is nearly completed. Work is still in progress on King-street bridge and the covered portion of channel, Hunter-street bridge and the footbridge between Hunter-street and King-street not yet having been commenced. Excavation amounting to 16,250 cubic yards was taken out and 4,791 cubic yards of refilling, 4,268 cubic yards of ballast and 2,728 cubic yards of concrete were placed in position. Cost to date, £41,560.

No. 2 Section, Parry-street to Macquarie-street.—The channel has been completed with the exception of two small portions at Dawson and Corlette streets. Bridges have been erected at Parkway-avenue, Union-street and Parry-street. Bridges are in course of construction at Bruce-street, Macquarie-street, Railway Bridge and Parkway-avenue, No. 2. Tooke-street bridge has not yet been commenced. Excavation amounting to 27,433 cubic yards was taken out and 1,574 cubic yards of refilling, 1,084 cubic yards of ballast and 2,675 cubic yards of concrete were placed in position. Total cost to date, £37,566.

No. 3 Section, Macquarie-street to Watkins-street.—The channel has been completed and Robey-street bridge is in course of erection. The other two bridges, at Bar Beach avenue and Watkins-street, have not yet been commenced. Excavation amounting to 5,150 cubic yards was taken out and 5,400 cubic yards of refilling, 80 cubic yards of ballast, 1,029 cubic yards of concrete were placed in position. Total cost to date, £9,138.

Section from near Union-street to Speedway, Racecourse Branch.—This is now completed together with all bridges from the entrance to past the Speedway. Excavation amounting to 101,719 cubic yards was taken out and 1,000 cubic yards of refilling and 2,320 cubic yards of concrete were placed in position. Total cost to date, £27,769.

Section from Tooke-street to Railway Bridge, Bruce-street Branch.—This section is well in hand. Total cost to date, £1,494.

Section from Watkins-street to Glebe Pit, Glebe Branch.—This section has just been commenced. Total cost to date, £2,623.

Further surveys were made on the third section, Glebe branch, Frederick-street branch, Merewether-street sub-branch, Cronin's Valley sub-branch, Bruce-street branch and Parkway-avenue to Bar Beach Channel.

Throsby Creek Stormwater Drainage System.—Griffiths Flat Section from Main Channel to Tocal-road. This section has been commenced, the total cost to date being £3,278. The main channel and about two-thirds of the branches have been surveyed and estimates of the whole scheme for submission to the Parliamentary Standing Committee on Public Works are nearing completion, and Parliamentary sanction to this submission has been obtained.

(c) Country Towns Sewerage and Stormwater Channels.

(i) WORKS COMPLETED.

Tamworth.—This work which was commenced in 1926 was completed during the year and handed over to the Council. It consists of high and low level reticulation systems, the former gravitating to Imhoff tanks situated some distances below the town on the Peel River. Sewage is pumped from the low level sewers through a rising main into the high level main sewer by electrically-driven pumps situated in a pump well on the outskirts of the town. The sewage then flows from the Imhoff tanks to the filters and from thence to the land treatment area by a syphon under the Peel River after being chemically treated. The total cost of the scheme was £87,245.

National Park.—This is a small scheme to serve the "Rest" at National Park and consists of a main sewer leading from the "Rest" to the septic tank and filters from whence the effluent is carried to underground rubble drains where it is absorbed. The cost was £1,534.

(II) WORKS UNDER CONSTRUCTION.

Dubbo.—This work which was commenced by day labour in 1926 was continued during the year and is now almost completed. It consists of an extensive reticulation system through which sewage gravitates to a pump well whence it is lifted through a rising main by electrically-driven pumps to Imhoff tanks and filters on the far side of the Macquarie River. From the filters the effluent is taken to a land treatment area where it becomes absorbed. The only portion remaining to be completed is the treatment works, which are now well in hand.

Lismore., Low-level Area at Gasworks.—This work which was practically completed last year could not be put into operation owing to the delay in importing the sewage ejectors which are being installed in pump well. This portion of the work is now almost completed and the necessary tests will shortly be carried out.

Goulburn.—Extensive additions to the existing sewers and treatment works have been commenced and are being carried out by day labour.

Stockton Mental Hospital.—A scheme is in hand consisting of sewers, pumping station with septic tank system of sewage treatment, the effluent from which will discharge into the ocean.

(III) WORKS PROPOSED AND INVESTIGATIONS.

Designs for Forbes sewerage were completed and submitted to the Council for their sanction to construct.

Proposals were investigated for additional works at the following towns:—Dubbo, Goulburn, Hay, Katoomba, Narrandera, Orange and West Tamworth.

Proposals for sewerage schemes at the following towns are being investigated and designed:—Bowral, North and South Lismore, Mudgee, Parkes, Quirindi, Glen Innes and Singleton.

Public Institutions and Hospitals.—During the period schemes were prepared for the following:—Casino, Coraki, Gladesville, Gunnedah, Kiama, Kenmore, Orange, Rydalmere and Walcha.

Stormwater Drainage.—Investigations were carried out for stormwater drainage systems at Gosford, Terrigal and Picton.

(III) WATER SUPPLY AND SEWERAGE: TREATMENT AND FILTRATION.

Water Supply.—Specifications for filtration works at Bowral were completed and a tender accepted for their construction. The treatment consists of aeration, coagulation, mechanical agitation, sedimentation, and filtration through rapid sand mechanical filters. The ultimate capacity of the plant will be 430,000 gallons. Reports were prepared on proposed filtration for Glen Innes, Cargelligo and Dungog. At Singleton the alterations to the water softener were carried out and quotations have been invited for a chlorination plant. Two cases of pollution of storage reservoirs by vegetable growths occurred. At Armidale the Dumaresq Creek Reservoir became badly infected with a green algae (*Anabena*). It was treated with copper sulphate 0.75 parts per million and the algae was thus destroyed. At Nowra a prolific growth of the *Potamogeton Ochreatus* produced an obnoxious taste in the supply during the spring. It was destroyed by dragging a thin wire across the bottom of the reservoir and raking ashore and burning all the debris. Special investigations of the quality of the water supplies were made at Mudgee, Cowra and Wellington. Mechanical and bacteriological analyses were regularly made of both the supplies at Broken Hill. Bacteriological work was carried out at the Port Pirie Laboratory by courtesy of the Commonwealth Government.

A joint inspection of the Blackheath Catchment Area was made with officers from the Health Department and regulations for its control are being prepared for the Council.

Catchment Area half-yearly report forms were issued to all Councils controlling water supplies for the purpose of indicating to the Local Authorities their responsibility with regard to the control of water supply catchments.

Sewerage.—Sites for treatment works have been investigated for the installations proposed at Mudgee and Quirindi. Alterations to the works at the Orange Mental Hospital were investigated with a view to their removal from the catchment of Gosling Creek. Designs for the remodelling of the treatment works at Goulburn were completed and submitted to the Council. An Imhoff tank and trickling filters fitted with rotary sprinklers were designed and are now under construction to increase the capacity of the works at Wagga. Extensions to the treatment works at Albury and Bathurst were designed. Designs for treatment plants were prepared for the Mental Hospitals at Gladesville and Rydalmere. Designs for new treatment works on a different site to that of the present ones at Lismore were put in hand. A chlorination plant was installed at Tamworth. The treatment works at Albury, Bathurst, Goulburn, Hay, Lithgow, Liverpool, Narrandera and Wagga have been visited regularly by the departmental Inspector, the effluents sampled, and advice given on the management of the plants.

General Research.—Reports were prepared on the new Silicosis Act and on proposed legislation with regard to the standardisation of cement and concrete. Mr. Herbert Fleming, M.I.E., Aust., Officer in Charge, Country Towns Water Supply and Sewerage, and Mr. W. T. Anderson, Supervising Engineer, represented this Department at the Commonwealth Conference on Public Health Engineering in Melbourne in September, 1927.

T. E. BURROWS, M.Inst.C.E., M.I.E., Aust.,

Chief Engineer for Water Supply and Sewerage,
Chief Engineer, N.S.W. Constructing Authority, River Murray Waters Act.

APPENDIX A.

RIVER MURRAY WATERS ACT.

ANNUAL REPORT FOR YEAR ENDED 30TH JUNE, 1928.

A.—Hume Reservoir.

- (i) Investigations and Designs.
- (ii) Land Acquisition.
- (iii) Construction.
 - (a) Road of Access.
 - (b) Quarry.
 - (c) Plant.
 - (d) Foundations for Dam.
 - (e) Concrete.
 - (f) Outlet Works.
 - (g) Coffor Dams.
 - (h) Bethanga Bridge.
 - (i) Deviating Roads.
 - (1) Surveys.
 - (2) Construction.
 - (j) General.

B.—Locks and Weirs.

- (i) Surveys and Borings.
- (ii) No. 10 Lock and Weir.
- (iii) No. 15 Lock and Weir.

A.—HUME RESERVOIR.

(i) *Investigations and Designs.*

Designs were finalised during the year under review for the trash racks structure surrounding the intakes for the hydro-electric and 9 feet regulating openings, foundations for south wing wall and energy dissipator and main wall expansion joints. All these received the approval of the River Murray Commission. Detailed designs were also prepared for an inspection gallery in main wall, reinforcement round hydro-electric and regulating intakes, and a partition wall in stilling pool.

(ii) *Land Acquisition.*

In accordance with a definite plan under which successive areas of land are to be acquired by certain dates, 798 acres were acquired during the year, making a total of 6,650 acres acquired to date.

(iii) *Construction.*

(a) *Road of Access.*—The road of access has been maintained in first-class order, a length of 20 chains at Hume Reservoir Railway Siding was scarified and resurfaced, and a similar length within the township boundary was treated with bitumen.

(b) *Quarry.*—The operations at the quarry included the supply of all crushed metal and displacers used in the main wall and north wing wall, the greater part of the crushed metal used in the south wing wall, and an amount of 9,174 cubic yards of spalls supplied to the Victorian section of works. The inclined railway was superseded by the junctioning of the tracks on the quarry floor with the main line to the dam, this change enabling greater quantities of displacers and spalls to be delivered at a reduced cost. A further crane was made available by transfer from the dam site, making five in all working at the quarry face, and the second shift has been dispensed with, except for a few men loading displacers. The condition of the quarry face is very satisfactory.

(c) *Plant.*—The southern section of the concrete belt has been raised to a new position, portion working on an incline of 18 deg. and portion at R.L. 615. The tail tower of the cableway has been dismantled and re-erected on a concrete pillar constructed at the intersection of the main wall and the south wing wall, this pillar forming portion of the permanent structure of the dam. The concrete elevator tower has been dismantled and portion is being reassembled on the face of the concrete pillar.

Items of plant received during the year include one 14 in. x 12 in. air compressor, one Barclay 3-feet gauge locomotive, one No. 7 McKiernan Terry pile hammer, one 22 cubic feet concrete mixer, one 10 cubic feet petrol-driven concrete mixer, one punching and shearing machine, eight jackhammers, one 12 in. x 8 in. stone crusher and screen, one Morris car. An automatic telephone exchange of thirty lines has been installed and is operating satisfactorily.

(d) *Foundations for Dam.*—The foundations for the main wall were completed in November, 1927. Irregularities in the strata were encountered in several places towards the southern end with the result that the excavations had to be considerably enlarged before satisfactory rock was met. The deepest point in the cut-off trench foundation was at R.L. 443. The foundations for the south wing wall have been troublesome throughout owing to the great depth of material which had to be removed, and the treacherous and broken strata passed through. The shallowest point in this excavation was at R.L. 467 and the deepest point at R.L. 428.50, the latter being 104 feet below the surface. During the very wet summer of the past year heavy slips were frequent with consequent delay to the work. At the end of the year under review the excavations for the foundations are practically complete, the last section some 20 feet in length being well in hand.

A trench for the base of the trash rack was completed, also the foundation for the energy dissipator for a length of approximately 200 feet.

The material excavated during the year was 96,419 cubic yards, making a total to date of 888,319 cubic yards, the former amount comprising 33,358 cubic yards granite, 24,606 cubic yards decomposed granite, and 38,455 cubic yards earth.

(e) *Concrete.*—Concrete has been placed as follows during the year:—Main wall 66,736, south wing wall 21,789, north wing wall 1,802, energy dissipator 316, stilling pool (outer and partition walls) 850, trash racks 541, and core wall 39 cubic yards, making a total of 92,073 cubic yards. The total placed to date is 206,573 cubic yards. Of the 21,789 cubic yards placed in the south wing wall, 4,128 cubic yards was composed of shingle and sand obtained from the old river bed uncovered by the excavations. The section of the energy dissipator referred to was built at the extreme northern end within the stilling pool. Sand and shingle, totalling 37,576 cubic yards, were obtained by contract from the river banks downstream from the dam site. The short wing wall on the upstream side of the centre line at the southern end has been brought up to R.L. 552.

(f) *Outlet Works.*—The supply and installation of the four 9-feet diameter steel outlet pipes and the three 13-feet diameter steel hydro-electric pipes were carried out by the Government Dockyard, Walsh Island, under contract. Plates for these pipes were assembled and electrically welded *in situ*, work being commenced in November, 1927, and completed in May, 1928. Stoney sluice frames and valve liner plates were attached to the 9 feet openings and embedded in concrete. On the hydro-electric openings the valve liner plates were attached, and the sills and lower vertical members of the Stoney sluice frames fixed in position. The valve on No. 1 hydro-electric opening is completely installed and the timber form work between the Stoney sluice and the steel pipe well advanced. A commencement has been made on the concrete work which will embed the whole.

(g) *Coffor Dams.*—With the joining up of the Victorian earth bank with the concrete in the main wall, the necessity for the upstream portion of the main coffer dam disappeared and a commencement was made in January on the work of steel pile extraction. To the end of the period under review 447 piles were extracted, the duty on the two hammers in use being very heavy. Provision has been made at the southern side of the stilling pool for the speedy erection and anchorage of a short coffer dam (No. 2) across the end of the short section of energy dissipator constructed. This will serve the purpose of preventing the water which passes through the 9 feet openings after the closing of the dam from flooding the site of the unconstructed portion of the energy dissipator.

(h) *Bethanga Bridge*.—Separate contracts have been arranged for the fabrication and delivery of steelwork and the erection of same.

(i) *Deviation of Roads*.—(1) *Surveys*.—The location and surveys of deviations of the Great Southern Road and Upper Murray Road are complete. Tenders have been accepted for the bridges over Tabletop and Bowna Creeks. The location surveys of the deviation on the Upper Murray Road were completed by the Main Roads Board.

(2) *Construction*.—Work is in progress on deviation of Great Southern Road. Clearing has been completed for a distance of $6\frac{1}{2}$ miles, fencing for $3\frac{1}{2}$ miles, formation for $4\frac{1}{2}$ miles and culverts for $5\frac{1}{2}$ miles.

The number of men employed is thirty-nine.

(j) *General*.—The number of men employed at 30th June, 1928, was 684. Three junior staff residences and a fire proof annex to the office were constructed, and the town recreation hall enlarged. The health of the community has been uniformly good.

B—LOCKS AND WEIRS.

(i) *Surveys and Borings.*

Investigations for the design of the River Murray Locking System from Mildura upstream towards Echuca were proceeded with during the year. One boring party has been continuously engaged for the period, a second has been operating since September of last year, while a third has just recently been commissioned. Two survey parties have been operating for the greater part of the year; the number has, however, recently been temporarily reduced to one.

The sites for Locks Nos. 16, 17 and 18 have been located at 225, 276 $\frac{1}{2}$ and 297 $\frac{1}{2}$ miles respectively, this, with the exception of some detail boring at No. 16 site, completing the boring of the series Nos. 12 to 18. At No. 16 site considerable work has been involved, operations covering some 21 miles of river. At No. 18 site a particularly favourable foundation has been obtained. Exploratory boring is at present in progress for the location at Nos. 19 and 20 sites.

The requisite survey data in respect of Nos. 12, 13, 14 and 15 sites, except for a few outstanding matters at Nos. 12 and 13 sites, has been obtained; the corresponding work at No. 18 site is at present in progress.

(ii) *No. 10 Lock and Weir.*

The close of the financial year saw the completion of construction work within No. 1 coffer dam, consisting of concrete in foundations under lock walls, concrete in lock walls, piling under lock floor, reinforced concrete in floor, concrete in navigable pass, concrete in pier between navigable pass and sluices, anchoring and erecting steel trestles with bridging, chains, &c., and construction of two pairs of wooden lock gates.

During the twelve months 20,000 cubic yards of gravel concrete and 177 cubic yards of limestone concrete were placed, making the totals to date 26,000 cubic yards and 927 cubic yards respectively. 341 tons of iron and steel work were delivered and fixed in position; 2,500 tons of cement were delivered by river from South Australia, and 360 tons received from No. 11 Lock, making total supply of cement to date 5,500 tons. About 11,000 cubic yards of gravel have been used in concrete, making 29,400 cubic yards to date. All sand has been obtained from the river bed.

A stone protecting apron has been constructed at the upstream entrance to the lock chamber. During the year 9,000 cubic yards of back fill have been placed, making 15,000 cubic yards to date.

The number of men employed at 30th June was sixty-three.

(iii) *No. 15 Lock and Weir.*

Construction was commenced in October last. A favourable towage contract was entered into and the plant, with the exception of the cableway and power plant, from No. 11 Lock, Mildura, which was nearing completion, as it became available was transferred to Euston. Construction of a branch siding from the Robinvale railway to the site of the works, a little under a mile in length, is in progress. A low river has prevailed up till the month of June which has been favourable to construction, and at the present time operations are being directed towards emptying the first coffer dam on the Victorian bank for inspection with a view to a decision in the matter of piling the foundations or otherwise.

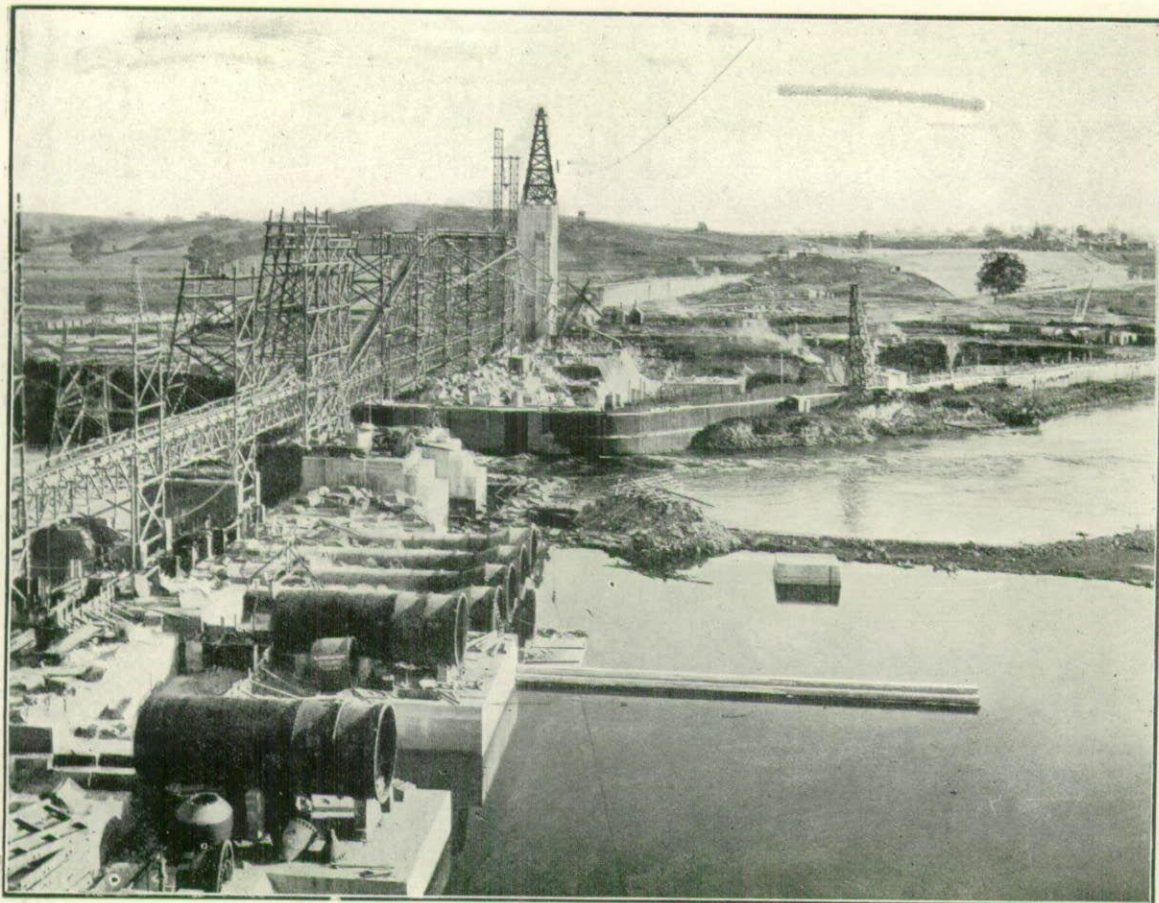
The lay-out of the township, with single men's barracks, restaurant, some twenty-four cottages for married employees, staff quarters, all sufficient for present requirements, together with provision for water supply and sanitation, is complete. The erection of buildings, office, workshops and other auxiliary buildings (except main store) is complete also, while a temporary power plant has recently been obtained and is in course of erection.

The first coffer dam on the Victorian bank, which is somewhat larger than usual in order to provide for up and down stream aprons, is well advanced, the whole of the steel and timber piling being driven, and the filling within a measurable distance of completion.

The number of men employed is 120.

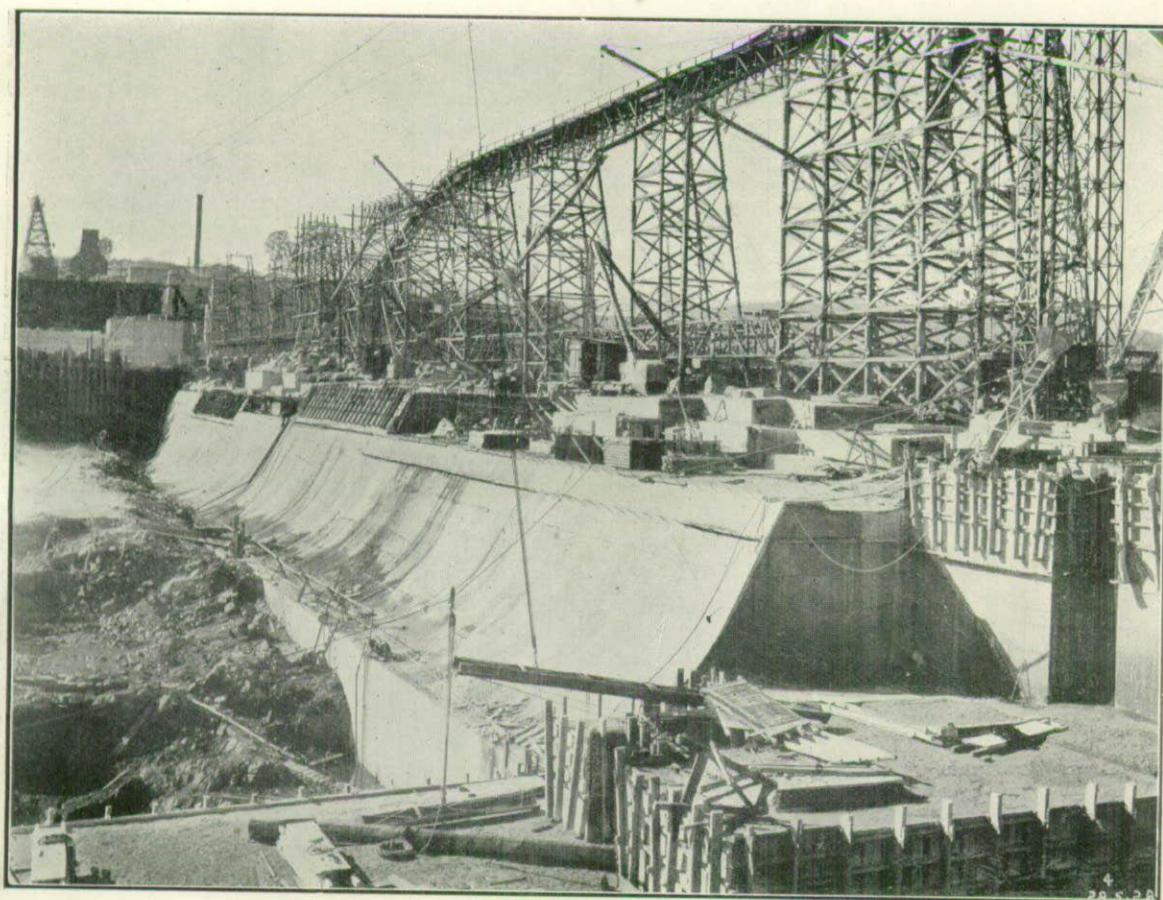
T. E. BURROWS, M.Inst.C.E.,
Chief Engineer for New South Wales,
River Murray Waters Act.

27th July, 1928.



River Murray Waters Works, Hume Reservoir.

General view looking South and showing outlet pipes and frames of Stoney sluices in position, coffer dam with construction of Spillway therein, including pier for tail tower of cableway, also earth embankment in Victoria.



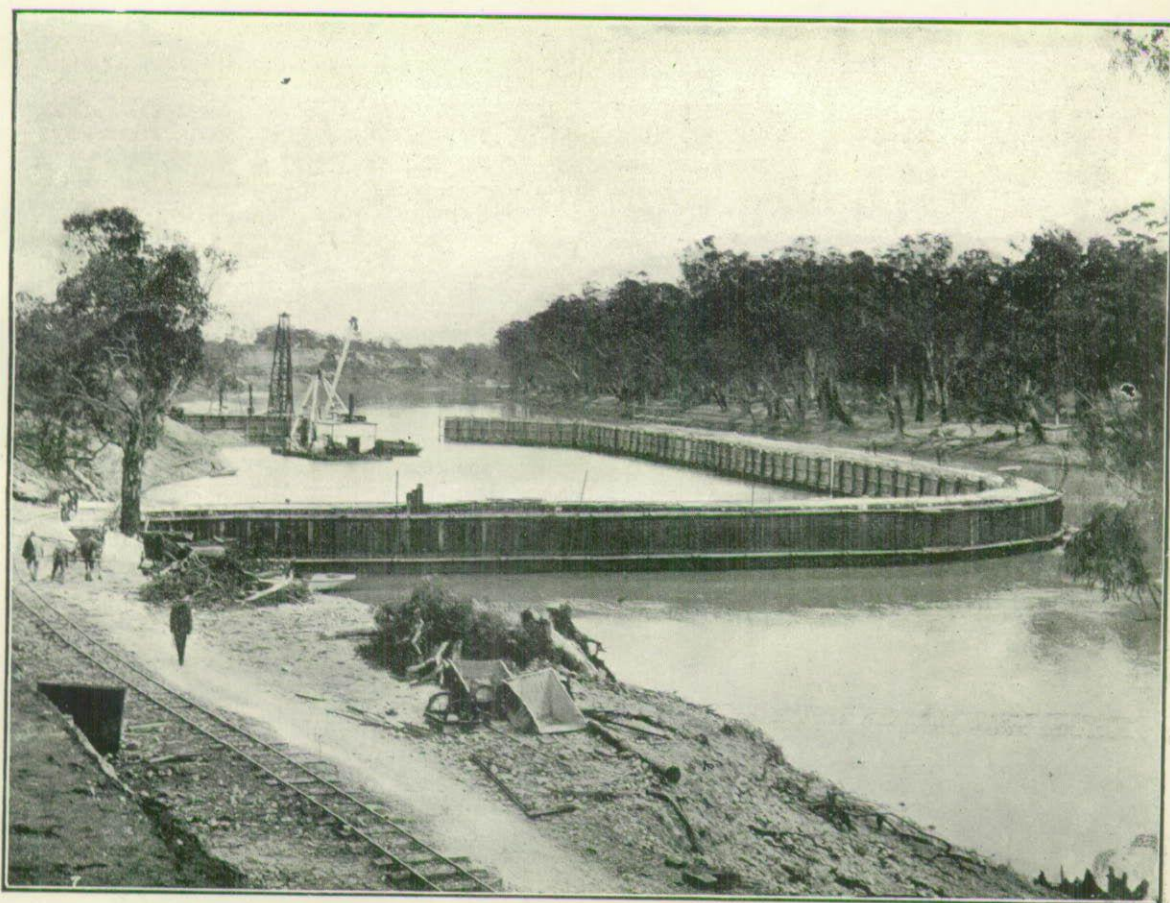
River Murray Waters Works, Hume Reservoir.

View looking North and showing construction of Spillway section of dam and of South Wing Wall inside coffer dam.



River Murray Waters Works, Lock No. 10, Wentworth.

Aerial photograph of lock and navigable pass completed inside coffer dam. The view looks up the Murray River and shows the Darling River flowing in from the North with the town of Wentworth on its right bank at the top of the pictures. The photograph is reproduced by courtesy of the Royal Australian Air Force.



River Murray Waters Works, Weir and Lock No. 15 at Euston. Cofferdam, No. 1, nearing closure.



Armidale Water Supply Storage Dam built across Puddledock Creek from which the water gravitates to service reservoirs in the town. The capacity of this dam is 206,000,000 gallons.



Molong Water Supply Dam built across Borenore Creek from which the water gravitates to a service reservoir in Molong. The capacity of this dam is 67,000,000 gallons.

Harbours, Roads, and Bridges Branch.

Annual Report 1927-28.

The total expenditure on construction and maintenance of harbour works, dredging, roads, bridges, ferries, public watering-places, &c., amounted to £898,082 15s. 2d., as detailed hereunder:—

	£	s.	d.
Harbour works (including dredging)	429,970	7	7
Roads	148,591	12	1
Bridges	214,862	11	5
Punts and ferries	73,496	12	1
Public watering-places	31,161	12	0
	<hr/>		
	£898,082	15	2

Local Government inquiries, numbering sixty-nine, were conducted by officers of the Branch for the Department of Local Government, including applications from councils for loans totalling approximately £1,063,950.

District Officers under the control of the Branch supervised road work for the Lands, Local Government, Labour and Industry Departments, and the Forestry Commission.

Inspections in connection with water right applications, and the supervision of the sinking of shallow bores in the Western Division have been carried out for the Water Conservation and Irrigation Commission.

HARBOUR WORKS.

Coff's Harbour, Port Kembla and Newcastle improvement works were continued by day labour, also the construction by contract of the new ocean jetty at Byron Bay. It is anticipated that the latter work will be completed and in commission during the ensuing year. Particulars of these works are detailed later.

The larger repairs and extensions in progress during the year include the following:—

- Byron Bay—General repair of existing jetty and moorings.
- Woolgoolga Jetty—General repair of existing jetty and moorings.
- Coff's Harbour—General repair of existing jetty and moorings.
- Cape Hawke—Repairs to existing training-wall.
- Newcastle—Construction mooring dolphins, Carrington.
- Newcastle—Repairs Dyke Wharf, lower end.
- Newcastle—Lee Wharf to Wickham Wharf roads.
- Port Kembla—Extension No. 4 Jetty.
- Moruya—Spur-wall construction.

DREDGING.

The "Fibronia"—a self-propelling suction dredge—was added to the plant, and was placed in commission on 1st May of the current year.

The quantity of material lifted during the year totalled 4,259,664 tons, carried out at a cost of 11·8d. per ton, as compared with 12·4d. per ton. the previous year.

Particulars of the depth on the bar and crossings of the various river entrances are indicated in Statement D.

RIVER ENTRANCES.

Only minor interruption to traffic, caused by weather conditions, was experienced at entrances where breakwaters and training-walls approximate the completed design.

The bar dredges have kept the other entrances fairly free, in comparison to the limited time they have been available for each port.

GENERAL MAINTENANCE.

The expenditure (excluding dredging and major construction works, separately referred to) on the maintenance of the various harbour and river works and ocean jetties amounted to £45,418 13s. 6d.

DOCKS.

The transactions of the docks at the Tweed, Richmond, Clarence, and Manning Rivers are detailed in Statement E.

HYDROGRAPHIC SURVEYS.

Re-surveys of Port Kembla Harbour, Coff's Harbour, Manning River entrance, soundings and current observations from Long Bay to Port Hacking for Metropolitan Water Supply and Sewerage Board were completed, and section of Cook's River from Tempe dam to Botany Bay was in hand at the close of the year. The surveys required for dredging work were also completed.

INLAND RIVERS.

A small expenditure was incurred in snagging operations on the Darling and Murray rivers.

BOURKE LOCK, WEIR, AND WHARF.

The expenditure in maintenance and repairs amounted to £110 10s. 2d. on the wharves and £237 13s. 9d. on lock and weir.

One inward and one outward steamer only were recorded during the year, handling 123½ tons of cargo. Collections for wharfage and craneage dues totalled £22 5s. 4d.

SWAMP DRAINAGE.

No additional trust or union was gazetted during the year, the total operating remaining at twenty-eight trusts and twenty unions.

The trust works on the North Coast have been well maintained in spite of a wet season. Owing to an exceptional amount of rain the conditions on the swamps have not been favourable to crops. It must, however, be understood that the successful drainage of these areas should be judged on the improvement of average conditions over a period of years.

Mooball and Crabbe's Creek Trust reverted from control by manager to trustees on 26th July, 1927.

BYRON BAY.

The construction of the new jetty by contract was continued, there remaining only for completion the lower longitudinal and cross wales and kerbs.

The expenditure on this jetty and appurtenances for the year was £28,542 3s. 9d.

The following works were put in hand under day labour, and were still in progress at the close of the year :—

Road approach—To goods yard—£1,448 3s. 7d. expended during this year.

Road access to jetty—Expenditure £841 15s. 4d.

Cattle Yard and Pig Pen—Expenditure £46 10s. 7d.

The placing of electric light, power cables and erection of electric cranes were put in hand and are still in progress. Expenditure amounted to £4,421 13s. 9d.

The maintenance of the existing jetty, with moorings, entailed an expenditure of £539 1s. 9d.

WOOLGOOLGA JETTY.

The expenditure on jetty maintenance amounted to £2,377 6s. 4d., which included the renewal of piles, girders, and capsils.

The moorings were overhauled and $7\frac{1}{2}$ fathoms of new cable laid.

COFF'S HARBOUR.

The breakwater works were continued throughout the year.

Construction expenditure	£32,601 12s. 3d.
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Tonnage of stone quarried	76,826 tons.
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Northern Breakwater.—The damage caused by gales during the year was repaired, which necessitated the depositing of 1,020 tons of stone at a cost of £872 17s. 2d.

The total quantity of stone placed in the wall has amounted to 402,115 tons, at a cost of £185,350 10s. 4d.=9s. 2-6d. per ton.

Eastern Breakwater.—Extended 30 feet to chainage 230 feet. Very severe gales and heavy seas were experienced during the latter part of the year.

The amount of stone deposited, 21,741 tons, costing £17,096 2s. 10d., making the total to date 114,967 tons at a cost of £77,673 12s. 11d.=13s. 6-1d. per ton.

Concrete Work.—There were 120 concrete blocks, each 40 tons, manufactured during the year, 107 of which were tipped at a cost of £4,031 9s. 7d., on the sea side and centre of the eastern breakwater. Concreting of the top of this wall was carried to chainage 230 feet, using 406 tons of concrete at a cost of £423 9s. 6d.

The total expenditure on the eastern breakwater amounts to £91,029 16s. 7d., covering the placing of 125,426 tons.

Reclamation Wall.—This wall was continued from chainage 2,208 feet to completion at 2,565 feet—the stone deposited amounted to 10,451 tons. The total quantity of stone in complete wall, 155,855 tons, costing £86,422 18s. 10d.=11s. 1-08d. per ton.

Coff's Harbour Jetty.—The expenditure on maintenance of the jetty and approaches amounted to £2,584 6s. 10d., which included renewal of piles, girders, fenders, &c.

The moorings were overhauled and one new buoy and $7\frac{1}{2}$ fathoms of new cable fixed.

NAMBUCCA RIVER IMPROVEMENTS.

The only work carried out was in depositing 874 tons of stone in the gap between the sand spit and river bank at Warrell Creek, at a cost of £228 12s. 10d.

MACLEAY RIVER.

Repairs were carried out to the pilot boat slip at a cost of £22 16s. 8d., and the channel on south side of South-West Rocks Creek improved to give relief at the pilot's boatshed.

PORT MACQUARIE.

Repairs to the pilot boat slip were completed at a cost of £73 4s. 6d.

CAMDEN HAVEN.

The 10-ton crane at quarry wharf was dismantled and transferred to depot.

CAPE HAWKE HARBOUR.

Repairs were carried out to the northern training-wall, 206 tons of stone being placed at a cost of £257 10s.

The southern sand bank of the Wallamba River channel was protected by placing 67 tons of stone at cost of £33 10s.

NEWCASTLE.

Submarine Rock Excavation.—The rock drills "Miner" and "Digger" were engaged on this work, concentrating mainly on the area north of the 500 feet entrance channel.

Owing to adverse weather conditions, and difficulty in dealing with isolated patches, the anticipated completion to the increased depth in this channel was not realised during the year.

An analysis of the work computed is tabulated hereunder:—

Position of work.	No. of holes drilled.	Total length drilled.	Explosives used.	Stone lifted.
				cub. yds.
Bar	251	3,018	3,342½	914
Additional on north side of main channel	140	1,124	1,340	941
Basin Entrance	4,688	41,820	13,980	1,111
Off Stockton .....	.....	.....	.....	.....
Totals during 1927-28	5,179	45,962	18,662½	2,966
Previous totals to 30th June, 1927	27,073	216,552	91,041	76,405
Grand total to 30th June, 1928.....	32 252	262,514	109,703½	79,371

Dredging.—A summary of the year's operations is as follows:—

Description.	Tons.
Harbour improvements and maintenance	2,229,720
Reclamation	102,870
River dredging	76,750
Total tonnage	2 409,340
Cost	£ s. d. 98,415 1 5

The tonnage includes rock lifted in submarine rock excavation.

Floating Dock.—Dredging was commenced during the year in the approach channel, swinging basin, and dock site.

The attached tabulated statement shows the work carried out in the respective sections.

Dredges.	Approach Channel. Tons Lifted.	Swinging Basin. Tons Lifted.	Dock. Tons Lifted.
"Juno"	595,100	.....	.....
"Hunter"	440,475	.....	.....
"Jupiter"	44,250	.....	.....
"Hexham" .....	.....	134,000	32,400
"Fibronia" .....	.....	28,850	.....
Total	1,079,825	162,850	32,400

Lee Wharf Extension.—The 540 feet extension of this wharf was completed and opened to shipping during the year. A roadway was constructed at the back of the wharf extending across the railway tracks to the existing 33 feet road.

The expenditure for the year amounted to £2,624 15s. 2d., bringing the total to £22,647 5s. 6d.

Road and Rail Connection, Lee Wharf to Wickham Wharf.—To enable this roadway to be continued extensive reclamation was carried out, and a dry rubble wall constructed to retain the pumped sand. The ballasting and metalling of the first section of the through roadway to Hannell-street being in hand at the close of the year, the railway line from Lee Wharf to Wickham Wharf has been ballasted for its entire length.

Hannell-street: Widening.—The widening of Hannell-street, Wickham, to 80 feet from Cowper-street to Throsby Creek was commenced during the latter part of the year. The expenditure for the year amounted to £1,246 2s. 5d.

Minor Works and Maintenance.—The construction of a 40 ft. x 40 ft. dolphin and a 20 ft. x 20 ft. mooring dolphin west of the Bunker Wharf, Carrington, were completed.

The repairs to lower end of Dyke Wharf included the renewal of piles, girders, headstocks, fenders and decking.

Lead-in road to Wickham Wharf was widened to 24 feet. Minor maintenance and repairs were carried out at the following places:—

A. A. Coy's Wharf, N.C.S.N. Coy's Wharf, Market-street Wharf, No. 1 Timber Wharf, and the various dolphins at Carrington and Stockton.

Total expenditure on harbour maintenance amounted to £9,835 13s. 2d.

Submarine Water Mains.—Repairs were carried out to the submarine water mains between Carrington, Walsh Island-Stockton, as required, at the request of the Hunter District Water Supply and Sewerage Board.

PORT KEMBLA.

The year's output from the old quarry amounted to 62,418 tons, distributed as follows :—

	tons.
Eastern Breakwater	2,333
Sea Wall	4,710
State Metal Quarries	55,334
Miscellaneous	41
	<hr/> 62,418 tons.

The total quantity of stone quarried in connection with harbour works has been 2,941,396 tons, costing £385,498 7s. 3d. = 31·45d. per ton.

New Quarry.—Further work in connection with opening up of the new quarry has been carried out and was in progress at the close of the year.

One compressor has been installed and is in operation, also an overhead bridge constructed across open cut leading to the upper face for the purpose of delivering stone to the State metal-crusher.

The lead-in road from Mount Kembla line to the upper face has been regraded, and diamond crossing placed. Two 10-ton cranes and Ruston steam shovel are now working in this quarry.

The total expenditure for the year on the new quarry and railway connections, &c., has been £13,787 6s.

Australian Iron & Steel Co's Jetty.—Except for minor items, this jetty was completed by private contract for the Australian Iron & Steel Company, to the satisfaction of this Department's requirements.

Haulage and Shipping.—Appendices A, B and C indicate traffic and shipping details of the port during the year.

Eastern Breakwater.—No new construction was carried out during the year, 2,335 tons being placed in repairs. The total quantity of stone tipped amounted to 982,727 tons, costing £248,854 17s. 5d., excluding concreting. It is, however, expected that the new quarry will be opened up sufficiently for the work of extension to be carried on during the early part of the ensuing year.

Workshop and Plant.—The work carried out during the year consisted mainly of running repairs to locos, and cranes, the fabrication of steelwork for the power house, bunkers, valve door for screening tank outlet chamber, and plate girders for bridge over Port Kembla road.

JETTIES

No. 1 Jetty.—In addition to the general maintenance, amounting to £169 4s. 2d., work was commenced on the repairs to fenders, which work was in progress at the close of the year. An amount of £1,852 3s. 6d. being expended during the year.

No. 3 Jetty.—General maintenance work cost £52 9s. 3d.

No. 4 Jetty.—An amount of £61 11s. 6d. was expended on maintenance. The work on the 300 feet extension was commenced during the latter half of last year. About 50 lineal feet of wharf has been completed, all girders and decking fixed for a further 20 feet, and all piles driven to a chainage of 90 feet.

It is expected the whole of the extension will be completed by the end of the ensuing year. Expenditure on work to date, £6,506 2s. 4d.

Minor repairs and renewals at the far Southern ports were carried out at Kiama Harbour, Ulladulla Pier, Bermagui Jetty, Tathra Jetty, Merimbula Jetty and Eden, entailing an expenditure of £1,126 19s. 5d. All moorings have been overhauled and are in a serviceable condition.

MORUYA.

Investigations were made of reported rocks in the channel, below Town wharf, and repairs to training wall at Town wharf completed at a cost of £26 7s. 8d.

The spur wall at the entrance was completed during the year at a total cost of £11,086 5s. 10d., using 48,769 tons of stone = 4s. 6·05d. per ton, total distance constructed 644 feet.

WOLLONGONG.

The coal shipped during the year amounted to 22,045 tons, producing a revenue of £699 5s. 4d., which shows a reduction on previous year's trade.

The expenses on shipping and minor repairs totalled £1,508 19s. 3d.

The strengthening of the breakwater was continued with mass concrete and concrete blocks at an expenditure of £264 3s. 8d.

BRIDGES.

Repairs and Maintenance.—Considerable expenditure (£79,304) has again been incurred in repairs and maintenance of the 400 bridges under the control of the Department.

The largest items of expenditure were :—

	£		£
Deniliquin	2,082	Duck River	1,416
Five Mile Warrambool	1,432	Glebe Island	2,658
Bundarra	1,061	Holdsworthy	1,868
Wentworth	2,032	Pymont	7,415
de Burgh	1,029		

Included in the expenditure on Pymont Bridge is an amount of £3,888 on reinforced concrete protection for the timber piles which had been previously sheathed with copper. The sheathing showed signs of deterioration and permanent protection was necessary.

Pyrmont Bridge—Operation of Swing Span.—The usual information in respect of this operation is submitted as follows :—

Number of openings	...	...	...	...	...	...	...	3,870
B.T.U. consumption	...	...	...	...	...	...	...	3,270
Cost of current	...	...	...	...	...	...	...	£13 12s. 6d.
Number of vessels passed through	...	...	...	...	...	...	...	4,981

From 1st July, 1902, to 30th June, 1928, the swing span of this bridge has been operated 145,712 times to permit the passage of vessels, the cost of electric power being £444 9s. 6d.—an average of .732d. per opening of swing span and gates.

BRIDGE CONSTRUCTION.

The following bridge construction works were in hand during the year :—

Mildura Bridge.—This bridge which was constructed under the Border Railways Agreement Act of 1922 was completed so far as the main bridge was concerned during the year and opened for traffic by the Secretary of State for the Dominions in October, 1927.

The work on the roadway approaches has been carried out by day labour and was nearing completion at the end of the year.

The total cost of the four contracts has been as follows :—

	1927-28.	Total to 30th June, 1928.
	£ s. d.	£ s. d.
No. 1.—Supply of Steelwork .....	.....	23,811 17 9
No. 2.—Erection of Steelwork and construction of piers of main bridge.	12,033 13 11	46,916 6 11
No. 3.—Erection of approach bridges on New South Wales side ...	1,632 0 8	20,138 6 0
No. 4.—Erection of approach bridges on Victorian side	202 13 7	5,604 14 11
Departmental supervision, survey, design, &c.	1,208 0 5	1,866 2 2
TOTALS—(Exclusive of Victorian Government Repayments)	15,076 8 7	98,337 7 9

The cost of the approaches to the 30th June was £6,271 18s. 9d., making a total of £104,609 6s. 6d. Of this amount, after allowing for refund from the Victorian Government, £10,570 has been expended during this year.

Abbotsford Bridge.—This, the second of the bridges constructed by this Department under the Border Railways Act, was completed so far as the main bridge was concerned and opened for traffic by His Excellency the Governor in July, 1928. The approach roads also comprised in this contract were completed in June.

The complete cost has not yet been ascertained.

The expenditure during the year was £8,473.

Euston Bridge.—This bridge was completed by the Victorian Railway Department during the year. The cost to New South Wales for this period has been £5,872. The total cost of the bridge has been £153,774.

The estimate for this work was £135,000, but owing to the increase in wages and also to the provision of a permanent way and fencing on the approaches a larger amount was necessary.

George's River Bridge.—The State Monier Pipe and Reinforced Concrete Works are proceeding with the construction of this bridge for the Sutherland Shire Council and the piers which caused considerable trouble have been completed above water during the year. It is expected that the work will be completed during 1928-29.

Yarrawa Bridge.—As stated in last Annual Report, this work has been completed at a cost of £11,696, of which £10,599 10s. represents payments to the contractor.

Tallywalka Creek Bridges, near Wilcannia.—Owing to a considerable delay waiting for timber, which had to be transported by river, this work was not completed until November last. The completed cost was £12,364, of which £11,693 represented payments to the contractor.

Kynnumboon Bridge.—This bridge was completed in July, 1927, at a total cost of £5,748, of which £5,117 was paid to the contractor.

Bridge over Cook's River at Mascot.—This bridge was completed during the year. The nature of the foundation was much firmer than anticipated and caused considerable difficulty in pile driving. The expenditure during the year has been £8,066. The bridge was opened to traffic in December, 1927, but work was not finally completed until April, 1928.

Bridge over Wyaldra Creek at Beryl.—This contract was completed and bridge opened to traffic during August, 1927. The total cost was £6,374. Payments to contractor amounted to £5,423, and in addition portion of the work was carried out by day labour.

Bridge over the Narran River at Bangate.—The replacement of this old bridge was let by contract, but owing to delay in commencing, the contract was cancelled and the work was completed during this year by day labour at a cost of £2,960 16s., which was below the estimated cost of £3,100.

Bridge over Emigrant Creek, near Ballina.—As stated in last year's report, the work on the bridge had been completed with the exception of the removal of the old bridge. This has since been carried out, making the total expenditure £7,700. Total payments to contractor amounted to £6,900.

Bridge over Polygonum Swamp, Bourke.—This contract was completed in September last, the total cost being £11,392. Payments to the contractor amounted to £10,821.

Bridge over Lachlan River at Collett's Crossing.—This work was completed and opened to traffic in November last year. The complete cost was £12,722, not including cost of the necessary resumptions. Payment to the contractor amounted to £12,141.

Gladesville Bridge.—The reconstruction of the roadway of this bridge has been completed. Expenditure during the year amounted to £2,446, making a total expenditure of £4,328.

Bridge over Tarrion Creek, near Brewarrina.—The contractor completed this bridge in October. The total cost was £3,929, of which £3,620 represented payment to the contractor.

Bridge over Willandra Creek, Road Whealbah to Tridalia.—Bridges over the by-wash and over the flow at Radcastles dam were completed in September. The contract cost was £1,341, the total cost being £1,475.

Bridge over Bellinger River at Urunga.—This contract is being carried out with satisfactory progress, and the expenditure during the year amounted to £11,319. The bridge has since been completed and handed over to the Main Roads Board.

Bridge over the Barwon River at Boonangar.—This bridge on the border between New South Wales and Queensland was completed in May. The total payment to the contractors amounted to £4,012. The Queensland Government is to share half the cost of this bridge.

Bridge over the Yass River at Hardwick-road.—This work in connection with Yass Water Supply has been completed, the contract cost amounting to £980 3s. 6d.

Coonbilly Creek Bridge, Road Bourke to Hungerford.—During the year a bridge was constructed at this point by day labour, consisting of four 25-foot spans. The estimated cost was £2,250, and owing to the use of certain material from a previously dismantled bridge and the economical method of carrying out the work, the actual cost has been £1,698 13s. 10d.

WORKS UNDER CONSTRUCTION AT 30TH JUNE, 1928.

Bridge over Castlereagh River at Gilgandra.—On the third invitation of tenders, only one was received, that of J. A. Jackson and Sons at £21,000, which was accepted in October. Work was commenced at the beginning of April, and satisfactory progress is now being made. The expenditure during the year amounted to £5,514.

Bridge over Three Mile Creek at Wentworth.—Work was commenced by day labour towards the end of the year and is still in progress. Expenditure to 30th June amounted to £1,150 7s. 10d.

Bridge over Belmore River at Gladstone.—A contract has been entered into with Mr. C. V. Lawson at £6,834 for renewal of this bridge, which will consist of one composite truss span of 70 feet and seven approach spans, four of 35 feet and three of 30 feet. The piers and abutments will consist of reinforced concrete headstocks and piles which will prevent any depredations by teredo. The expenditure during the year amounted to £2,350.

Bridge over Middle Creek, Road Mossgiel to Hillston.—The contract for this work was let to Mr. L. J. C. Mansfield at £1,423 10s., and was rapidly approaching completion at the end of the year. An amount of £541 was expended during the year.

Bethanga Bridge.—As stated in last year's report, this bridge is being erected in connection with the construction of the Hume Reservoir. The piers, which are being constructed by the State Rivers and Water Supply Commission of Victoria, were almost completed at the end of the year. A contract was let for the supply of the steel superstructure to Chas. Ruwolt Proprietary Ltd. of Richmond, Victoria, at £71,890. The contractors will obtain all material possible from Australian manufacturers. A further contract has been entered into for the erection of the steelwork and the completion of the bridge with Mr. W. H. Thompson at £43,473.

Bridge over Paterson River at Gostwyck.—To replace the old bridge at Gostwyck, it was decided to construct a new bridge consisting of one steel span of 21 feet 1½ inches and six timber approach spans, two of 36 feet 4 inches, and three of 35 feet and one of 30 feet.

A contract to supply the necessary steelwork was entered into with the Government Dockyard, Newcastle, at £4,642 5s. 6d. The contract for the erection of the steelwork and completion of the bridge was let to Mr. C. V. Lawson at £8,334. Steelwork has been delivered and the bridge was nearing completion at the end of the year. Expenditure to 30th June, 1928, was £11,434 9s. 5d.

Woychugga Creek Bridge, near Wilcannia.—The old bridge required renewal, and arrangements have been made to rebuild by day labour at an estimated cost of £2,350. The bridge will consist of five timber beam spans of 24 feet each.

Bridge over Murrumbidgee River at Eurolic, near Yanco.—To provide another means of crossing the Murrumbidgee River and give access to the railway from valuable land on the southern side, arrangements were entered into with the local Shire Council and the Local Government Department to construct a bridge near the Yanco Agricultural High School. The Local Government Department and the local Shire Council are each contributing £3,000 towards the cost. A contract for this work was entered into with Mr. J. R. Hyland at £9,248 7s. 11d. The structure will consist of two 92-foot composite truss spans and four approach spans, two of 35 feet and two of 30 feet. The expenditure to the 30th June was £191.

Bridge over Wakool River at Coonamit.—To provide access from some of the benefited lands to the new Border Railway from Gonn Crossing to Stoney Crossing, tenders were invited for a bridge consisting of two 92-foot composite truss spans and seven approach spans, five of 35 feet and two of 30 feet. A contract was let, but was subsequently cancelled and fresh tenders invited.

Box Creek Bridge, Road Booligal to Hillston.—A contract was entered into with Mr. W. Bailey to construct a timber bridge consisting of seven spans of 25 feet at £1,889. The bridge was fast approaching completion at the end of the year.

Bridge over Birrie River at Goodooga, Road Goodooga to Brenda.—To replace the old bridge at this crossing, a contract was entered into with Mr. L. J. C. Mansfield at £5,678. The bridge will consist of one 70-foot composite truss span and four approach spans, two of 35 feet and two of 30 feet. The expenditure during the year has amounted to £105.

Bridge over Wakool River at Gee Gee.—This is another bridge to provide access to the Victorian Border Railway from Gonn Crossing to Stoney Crossing. A contract has been entered into with Mr. A. C. Burdett, of Moulamein, at £5,948 2s. Work had not commenced at the end of the year.

Footbridge over the Billabong at Moulamein.—The old footbridge giving access to the Police Station and paddock at Moulamein was no longer safe and a new bridge is being constructed by Contractor A. C. Burdett at an amount of £709. Work had not been commenced at the end of the year.

Bridge over Kallyanka Creek, near Wilcannia.—To bridge one of the many crossings on the road from Wilcannia to Bourke, arrangements have been made to construct a bridge over the Kallyanka Creek, consisting of six spans of 25 feet each at an estimated cost of £2,695. This work is being carried out with assistance from the Federal grant for roads in the Western Division. When tenders were invited only one tender was received. As this offer was considered too high, arrangements have been made to carry out the work by day labour.

Undercliffe Bridge Footway.—Work on this footway was just commencing at the end of the year, an expenditure of £78 10s. having been incurred.

Camden Bridge Footway.—The addition of a footway to the Camden Bridge has been completed by day labour during the year at a cost of £1,089 10s. 10d.

Newton Boyd Bridge.—Heavy floods washed out the approaches to this bridge on the road from Glen Innes to Grafton, necessitating the construction of a new span and the strengthening of two piers. The work was completed during the year at a cost of £261 17s. 1d.

BRIDGE WORKS INVESTIGATED.

In addition to the above, the following bridge works have been under consideration during the year:—

Taemas Bridge.—Plans and specifications for the new bridge are almost complete and it is expected that tenders will be invited for the new structure by the Main Roads Board at an early date. Expenditure on this work during the year has been £7,472 0s. 11d., most of which has been incurred on the construction of approach roads.

Bridge over Duck River, Road Girilambone to Marra Crossing.—Tenders have been invited for a new structure.

Marra Creek Bridge, Road Carinda to Brewarrina.—Tenders will be invited for this work when funds are available.

Bridge over the Goulburn River at Martindale.—To provide access to a recent subdivision of valuable land on the south side of the Goulburn River near Denman, it is proposed to construct a low-level bridge. The local residents in conjunction with Muswellbrook Shire Council have agreed to contribute towards the cost of the work, which will also be subsidised by the Local Government Department. On completion of the arrangement, tenders will be invited for the construction of this work.

TRANSFER OF CONTROL OF NATIONAL WORKS TO THE MAIN ROADS BOARD.

Following decision of Cabinet, arrangements are being made for the repair, maintenance and renewal of national bridges on State highways to be transferred to the Main Roads Board, as the Board can suitably arrange to take them over.

National bridges and ferries on other than main roads, and in the Western Division, remain with this Department.

Roads.—In the Metropolitan District concrete and other roads were constructed at Bunnerong, Randwick Rifle Range, Daceyville, and Ku-ring-gai Chase at a total cost of £14,646.

Road Woodenbong to Queensland Border.—This road is still in hand, progress for the year having been very slow owing to the abnormally wet season, 90 inches of rain having fallen from January to June, with the result that there were only 144 days in the year fine enough for work.

The extent of the work done to date is:—

Forming the full length of the road	...	...	...	...	...	...	9 miles 23 chains.
Ballasting	...	...	...	...	...	...	6 miles 53 chains.
Metalling	...	...	...	...	...	...	2 miles.

The total expenditure for the year was £9,936.

Road round Hume Reservoir Flood Waters.—The early impounding of the waters above the Hume Reservoir necessitated the construction of 20 miles of new road to serve the Sydney-Melbourne and Upper Murray River traffic. This construction is in hand, the work done to date being—

Clearing	...	...	...	...	...	...	6½ miles.
Forming	...	...	...	...	...	...	4½ miles.

while tenders have been accepted for two bridges. The total expenditure for the year has been £10,037.

Abercrombie Road.—The first section of the new road to these caves was practically completed during the year at a total cost of £5,973, the expenditure for the year having been £4,914. This work was considerably in excess of the estimate owing to the depth and hardness of the rock encountered.

Warunga State Forest Road.—A road 300 chains long was made for the Forestry Commission to the Warung State Forest at a cost of £1,205.

Roads to Kosciusko and to Jenolan Caves have been maintained and improved during the year, while a new road with a 1-20 grade has been located and surveyed between Jenolan Caves and Wombeyan Caves.

Western Division Roads.—These have had the customary attention by which short lengths of formation together with general maintenance work have been carried out, the total cost for the year having been £23,895.

Shortly before the close of the year this Department's claim for a share in the Federal Road Vote of £2,000,000 per annum to the States was recognised, and out of a total of £552,000, being this State's allotment, the Western Division was given £40,000 per annum. The statutory contribution of 15s. per £ to be provided by the State, equalling £30,000 for the Western Division, was found by a transfer from the Main Roads Board of £10,000 from the motor tax and license fees, and by a special grant from the State of £20,000.

The allotment for this Department came so late in the year that all that could be done was to partition the Western Division into Federal Aid Roads to conform with those in the Central Division, and to prepare the allocation of the vote thereon.

PUNTS, FERRIES AND LAUNCHES.

A new punt to carry twenty-four to thirty cars was constructed by the Government Dockyard by contract for £21,823. This is for immediate use as a relief punt on George's River, and for transfer elsewhere on completion of the George's River bridge.

The new ferry over the Parramatta River between Mortlake and Putney was completed and a relieving Parramatta River punt installed, the total cost to the Department for immediate approaches and installation being £2,496. The roads of approach were constructed by the respective Councils.

At Louth on the Darling River a new wooden punt was built and installed at a cost of £1,346.

Apart from these works, the Government ferries throughout the State were satisfactorily maintained at a cost of £53,048.

Although the financing of most of these ferries, namely, all those on main roads, was transferred to the Main Roads Board on 30th June, 1928, their maintenance and control is to remain with this Department for the present.

PUBLIC WATERING-PLACES.

Several new public watering-places throughout the Western Division were completed and opened for the use of traffic during the year. All benefited by the welcome rains that fell, and the additional tanks were greatly appreciated by the travelling public. The expenditure for the year amounted to £7,417.

Apart from these, several of the public watering-places were provided with new cottages, other cottages were repaired, orchards were planted, pumping appliances installed, and the public watering-places made as attractive and useful as possible with the very limited amount of funds (£20,363) at the disposal of the Department. These improvements merely go to emphasise the amount of work that is required to bring this very necessary service up to a proper state of efficiency, which can only be done by the provision of a considerable increase of expenditure annually.

R. VOWELL, M.I.C.E., M.I.E.A.,

Chief Engineer Harbours, Roads and Bridges.

PORT KEMBLA.

Traffic and Shipping Returns.

STATEMENT A.

Traffic.		Tons.
A. Northern Sidings to No. 1 Jetty (excluding Kembla)		169,452
B. Mount Kembla Colliery, delivered Northern Sidings, thence No. 1 Jetty		44,134
D. Mount Kembla Colliery, delivered No. 3 Jetty Sidings, thence No. 3 Jetty		61,139
E. Mount Lyell Sidings to No. 3 Jetty		
F. Northern Sidings to No. 3 Jetty (excluding Kembla)		43,817
G. Departmental convenience, Mount Lyell Loop to No. 1 Jetty, Kembla		8,362
H. Northern Sidings to No. 4 Jetty		
Ha. Electrolytic R. and S. Company's Sidings to No. 3 Jetty (slag)		
Total		326,904
Shipping.		
Quantity shipped at No. 1 Jetty		212,061
" " No. 3 Jetty		106,481
" " No. 4 Jetty		8,362
Total		326,904

Traffic (Other than for Shipment).

Direction.		tons. cwt. qrs.
Inwards		65,014 14 3
Outwards		90,259 6 1
Total		155,274 1 0

SUMMARY OF ACCOUNTS—PORT KEMBLA OFFICE.

Port Kembla.

STATEMENT B.

Haulage and Shipment of Coal—	£	s.	d.	£	s.	d.	£	s.	d.
Shipping	18,337	7	7						
Haulage	2,717	7	6						
Berthing	1,619	2	7						
Launch	716	10	0						
Gangway	138	0	0						
Hawsers	527	0	0						
2-ton crane	484	13	7						
5-ton "	781	0	0						
Telephone charges	3	10	8						
Sale of water	296	2	6						
Anchorage	5	0	0						
Wages	27	0	6						
Sundries	60	13	6						
Way leave	337	19	8						
Hire of waggons	19	10	0						
Boat fees	5	0	0						
Toll	1	7	2						
				26,077	5	3			
Navigation Department—									
Harbour dues	5,957	2	2						
Tonnage rates	4,272	16	10						
				10,229	19	0			
Electric Power—									
Local lines	10,257	14	4						
Western lines	20,003	9	11						
Southern lines	17,916	3	3						
Gerrington Township	57	16	10						
				48,235	4	4			
Resumed Properties Department—									
Rent of cottages	985	16	0						
" land	1,403	6	0						
" camping areas	31	0	0						
Sanitary fees	42	10	6						
				2,462	12	6			
Port Kembla Harbour Works—									
Sale of spalls	9,846	7	11						
Outside services	1,011	10	3						
Stock. Sale of general stores	2,183	5	7						
Miscellaneous services	77	6	7						
Rent ex land, etc.	103	5	9						
				13,221	16	1			

Outside Port Kembla and Wollongong.

Services	76 12 1
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Wollongong.

Shipping	633 3 10
Coal into bin	66 1 6
	699 5 4

101,002 14 7

PORT KEMBLA.

STATEMENT C.

Trade and Shipping Returns.

Vessels entering Port Kembla.	1924-25.		1925-26.		1926-27.		1927-28.	
	Arrivals.	Net Registered Tonnage.	Arrivals.	Net Registered Tonnage.	Arrivals.	Net Registered Tonnage.	Arrivals.	Net Registered Tonnage.
Overseas	125	393,428	147	489,754	155	498,914	125	421,542
Coastal	221	48,626	202	44,618	248	58,802	216	47,238
Interstate	132	189,253	96	124,781	107	151,287	191	170,360
Totals	478	631,307	445	659,153	510	709,003	472	639,140

Principal Exports.

Item.	1924-25.		1925-26.		1926-27.		1927-28.	
	Tonnage.	Value.	Tonnage.	Value.	Tonnage.	Value.	Tonnage.	Value.
Cargo coal	157,833	£ 157,833	161,632	£ 161,632	213,223	£ 213,223	140,218	£ 140,218
Bunker coal	132,151	132,151	110,247	110,247	161,286	161,286	131,626	131,626
Coke	59,431	59,431	47,880	47,880	77,173	77,173	55,060	55,060
Copper	3,300	221,746	3,132	207,808	2,211	152,522	4,430	288,282
Bluestone	348	11,832	391	13,294	403	13,387	759	25,274
Slag .....	.....	.....	.....	.....	.....	.....	.....	.....
Fertilisers	35,306	220,800	37,625	230,500	39,537	236,000	46,700	272,000
Fluxes, etc.	300	900	546	2,154	.....	.....	54	288
Manufactured metals	11,969	1,240,650	9,246	979,626	7,400	800,555	6,671	713,060
Totals	400,638	2,045,343	370,699	1,753,141	501,233	1,654,146	385,518	1,625,808

Principal Imports.

Item.	1924-25.		1925-26.		1926-27.		1927-28.	
	Tonnage.	Value.	Tonnage.	Value.	Tonnage.	Value.	Tonnage.	Value.
Blister copper	10,590	£ 916,912	9,003	£ 770,879	7,903	£ 550,430	6,193	£ 427,900
Ore	1,433	19,421	650	8,866	3,985	51,410	10,819	97,371
Concentrates	4,226	60,292	1,701	83,970	1,207	18,471	1,435	29,202
Matte	3,294	55,617	6,931	116,440	2,324	29,514	5,866	96,789
Phosphate rock	15,236	35,303	15,175	35,136	24,432	59,119	22,963	55,623
Sulphur	3,232	15,456	3,939	18,008	2,194	13,160	5,950	36,139
Pyrites .....	.....	.....	.....	.....	.....	.....	.....	.....
Fertiliser (by rail)	3,538	41,228	2,406	27,818	1,669	19,376	1,086	12,738
Bags and packing materials (by rail)	465	21,556	408	22,055	500	22,299	600	24,638
Lead .....	.....	.....	1,969	72,971	800	24,976	1,195	27,934
Other Metals .....	.....	.....	224	14,426	778	48,212	1,050	37,250
Totals	42,014	1,165,795	42,406	1,170,569	45,792	836,967	57,157	845,584

PORT KEMBLA—STATEMENT C—continued.

Financial Statement.

Item.	1924-25.		1925-26.		1926-27.		1927-28.	
	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Haulage and ship- ment of coal ...	26,461 13 10	17,970 15 6	25,856 3 1	19,108 11 3	33,791 11 6	18,594 0 10	26,077 5 3	20,969 10 11
Power House ...	28,236 17 10	20,695 18 7	35,291 12 3	21,551 12 9	34,458 11 6	28,996 1 10	48,235 4 4	32,519 9 1
Totals.....£	54,698 11 8	38,666 14 1	61,147 15 4	40,650 4 0	68,250 3 0	47,590 2 8	74,312 9 7	53,489 0 0

PARTICULARS OF RIVER ENTRANCES OF NEW SOUTH WALES.

STATEMENT D.

Name of Port.	Depth on Bar prior to commencement of work. Position variable.	Sailing distance from Sydney.	Total length of River.	Limit of Navigation for Boats drawing 4 feet.	Catchment Area of River.	Area of Tidal Compartment.		Proposed width of River Entrance between Breakwaters.	Depths during the year 1927-28 at Low Water Spring Tides.						Anticipated Depth on Completion of Scheme.
									Maximum.		Average.		Minimum.		
									Bar.	Crossing.	Bar.	Crossing.	Bar.	Crossing.	
	ft. in.	Sea mls.	St. mls.	St. mls.	Sq. mls.	Acres.	Sq. mls.	ft.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft.
Tweed	3 0	372	46	24	418	5,000	8	500	9 6	8 6	6 4	7 11	2 4a	6 6	9
Richmond	7 0	328	149	68	2,683	6,800	10½	1,000	12 6	12 6	10 8	12 0	8 05	11 0	12
Clarence	8 0	294	247	67	8,505	34,000	53	1,400	13 0	13 0	11 1	11 8	8 0c	10 0	18
Bellinger	3 9	228	76	15	479	1,640	2½	500	6 9	6 0	4 10	4 10	2 5d	2 0	9
Nambucca	4 9	219	58	9	552	2,730	4½	500	5 6	6 0	4 9	4 4	3 0e	3 6	9
Macleay	5 0	208	274	39	4,581	3,750	6	700	9 0	15 0	8 0	8 1	6 0	3 0	12
Hastings	5 0	112½	110	19	1,389	6,400	10	650	7 9	4 6	5 8	3 7	3 9f	1 9	10
Camden Haven	4 6	159½	18	13	238	7,240	11½	400	7 3	6 6	6 1	6 1	5 0	6 0	8
Manning	8 0	141	141	29	3,164	6,860	10½	800	7 6	9 6	5 8	9 6	4 6	9 6	12
Cape Hawke ...	2 3	125	46	17	514	21,930	34½	400	7 5	14 0	4 3	13 8	1 4	12 0	9
Lake Macquarie	...	50	...	...	291	26,000	40½	...	5 0	4 6	3 10	3 7	3 3	3 0	...
Crookhaven (including Shoalhaven River).	11 0	71	205	22	2,801	2,808 6,533	4½ 10½	...	13 6	8 6	13 6	8 6	13 6	8 6	12
Bateman's Bay	4 0	129	10	24	696	3,750	6	...	9 3	...	8 2	...	5 3	...	10
Moruya	6 0	139	93	4	609	1,550	2½	...	25 0	10 0	20 4	8 7	16 0	7 0	9
Wagonga .....	...	158	9	5	52	1,650	2½	340	8 6	7 0	7 5	6 4	6 0	5 0	15

a Tweed River Minimum Bar, 1 day only.
b Richmond River " " 3 " "
c Clarence River " " 1 " "
d Bellinger River " " 1 " "
e Nambucca River " " 1 " "
f Hastings River " " 1 " "

STATEMENT E.

DOCK TRANSACTIONS.

	Terranora Dock, Tweed River.	Riley's Hill Dock, Richmond River.	Ashby Dock, Clarence River.	Candle Dock, Manning River.
No. of Government vessels docked	1	5	4	1
Tonnage of Government vessels docked	80	795	356	64
No. of private vessels docked	8	.....	4	1
Tonnage of private vessels docked	497	.....	334	91
Revenue received during year	£109 3s. 3d.	.....	£107 3s. 6d.	£9 1s. 3d.
Expenditure, docking private vessels	£69 2s. 1d.	.....	£119 19s. 6d.	£45 2s. 6d.
Cost—Dock maintenance and repairs	218-11-9	371-2-6	467-2-10	£204 7s 0d.
				221-6-2

STATEMENT of Ladder Dredge Expenditure for twelve months ending 30th June, 1928.

Ladder Dredge.	Where working.	Material lifted.	Tons lifted.	Hours dredging.	Hours working.	Expenditure.	Pence per ton.	Cost per hour dredging.	Cost per hour working.	Percentage of working hours.							Remarks.
										Dredging.	Coaling.	Removals.	Bad weather.	Waiting for punts.	Repairs.	Other causes.	
"Clarence"	Newcastle	Mud	254,300	941	2,184	£ s. d. 6,496 19 11	d. 6·13	£ s. d. 6 18 1	£ s. d. 2 19 6	43	3	20	4	13	10	7	Filling punts and long tow.
"Hunter"	"	Mud and sand	825,500	887	2,179	8,259 2 3	2·4	9 6 3	3 15 10	41	6	21	2	6	19	5	
"Juno"	"	Sand and silt	622,100	1,071	2,175	9,205 17 7	3·55	8 11 11	4 4 8	49	2	21	1	5	14	8	
"Lansdowne"	Not in commission .....	.....	.....	.....	.....	120 6 3	...	.....	.....	...	...	...	...	...	...	...
		Totals.....	1,701,900	2,899	6,538	24,082 6 0	3·4	8 6	3 13 8	44	4	21	2	8	14	7	
		Averages											

Large Sand-pump Dredge.	Where working.	Material lifted.	Ton lifted.	Hours dredging.	Hours working.	Expenditure.	Pence per ton.	Cost per hour dredging.	Cost per hour working.	Percentage of working hours.							Remarks.
										Dredging.	Coaling.	Removals.	Bad weather.	Disposal of silt.	Repairs.	Other causes.	
"Ballina"	Not in commission	£ s. d. 1,862 6 11	d. ...	£ s. d.	£ s. d.	Repairs to pontoons and di- mantling condemned boilers.
"Chindera"	Tweed River	Sand, clay, silt, and gravel	52,935	1,239	2,174	5,686 3 9	25·8	4 11 9	2 12 4	57	6	15	2	1	12	7	Docking and extensive repairs.
"Hexham"	Newcastle	Mud and sand	166,453	403	2,174	11,324 16 5	16·3	28 2 0	5 4 1	19	7	24	1	4	37	8	Under repairs four months.
"Fibronia"	Newcastle	Sand and slurry	28,850	146	493	715 9 3	5·9	4 18 0	1 9 0	30	5	20	9	8	2	26	Commissioned 1st May, 1928.
"Stockton"	Not in commission	666 16 10	
"Harrington"	Richmond River	Mud and sand	69,020	637	2,174	5,355 1 1	18·6	8 8 1	2 9 3	29	4	23	2	...	35	7	Under extensive repairs.
"Antleon"	{ Macleay River	Sand	187,750	478	2,333	13,059 7 7	16·7	27 6 5	5 11 11	21	7	20	7	23	8	14	
	{ Nambucca River																
	{ Clarence River																
	{ Tweed River																
	{ Moruya																
"Latona"	{ Port Macquarie	"	273,250	637	2,229	13,402 8 0	11·8	21 0 8	6 0 3	29	7	12	10	20	10	12	
	{ Macleay River																
	{ Nambucca River																
	{ Bellinger River																
	{ Cape Hawke																
"Jupiter"	{ Lake Macquarie	"	218,500	285	2,192	12,771 5 4	14·0	44 16 3	5 16 6	13	4	8	4	10	53	8	
	{ Newcastle																
	{ Clarence River																
	{ Byron Bay																
	{ Richmond River																
"Tethys"	{ Newcastle	"	255,800	540	2,315	16,789 13 2	15·8	31 1 10	7 5 0	23	5	19	9	9	19	16	
	{ Byron Bay																
	{ Richmond River																
	{ Clarence River																
	{ Macleay River																
"Neptune"	{ Coastal Moorings	"	229,355	567	2,316	9,107 0 0	9·5	16 1 3	5 18 8	25	5	17	6	16	25	6	
	{ Bateman's Bay																
	{ Moruya																
	{ Wollongong																
	{ Botany Bay																
	{ Port Hacking																
	{ Hunter River																
	{ Newcastle																
Totals			1,481,913	4,932	18,400	90,740 8 4	14·7	18 8 0	4 18 7	27	6	17	6	10	22	12	
Averages	

STATEMENT of Small Sand-pump Dredge Expenditure for twelve months ended 30th June, 1928.

Small Sand-pump Dredge.	Where working.	Material lifted.	Tons lifted.	Hours dredging.	Hours working.	Expenditure.	Pence per ton.	Cost per hour dredging.	Cost per hour working.	Percentage of working hours.							Remarks.
										Dredging.	Coaling.	Removals.	Bad weather.	Waiting for punts.	Repairs.	Other causes.	
"Bellingen"	Bellingen River	Sand	90,700	1,007	2,183	£ s. d. 3,717 12 4	d. 9·8	£ s. d. 3 13 10	£ s. d. 1 14 0	46	1	12	1	...	36	4	Removed from Bellinger River to Newcastle, July, 1928, and placed out of commission pending extensive repairs.
"Botany"	Newcastle.....	Mud and sand	70,417	633	2,165	8,192 17 3	27·9	12 18 10	3 15 8	19	3	20	...	...	23	25	Extensive repairs.
"Forster"	Cape Hawke.....	Sand	88,661	1,001	2,174	3,313 18 8	8·9	3 6 2	1 10 6	46	1	24	2	...	21	6	
"Gosford"	Cook's River	Mud and clay	143,100	1,417	2,174	4,970 19 6	8·3	3 10 2	2 5 9	65	2	15	2	...	5	11	
"Macksville"	Nambucca River	Sand, shell, and shingle	123,780	1,033	2,185	5,052 4 1	9·8	4 17 10	2 6 3	47	3	20	3	...	18	9	Working as a grab dredge.
"Maclean"	Clarence River	Mud, clay, shingle, sand, and gravel.	21,420	965	2,178	4,262 8 0	47·8	4 8 4	1 19 1	44	2	12	13	1	23	5	
"Swansea"	Newcastle and Port Stephens.	Sand, shell, and mud	114,535	871	2,210	6,833 1 2	14·3	7 16 11	3 1 10	39	3	22	1	4	20	11	Dredge foundered at Newcastle 4th October, 1927. Raised and under repairs till 10th January, 1928.
"Tempe"	Cook's River	Mud and clay	7,566	1,014	2,174	2,738 17 6	86·9	2 14 2	1 5 2	47	...	7	...	...	38	8	Extensive repairs. Installation of electric pump.
		Totals	660,179	7,941	17,443	39,081 18 6											
		Averages					14·2	4 18 5	2 4 10	45	2	16	3	1	23	10	

STATEMENT of Grab Dredge Expenditure for twelve months ended 30th June, 1928.

Grab Dredge.	Where working.	Material lifted.	Tons lifted.	Hours dredging.	Hours working.	Expenditure.	Pence per ton.	Cost per hour dredging.	Cost per hour working.	Percentage of working hours.							Remarks.
										Dredging.	Coaling.	Removals.	Bad weather.	Waiting for punts.	Repairs.	Other causes.	
"Como"	Cook's River	Mud and clay	116,900	1,346	2,174	£ s. d. 2,685 1 6	5·5	1 19 11	1 4 8	62	2	8	1	6	15	6	Extensive overhaul.
"Coraki"	Richmond River.....	Sand, debris, and gravel.	8,394	550	2,174	2,429 8 5	69·5	4 8 4	1 2 4	25	3	12	7	...	43	10	
"Harwood"	Tweed River	Mud and gravel	18,524	758	2,174	2,034 2 7	26·4	2 13 8	0 18 8	35	4	7	2	...	47	5	Extensive overhaul.
"Minmi"	Newcastle	Mud, rock, hard sand, and debris.	67,145	989	2,264	3,913 11 10	12·5	3 19 1	1 14 7	44	2	24	2	10	10	8	
"Urunga"	Nambucca River	Gravel.....	11,764	1,053	2,174	2,433 8 7	49·5	2 6 2	1 2 5	48	2	23	3	...	11	13	Extensive repairs.
"Wallsend"	Newcastle	Rock, mud, and sand	143,270	1,290	2,179	3,420 8 3	5·7	2 13 0	1 11 5	59	2	16	3	5	9	6	
"Wickham"	"	Mud and sand	49,645	1,127	2,174	3,061 16 0	14·8	2 14 4	1 8 2	52	4	15	2	11	7	9	
		Totals	415,672	7,113	15,313	19,977 17 2											
		Averages					11·5	2 16 2	1 6 1	46	3	15	3	5	20	8	

STATEMENT of Tug and Hopper Barge Expenditure and Work for twelve months ended 30th June, 1928.

Tug or Hopper Barge.	Where employed.	Tons towed.	Miles run towing.	Miles run special service.	Total working hours.	Hours attending.	Cost of towing.	Cost of all special service.	Cost per ton.	Cost per mile towing.	Cost per mile special service.	Cost per hour working.	Cost per hour attending.	Percentage working hours.					Remarks.
														Steaming.	Coaling.	Repairs.	Bad weather.	Other causes.	
							£ s. d.	£ s. d.	d.	s. d.	s. d.	s. d.	s. d.						
"Cardiff"	Newcastle	207,000	6,941	113	2,267	2,023	2,479 17 10	79 14 3	2-9	7 1	14 1	22 7	25 4	62	5	11	1	21	
"Casino"	Richmond River.....			1,009	252	252		3,463 1 11	...	...	68 8	274 10	274 10	66	1	...	...	33	
"Croki"	Cook's River	116,900	2,347	16	2,199	1,972	553 13 10	2 16 6	1-1	4 9	3 6	5 1	5 7	47	6	10	1	36	
"Eden"	Newcastle	119,770	4,941	295	1,819	1,766	2,137 16 2	165 13 0	4-3	8 8	11 3	25 4	26 1	65	7	3	2	23	
"Hamilton"	"	78,560	2,720	708	1,150	993	1,025 13 0	205 17 6	3-1	7 6	5 10	21 5	24 10	63	4	14	3	16	
"Hinton"	"	100	8	6,554	2,395	2,347	1 13 7	1,968 6 11	4-0	4 2	6 0	16 5	16 9	67	5	2	...	26	
"Mayfield"	"			6,853	2,554	2,528		924 3 9	...	...	2 8	7 3	7 4	72	9	1	...	18	
"Moruya"	"			7,675	2,567	2,328		3,353 1 3	...	...	8 9	26 1	28 10	50	5	9	...	36	
"Paterson"	"	83,180	3,414	1,787	2,251	1,974	1,417 18 1	1,087 17 2	4-1	8 4	12 2	22 3	25 5	47	6	12	1	34	
"Taree"	"	8,930	467	8,165	2,467	2,362	127 17 0	2,076 7 2	3-4	5 6	5 1	17 10	18 8	60	7	4	...	29	
"Waratah"	Newcastle and Coast	215,050	6,900	1,088	2,336	2,191	2,438 11 6	566 8 9	2-7	7 1	10 5	25 9	27 5	65	3	6	2	24	
"Grafton"	Newcastle	443,750	3,504		2,177	2,067	3,701 19 9		2-0	21 1	...	34 0	35 10	28	2	5	1	64	
"Lismore"	"	406,000	3,170		2,180	1,964	3,680 12 2		2-2	23 3	...	33 9	37 6	25	2	10	1	62	
"Orestes"	"	317,700	3,207	426	2,244	2,210	5,160 12 5	424 11 6	3-9	32 2	19 11	49 9	50 6	30	2	1	1	66	
"Rhea"	"	281,150	2,855		2,174	1,820	7,230 0 4		6-2	50 8	...	66 6	79 5	24	1	16	2	57	
Totals		2,278,990	40,474	34,689	31,032	28,797	29,956 5 8	14,317 19 8											
Averages									3-2	14 10	8 3	28 6	30 9	52	4	7	1	36	

COMPARATIVE STATEMENT of Quantity and Cost of Work done by Ladder Dredges (with Towing) for Periods as stated

Ladder Dredge.	Where Working.	1st July, 1926, to 30th June, 1927.			1st July, 1927, to 30th June, 1928.			Remarks.
		Dredging, Towing and Repairing.			Dredging, Towing and Repairing.			
		Tons.	Expenditure.	Pence per Ton.	Tons.	Expenditure.	Pence per Ton.	
			£ s. d.	d.		£ s. d.	d.	
"Clarence"	Newcastle	249,800	13,727 6 2	13·2	254,300 [†]	10,171 0 6	9·6	
"Hunter"	"	732,500	18,581 5 10	6·1	825,500	15,688 8 2	4·6	
"Juno"	"	254,580	17,117 11 3	16·1	622,100	21,788 4 10	8·4	
"Richmond" .....	.....	.....	471 3 6	.....	.....	.....	.....	Out of commission.
"Orara" .....	.....	.....	286 0 8	.....	.....	.....	.....	Condemned and sunk at sea
"Lansdowne" .....	.....	.....	127 14 3	.....	.....	120 6 3	.....	Out of commission.
Totals.....		1,236,880	50,311 1 8	9·7	1,701,900	47,767 19 9	6·7	

**COMPARATIVE STATEMENT of Quantity and Cost of Work done by Large Sand Pump Dredges (with Towing)
for Periods as stated.**

Large Sand Pump Dredge.	Where Working.	1st July, 1926, to 30th June, 1927.			1st July, 1927, to 30th June, 1928.			Remarks.			
		Dredging, Towing and Repairing.			Dredging, Towing and Repairing.						
		Tons.	Expenditure.	Pence per Ton.	Tons.	Expenditure.	Pence per Ton.				
			£ s. d.	d.		£ s. d.	d.				
" Ballina "	Moruya	147,850	6,847 13 3	11-1	.....	2,168 2 10	.....	Removed to Newcastle in July, 1927, for extensive overhaul.		
" Chindera "	Tweed River	115,305	4,794 0 11	9-9	52,935	5,805 8 0	26-3	Dredgings consisted mainly of clay, shingle and gravel.			
" Hexham "	Newcastle	163,662	6,684 14 1	9-8	166,453	12,867 14 4	18-6				
" Fibronia "	Newcastle	.....	.....	.....	28,850	1,201 4 11	10-0	Commissioned and commenced work 1st May, 1928.		
" Morpeth "	Newcastle	.....	22 15 3	.....	.....	.....	.....	Out of commission.		
" Stockton "	Newcastle	.....	522 6 0	.....	.....	666 16 10	.....			
" Harrington "	Richmond River	95,067	8,796 11 5	22-2	69,020	5,582 16 11	19-4				
" Antleon "	Macleay River	144,300	13,296 3 10	21-10	187,750	13,206 14 11	16-9	Port.	Tons.	£ s. d.	d.
	Nambucca River							9,650	453 1 3	11-3	
	Clarence River							29,350	2,423 17 7	19-8	
	Tweed River							31,400	1,296 17 9	9-9	
	Moruya River							21,600	1,512 1 10	16-8	
" Jupiter "	Moruya	363,700	13,307 3 8	8-8	218,500	12,956 13 7	14-2	Moruya River	63,250	4,111 10 8	15-6
	Narooma							32,500	2,140 14 4	15-8	
	Coastal Tows							.....	1,268 11 6	.....
	Newcastle							37,500	4,968 0 4	31-8	
" Latona "	Clarence River	175,300	12,784 9 1	17-5	273,250	13,491 16 2	11-9	Clarence River	132,500	5,997 0 7	10-8
	Byron Bay							9,750	354 1 4	8-7	
	Richmond River							38,750	1,637 11 4	10-1	
	Port Macquarie							125,500	5,483 17 8	10-4	
	Macleay River							25,750	974 10 2	9-1	
" Tethys "	Nambucca River	192,100	13,884 18 3	17-3	255,800	16,908 17 4	15-9	Nambucca River	29,750	1,265 0 11	10-2
	Bellinger River							14,750	1,023 10 8	16-7	
	Cape Hawke							5,500	556 17 3	24-3	
	Lake Macquarie							72,000	4,182 10 6	13-9	
	Byron Bay							10,850	724 11 7	16-03	
" Neptune "	Richmond River	338,114	13,629 6 4	9-7	229,355	9,226 4 2	9-7	Richmond River	102,200	4,937 1 0	11-6
	Clarence River							52,450	3,176 1 6	14-4	
	Macleay River							90,300	5,855 7 5	15-1	
	Coastal Moorings							.....	2,215 15 10	.....
	Bateman's Bay							19,405	713 13 1	8-4	
Totals	Moruya	1,735,398	94,570 2 1	13-1	1,481,913	94,082 10 0	15-2	Moruya	31,500	1,525 11 10	11-1
	Wollongong							700	179 9 7	61-	
	Botany Bay							3,750	200 16 11	12-	
	Port Hacking							77,250	2,286 5 1	7-	
	Hunter River							76,750	2,106 15 5	6-	
	Newcastle							20,000	1,465 15 4	17-	
	Clarence River							.....	683 14 9	.....
	Coastal Tows							.....	64 2 2	.....

**COMPARATIVE STATEMENT of Quantity and Cost of Work done by Small Sand Pump Dredges (with Towing)
for Periods as stated.**

Small Sand Pump Dredger.	Where Working.	1st July, 1926, to 30th June, 1927.			1st July, 1927, to 30th June, 1928.			Remarks.			
		Dredging, Towing and Repairing.			Dredging, Towing and Repairing.						
		Tons.	Expenditure.	Pence per Ton.	Tons.	Expenditure.	Pence per Ton.				
			£ s. d.	d.		£ s. d.	d.				
" Bellingen " ...	Bellinger River...	95,780	3,948 9 7	9-9	90,700	3,836 16 7	10-2	Extensive overhaul.			
" Botany " ...	Newcastle.....	105,872	4,199 3 1	9-5	70,417	8,521 11 11	29-0				
" Forster ".....	Cape Hawke.....	128,093	3,545 11 5	6-6	88,661	3,461 6 1	9-4				
" Gosford " ...	Cook's River ...	65,352	4,228 11 11	15-5	143,100	5,121 3 5	8-6	Working as grab dredge.			
" Macksville " ...	Nambucca River	154,660	3,592 3 3	5-6	123,780	5,169 15 5	10-0				
" Maclean " ...	Clarence River...	25,089	3,108 16 0	29-7	21,420	4,482 14 0	50-2				
" Swansea " ...	Newcastle, Port Stephens.	121,559	5,599 16 11	11-1	114,535	8,162 8 6	17-1	Port.	Tons.	Cost.	
								£	s. d.	£	s. d.
								Newcastle	47,410	3,002 8 9	
								P. Stephens	67,125	5,159 19 9	
" Tempe " ...	Cook's River	20,098	3,920 8 10	46-8	7,566	2,858 1 8	90-7	Extensive overhaul, and electric pump installed.			
Totals.....		716,503	32,143 1 0	10-76	660,179	41,613 17 7	15-1				

Electrical Engineering Branch.

Annual Report, 1927-28.

I.—INTRODUCTION.

The chief event of the past year has been the inauguration of the electricity supply to the districts served by the hydro-electric power station at Burrinjuck. This station was put into service on the 11th February, 1928, and officially opened by the Minister on 2nd April.

As the great majority of the transmission lines and substations were complete and ready for service the various towns connected to the system were quickly changed over to bulk supply, the last town to be so connected being Wagga Wagga on 26th March.

After the delays in the construction of this work, which were chiefly caused by the record flood of May, 1925, and which have already been covered in previous reports, the consummation of this scheme is a matter for considerable satisfaction, particularly as the whole system went into service with comparatively few of those troubles which almost invariably occur at the outset of any large undertaking. Indeed the only serious interruption to supply that has occurred to date was on the morning of 13th April for six hours to the towns of Wagga and Junee.

Once the main power-house building was completed the installation of the machinery proceeded rapidly, the first machine being ready for a trial run shortly after the New Year.

The negotiations for the supply of power to the Federal Capital have been practically completed, and authority has now been given to proceed with the construction of the transmission line.

Negotiations have also been completed for the supply of electricity to Yass.

Investigations are now in hand for the supply of electricity to rural districts, including some of the smaller townships.

The increase in the consumption of electricity in those districts served by the Port Kembla system continues satisfactorily. The most important addition was the town of Nowra, which was officially switched on on 16th May, 1928. The extensions to the power-house continue, and the power station is now designed to meet extensions up to an effective capacity of 20,000 kW (25,000 kW installed).

Another important feature is the inter-connection with Australian Iron & Steel Ltd., for the interchange of power between the company's power-house (which utilises waste heat) and the Department. A five-year agreement has been completed to this end. This arrangement should be brought into force early in the coming financial year.

The survey of the transmission line between Kiama and Moss Vale which will complete the ring main has been completed.

The investigations of the water-power resources of the State still continue, and particular attention has been devoted to the preparation of a definite scheme for the further development of the Clarence River resources, which it is intended to place before the Development and Migration Commission.

Co-operation with other Government Departments and local governing bodies is being actively maintained.

II.—HYDRO-ELECTRIC INVESTIGATIONS.

During the year one survey party was in the field carrying out surveys for hydro-electric proposals, while two field parties, working part time, were engaged on stream gauging work.

Swampy Plains.—A complete survey was made for a proposal on the Swampy Plains River, which is the main branch of the Upper Murray, and has its source on the western slopes of the Kosciusko Range. The survey included sections for a dam to 200 feet above bed level at Murray Gates, a contour survey to the upper limit of the Geehi Flats, and a conduit line from the dam site to a power station site $4\frac{1}{2}$ miles down stream.

The storage capacity of the reservoir at the 200 feet contour will be 4,282 million cubic feet. The section for the dam is excellent, the stream width being 81 feet, the side slopes of hard slate about 50° , and the crest length 452 feet.

The average gross head at the power station site, including the head due to the storage, will be 340 feet. From twelve months' gaugings the controlled flow is estimated at 400 cusecs, which on a 50 per cent. load factor and allowing 10 per cent. loss in head would produce 20,000 h.p.

Clarence-Mitchell Rivers.—A further survey in connection with these streams was commenced in May, and is proceeding. Information was obtained on the proposal for a dam to 200 feet above bed level just below the Clarence-Mitchell junction, with a power station in the Gorge, where the bed level is some 60 feet lower.

Flood levels of the 1928 flood were also secured in connection with the proposal to use the storage, partly for hydro-electric power and partly for flood prevention. The total capacity of the Gorge dam to 200 feet is estimated at 93,000 million cubic feet, while the top 25 feet—if used for flood prevention—would hold 29,000 million cubic feet.

Further survey work is being done in connection with the Jackadgery and Mount Tindal proposals on the Mitchell and Nymboida Rivers respectively.

Stream Gauging.—Stream gauging was continued as usual and daily readings were recorded at all the stations. Many new points were obtained for the rating curves, particularly some high flows in the

northern district during the floods in February, 1928. A complete series of gaugings were obtained for Swampy Plains from low water to a minor flood. These were obtained by the surveyor while the survey work was proceeding.

List of Hydro-electric Gauging Stations at 1st July, 1928.

Northern District.		Southern District.	
Stream.	Station.	Stream.	Station.
Apsley	Waterloo No. 1.	Goodradigbee	Brindabella.
Apsley	Waterloo No. 2.	Buddong	Weir.
Boonoo Boonoo	Wilnor.	Gilmore	Batlow (Auto-Recorder).
Bookookoorara	Undercliffe.	Gilmore	Batlow.
Bielsdown	Dorrigo.	Little Gilmore	Batlow.
Commissioners' Water	Eathorpe.	Mongarlowe	Charlyong.
Coopers	Repentance.	Ellensborough	Elaands.
Chandler	Chandler.	Corang	Hockeys.
Clarence	Tabulam.	Snowy	Jindabyne.
Clarence	Newbold.	Swampy Plains	Khancoban.
Deerpark	Deervale	Tooma	Possum Pt.
	(Discontinued.)	Rutherford	Solid Cutting.
Gara	Gara House.	Tantawangalo	Dam Site.
Guy Fawkes	Ebor.	Tuross	Tuross.
Jock's Water	Maida Vale.	Jounama	Talbingo.
Major's Creek	Grafton-road.	Tamut	Talbingo.
Macdonald	Rimbah.	Shoalhaven	Welcome Reef.
Macdonald	Woolbrook.	Shoalhaven	Warri Bridge.
Marom Creek	Alstonville.	Yarrangobilly	Yarrangobilly.
Mitchell	Jackadgery.	Upper Shoalhaven	Valeview.
Never Never.....	Gleniffer.		
Nymboida.....	Nymboida.		
Nymboida.....	Buccarumbi.		
Oaky Creek	Kempsey-road.		
Oaky Creek	Yahroonah.		
Rocky Creek	Dorrigo.		
Styx	Jeogla.		
Tia	Tia Station.		
Tenterfield	Clifton No. 1.		
Tenterfield	Clifton No. 2.		
Wilson's Creek	Goonengarry.		
Wollomombi.....	Wollomombi.		
Yarrowitch	Yarrabindi.		
Yarrowitch	Yarrowitch.		

Hydro-electric Committee.—No meetings of the Special Expert Committee on Hydro-electric Development were held during the year for the reason that the Shoalhaven River scheme has not yet been authorised, and no other proposals are yet sufficiently advanced for submission to the Public Works Committee.

III.—BURRINJUCK HYDRO-ELECTRIC DEVELOPMENT.

Power Station Construction.—The main walls of the building were completed to parapet level early in September, and the roofing, guttering &c., were in position by the end of that month.

Turbo Generators.—On completion of the roof, the erection of the generators was commenced. The stators of these machines arrived from England each in four sections, and the connection of these sections, together with the mounting of the thrust bearing carrying the rotor and the final fitting of the coupling between the turbine and generator shafts, entailed a considerable amount of labour. No. 1 was completed and had a trial run on 4th January, 1928. No. 2 generator was completed by the middle of March.

No. 1 unit was put on load on 11th February. No. 2 unit was put into service early in April to allow certain alterations to be made on No. 1.

During the erection of the generators the switchgear was erected, the transformers dried out, and the outdoor substation, consisting of a steel structure on concrete foundation blocks, was completed.

It was found advisable to form three training-walls outside the main building to prevent flood debris being washed into the draft tube outlets. These were constructed of massive concrete down to draft tube floor level and extended 30 feet out from the building. Each of the two chambers formed by these training-walls is fitted with drop logs at the outer end so that one chamber can be logged off and pumped out without interfering with the running of the other unit.

Completion of the remainder of the work, including the entrance portico, approach platform, access steps &c., proceeded gradually and the whole station was completed by the end of June.

Owing to the exposed state of the pressure pipe both from flood discharges and from boulders, &c., coming down the steep side slopes, it was considered advisable to cover the whole pipe with concrete from the upper end of the northern spillway to the power station. This was completed early in May, and the pipe is now considered safe against all likely conditions.

Power Station Operation.—The maximum demand on the station to 30th June, 1928, was 1,500 kilowatts.

Owing to the small demand in the initial stage some difficulty has been experienced due to the heavy charging currents of the transmission lines, the charging kVA amounting to 18.3 kVA permile of 66 kV line. This has resulted in the exciter voltage falling to a value below that at which the Tirrill automatic voltage regulator would normally function, and it has consequently been necessary to insert additional resistance in the generator fields in order to raise the voltage of the exciter. This trouble will disappear automatically as the load grows.

In view of proposed extensions of the transmission line to Canberra involving a further 65 miles of line, and a further heavy increase in the charging kVA, it has been decided to instal a 2,000 kVA shunt reactor to improve the power factor at the generator and to some extent neutralise the heavy leading kVA required for charging the lines.

The general operation of the plant has been satisfactory. The average running-load factor is 53 per cent.

Transmission Lines.—The 66 kV lines included in the first constructional programme have been completed during the year, and a supply of electricity has been given to six municipalities. The dates of commencement of supply were as follow :—

Municipality.	Date of Commencement of Supply.
Murrumburrah and Harden	21st February, 1928.
Cootamundra	12th February, 1928.
Junee	20th February, 1928.
Gundagai	23rd February, 1928.
Wagga Wagga	25th March, 1928.
Young	13th March, 1928.

The ring system having been completed, an alternative supply by either of two routes can be given to all these municipalities, excepting Young, which is supplied by a single circuit spur line from Murrumburrah switch structure. The demands of these municipalities have increased appreciably since the change over to the Burrinjuck system. In the case of Wagga Wagga the maximum demands exceed 1,000 kVA. The lines and substations were made alive without incident and no insulator failures have occurred.

The work of constructing a single circuit 66 kV line from the existing switch structure at Bogalara to Yass and Canberra has commenced. The length of the line is 65 miles. The survey for the extension of the line from Young to Wyangala dam, a distance of 52 miles, is almost completed.

Substations.—Locally manufactured transformers were installed and connected at all the substations excepting Wagga Wagga and Tenandra, where imported transformers of British manufacture have been provided.

Communication.—The wireless stations have been in regular use and have given satisfaction.

Rural Supply.—An urgent demand exists for rural supplies outside the municipal areas already served from the main substations. Power surveys are in progress and an extensive system of rural distribution at a pressure of 6,600 volts is in view. The distances to be covered are large and the loads scattered. The cost of construction, therefore, is of considerable importance in the economics of the proposal. Special methods are in course of design with a view to providing such services at minimum cost.

Additional Power Station.—It is evident that by 1931 with a normal increase in demand of the towns already connected to the system, together with the growing additions to the Federal Capital, Yass and Queanbeyan, the plant available at the present power station will be unable to meet the demand.

As shortage of power to connected consumers would be bad policy and it will take at least two years to complete an additional power station, it is clear that construction work should be put in hand without delay.

After careful consideration of various proposals it has been decided that this additional power station should be built at Burrinjuck, immediately below the wall and opposite the two Stoney sluices, which would be directly connected with the turbines.

A strong argument in favour of the additional plant being installed at Burrinjuck is the fact that the existing transmission lines have been constructed capable of carrying this increased load.

Preliminary hydraulic designs and specification for turbines and generators have therefore been prepared for three units of 7,500 kW each, giving 15,000 kW maximum output with 50 per cent. spare plant.

The estimated cost of this station complete is £260,000.

In addition to the stations at Burrinjuck, a reserve station of about 10,000 kW will be necessary, for although the turbines will normally supply 20,000 kW or four times the capacity of the existing plant, the water restrictions during non-irrigating months may not permit of this output being attained during those months. The periods of restriction will average two months per annum, but will not exceed four months in any one year.

The Irrigation Commission has authorised the utilisation of sufficient water to meet a demand of 10,000 kW throughout the year up to 1935 and the period may be extended beyond that date, depending on irrigation requirements.

The reserve station is estimated to cost £150,000, but is not likely to be required till 1934. The total cost of the complete scheme for 20,000 kW effective output, including additional transmission lines, is £1,100,000 or £55 per kW.

IV.—PORT KEMBLA ELECTRICITY SUPPLY.

Power Station.—During the past year considerable progress has been made with the extensions to the plant.

A fourth turbine unit of 3,000 kilowatt capacity manufactured by Messrs. Bellis and Morcom connected to a British General Electric Generator has been installed and put into service. A fourth boiler has been erected by Messrs Babcock and Wilcox. This boiler is of the triple drum W.I.F. type and has a heating surface of 8,019 square feet. The stoker is of the latest balanced draft type.

The present installed capacity of generating plant is 7,500 kilowatts. Cope's automatic feed water regulators have been obtained for all boilers.

Satisfactory progress has been made with the extension of the bunkers and coal-handling equipment. The new circulating water system is also well advanced.

A "Lea Cubi-meter," for weighing the coal supplied to the bunkers, has been installed and is operating satisfactorily.

Lea coal meters have been ordered for boilers 3 and 4.

In order to overcome the corrosive action in the boilers resulting from the presence of air in the feed water an order has been placed for a de-aerating plant. The apparatus consists of a de-aerator of 175 square feet heating surface and a heater combined capable of dealing with 45,000 lb. of feed water per hour at a temperature of 80° F., and to deliver the de-aerated feed water at a temperature of 160° F. Provision is made for the automatic addition of live steam, in the event of there being an insufficient quantity of exhaust steam available from auxiliaries, sufficient to maintain a temperature of at least 160° F. in the feed water delivered from the de-aerator. An "Arca" thermostatic regulator is provided for this purpose.

Some trouble has been experienced with vegetable algae in the make-up water, and it may be necessary to instal a filtering plant.

A partial shut down of the plant occurred on the 15th June, 1928, owing to an inrush of sea water which flooded the basement of the power station to a depth of 4 feet 6 inches. The motors driving the condensate lift and extraction pumps were submerged. At the time of the occurrence there was a heavy sea running and a high wind, and at high tide under these combined effects the sea water was driven over the temporary dam into the channel excavated for the circulating water conduits. This then entered the power station basement through the openings from the circulating water ducts.

Good progress has been made with the erection of the 2B2 "Reyrolle" Ironclad Switchgear, and the re-arrangement of some of the old switchgear. When completed the switchgear will be of ample capacity for the ultimate station of 20,000 kilowatts.

A general re-arrangement of the low-tension circuits in the power station has been prepared.

The first portion of the extensions of the high-tension step-up station have been completed. An underground cable duct has been built between the switch room and the substation. Preparations have been made for a duplication of the existing substation allowing for additional outgoing lines and for transformer banks of sufficient capacity for the ultimate station. The work is about to be started.

Four 1,200 kVA single phase 6,600–19,082 volts transformers have been supplied and three are now in service. These were manufactured by Standard Waygood Ltd. in Sydney.

Transmission Line System.—No extensions to the 33 kilovolt lines have been made during the year. The survey for an interconnecting line between Kiama and Moss Vale has been completed.

The rapid increases in the demands by consumers have involved the reconstruction of many of the lines and substations. The local lines serving the consumers in the Port Kembla district have been reconstructed and the provision of alternative routes and sectionalising switches ensure that any interruptions which occur will be of minimum duration. A supply was given to Australian Iron & Steel Ltd. from the local lines for constructional purposes.

The new metal quarry at Port Kembla has commenced operations and also the adjoining metal crusher.

A new quarry has been opened at Shellharbour and a supply has been given for all purposes.

Kiama Substation.—A substation of 1,800 kVA capacity has been completed near Kiama and is ready for service.

This substation has been specially designed and constructed to ensure continuous operation under the severe conditions which are experienced near the coast in the Port Kembla district.

The building is of brick and is efficiently ventilated. The transformer equipment consists of four 1,200 kVA single-phase transformers, which transform from a pressure of 33,000 volts to 6,600 volts. The switchgear controlling the various 6,600 volt circuits is of the automatic reclosing type.

The adjustments are such as to ensure a sequence of closing, if the circuit breakers should operate due to overload or fault on the 6,600 volt circuits. The breakers automatically reclose three times, when, the fault still exists, the relays prevent the breaker from operating again. It is anticipated that the provision of these breakers will reduce interruptions to consumers to a minimum.

A switch structure has been located outside this main substation and is equipped with isolating and break switches of the Departmental standard design. The arrangement of switches is such that a selective portion of the line may be readily isolated and the supply to other consumers maintained under these conditions.

Consumer.	1924-25.			1925-26.			1926-27.			1927-28.		
	kWh Sold.	M. D.	Revenue.	kWh Sold.	M. D.	Revenue.	kWh Sold.	M. D.	Revenue.	kWh Sold.	M. D.	Revenue.
<i>Port Kembla-Kiama.</i>		kW.	£		kW.	£		kW.	£		kW.	£
S.M. Quarries, Bombo	294,648	200	2,105	217,800	256	1,984	291,800	299	2,403	306,428	345.6	2,403
S.M. Quarries, Kiama	228,710	222	1,994	258,000	263	2,360	269,300	329.7	2,266	327,220	368	2,266
Railway Commissioners Quarry, Bombo.	270,538	205	2,072	384,482	262.87	2,602	415,171	270	2,830	474,084	276	3,111
N.S.W. Blue Metal Co., Minnamurra.	360,650	321	2,713	484,250	488	4,333	576,800	542.5	4,602	573,700	542.5	4,602
N.S.W. Blue Metal Co., Bombo.	...	...	...	...	...	...	9,687	...	98	309,687	259.2	2,266
N.S.W. Blue Metal Co., Shellharbour.	...	...	...	...	...	...	...	...	...	57,840	120	...
Federal Quarry	26,735	60.9	190	87,360	135.48	816	102,490	124.8	869	142,800	154.8	1,111
Kiama Municipal Council	22,055	39.4	158	94,874	75.46	595	137,730	131.8	907	226,980	111.6	1,111
Small Consumers	635	...	20	1,035	...	28	1,896	...	44	5,116	...	...
<i>Kiama-Nowra.</i>												
Nowra Municipal Council	...	...	...	...	...	...	...	...	...	11,000	50	...
Berry Municipal Council, Berry.	...	...	...	...	...	...	2,160	14.4	17	45,280	24	...
Berry Municipal Council, Bomaderry.	...	...	...	...	...	...	...	...	...	10,265	11	...
Small Consumers .....	...	...	...	...	...	...	...	...	...	1,678	...	...
<i>Port Kembla-Nepean River.</i>												
Cordeaux Dam	611,470	...	3,822	178,510	...	1,116	44,780	...	309	5,980	...	...
Avon Dam	1,007,590	...	6,297	519,351	...	3,246	187,581	...	1,174	10,891	...	...
Nepean Dam .....	...	...	...	...	...	...	199,896	...	1,249	716,108	...	...
Pumping station No. 2 Dam.	116,745	...	730	218,319	...	1,377	305,640	...	1,946	258,430	...	...
Central Illawarra, Unanderra.	...	...	...	...	...	...	10,800	34.8	84	110,400	57.6	...
Mt. Kembla Colliery ...	...	...	...	...	...	...	...	...	...	303,325	79.2	...
<i>Nepean River-Moss Vale.</i>												
Mittagong Municipal Council.	32,840	94.2	390	142,123	70.5	1,134	244,264	105	1,705	308,604	112.2	...
Bowral Municipal Council.	...	...	...	311,698	153.72	2,390	442,850	165.6	3,039	475,710	165.6	...
Bowral Water Supply	13,560	48.8	95	78,460	70	433	95,260	46.5	468	74,700	...	...
Moss Vale Municipal Council.	56,681	64.8	487	140,560	64.8	1,102	178,791	165.6	1,331	238,504	98.4	...
Moss Vale Water Supply.	33,703	39.6	119	117,680	39.6	429	114,650	46.5	392	112,890	30.8	...
Nattai Shire	1,970	...	59	18,338	18.39	190	72,079	63	596	73,687	69.3	...
Southern B.M. Quarry	...	...	...	...	...	...	7,077	...	56	425,677	373.3	...
<i>Local Services.</i>												
Port Kembla, Old Quarry.	180,816	100	877	170,200	100	855	168,400	180	1,002	166,600	174	...
Port Kembla, Shipping	168,497	236	1,531	132,294	236	1,453	177,321	236	1,403	151,979	186	...
Port Kembla, S.M. Quarry.	90,410	100	663	93,690	95	670	111,550	95	687	82,610	95	...
Port Kembla, New Quarry.	...	...	...	...	...	...	8,860	18.9	129	41,045	19.5	...
Hoskins Iron and Steel Co.	...	...	...	...	...	...	23,640	52.8	138	109,530	134.4	...
Central Illawarra Con. Port Kembla.	...	...	...	...	...	...	7,920	30	56	149,760	54	...
Wollongong Municipal Council.	605,590	312	4,166	703,182	366.4	3,725	746,810	379	4,074	1,011,762	459.8	...
Small Consumers	93,950	...	675	112,205	...	754	98,165	...	773	64,737	...	...
Miscellaneous .....	...	...	87	...	...	219	...	...	183	...	...	...

The substation has been constructed by day labour.

Municipal Electricity Schemes.

Gerringong.—The Kiama-Nowra high-tension transmission line having been completed, a supply became available for the town of Gerringong, but the Municipal Council could not make financial arrangements for the construction of a reticulation system. The Department, therefore, provided the funds and constructed the system at a cost of £2,300. The rates charged are on a sliding scale basis, beginning at 10d. per kWh for a residence with four active rooms. The rate for industrial power is 2½d. per kWh. The Department also provided and erected a street lighting system and an annual rental per lamp is paid by the Council. The *Berry Municipality* completed its reticulation in Bomaderry, and this town was switched on during the year. Satisfactory arrangements were made with the *Nowra Council*, and a supply was given from the Bomaderry main substation.

Australian Iron & Steel Limited.

An agreement has been signed between the Department and Australian Iron and Steel Ltd., Port Kembla, for the interchange of electrical energy. Australian Iron & Steel Ltd. has established a power station to supply the steelworks. This station obtains its power by burning under steam boilers the waste gases from the blast furnaces.

The agreement provides that the company will supply the Department up to a maximum of 1,500 kilowatts as and when required. Certain works belonging to the company at Port Kembla, which are not directly connected to the main works, will be supplied with electrical energy by the Department, and the Department will provide a standby service for the main works. This agreement is to the mutual advantage of the Department and the company. It has enabled the company to obtain a satisfactory standby service from the Department, which could not otherwise have been obtained without duplication of plant, and it has enabled the Department to defer the next extension of plant for a year or more and to shut down the power station at times of light load.

Experiments are also being made in the power station in an endeavour to burn the refuse coal from various sources.

V.—WORK FOR OTHER DEPARTMENTS.

Local Government Department.—Assistance has been given to the Local Government Department in connection with loan proposals and franchise agreements for country towns and villages.

The towns dealt with during the year were :—

Franchise.

Ardlethan.
Aberdeen.
Adelong.
Bourke.
Boggabri.
Bowraville
Barraba
Canowindra.
Camden.
Eugowra.
Guyra.
Lockhart.
Moree.
Paxton.
Tumbarumba.
Uralla.
Wentworth.

Loan.

Bankstown.
Blue Mountain Shire.
Cullen Bullen.
Central Illawarra.
Erina Shire.
Gilgandra.
Inverell.
Ingleburn.
Mudgee Council.
Narrandera.
Sutherland.
Young.

In all these cases an endeavour has been made to standardise the system of supply throughout the State. This has involved considerable opposition from the owners of direct current undertakings. Following the practice in other countries, recommendations have been made to the Local Government Department that no loan or franchise agreements should be approved, except under very special circumstances, for the inauguration or extension of a direct current system. Efforts have been made to secure, wherever possible, a supply of alternating current at standard frequency and voltage, and a continuous service throughout the twenty-four hours.

The standard specification for Overhead Lines prepared by the Electricity Supply Association of Australia has been adopted by the Department, and all country towns are required to conform thereto in so far as the Local Government Department has authority.

Erina Shire.—One of the Local Government proposals that came more particularly into prominence was that of the supply of electricity to Erina Shire.

The first proposal submitted by the Shire provided for the supply of electricity from the Railway Commissioners, who proposed to construct a transmission line from Newcastle to Gosford. This proposal was not approved, as being too expensive for the Shire to undertake; the Shire was asked to submit a less ambitious proposal.

In resubmitting the scheme, the Shire entered into a tentative agreement with the Newcastle City Council, who proposed to construct a transmission line via Swansea and Catherine Hill Bay to give the supply. The Shire proposed to borrow the sum of £49,000 for this work.

Before reaching a decision a conference was held by the Minister for Local Government in which all interested parties were present, including the Railway Commissioners. As a result of this conference the proposal was again negatived.

It is now understood that satisfactory negotiations have been completed on the original basis, which will involve the Shire in considerably less capital expenditure than either of the two proposals previously submitted. The Erina Shire will borrow the sum of £3,300 for the reticulation of Wyong; Gosford will be connected to the Railway Commissioners' system. For this a special loan is not necessary. A new shire has been formed, called the Woy Woy Shire, and this body proposes to borrow the sum of £16,700 for the reticulation of the town of Woy Woy and district.

Water Conservation and Irrigation Commission.

In accordance with arrangements previously made, this Department has advised the Irrigation Commission on matters connected with the electricity supply in its areas. The rates which were adopted during the past year for the supply of electricity for domestic and farm consumption have considerably increased the use of electrical appliances in the home, and this aspect of the undertaking has now assumed quite important proportions.

VI.—WORK FOR OTHER BRANCHES.

Harbours, Roads and Bridges Branch.

Cook's River.—In connection with the dredging of Cook's River, the dredge "Tempe" has been fitted with an electrically-driven centrifugal pump. A transmission line was constructed for the work, which is connected to the City Council's supply. It is intended in the future to completely electrify the dredge, and provision has been made for the ultimate capacity.

Byron Bay Jetty.—A transmission line has been constructed for the operation of electric cranes on the new jetty at Byron Bay. This line extends from the local Council's substation to the shore end of the jetty. Cables for light and power have been run beneath the decking for approximately 2,000 feet to the sea-end of the jetty in galvanised-iron pipe.

Country Towns Water Supplies.

The electrically-operated pumping plants at Condobolin, Cowra, Yass have been satisfactorily completed and tested. This branch has supervised the electrical portions of the plant. Tests have been carried out of the water supply pumping plants at Dubbo.

Advice has been given as required in connection with all electrical pumping installations.

Nepean Dam, Hume Reservoir, Northern Suburbs Ocean Outfall Sewer, Newcastle Stormwater Drainage.

The electrical equipment has been supervised and inspections made as requested.

Information was supplied to the Water Supply and Sewerage Branch in connection with the discharge arrangements at Hume Reservoir for the proposed hydro-electric plant, also the discharge pipe for an auxiliary turbine for operating the gates and for construction purposes. Drawings and a specification are being prepared for this auxiliary hydro-electric unit.

VII.—STANDARDISATION COMMITTEES.

Officers of this Branch have represented the Public Works Department on the various State and Sectional Committees created by the Australian Commonwealth Engineering Standards Association.

VIII.—ELECTRICAL EXHIBITIONS.

The assistance of the Department was given and exhibits were shown at two Electrical Exhibitions during the year.

The first was in the Town Hall, Sydney, in March, 1928, and was arranged by the Electrical Manufacturers Section of the Chamber of Manufacturers.

The second Exhibition was held in the Town Hall, Wollongong, from 21st to 26th May, and was arranged by the Wollongong Council in co-operation with the Department.

IX.—ELECTRICAL STATISTICS.

This Branch has now undertaken the preparation of official statistics in regard to the supply of electricity in New South Wales.

With the co-operation of the various electrical concerns yearly statistics are being compiled and tabulated for the whole of the Electricity Supply Undertakings in the State.

From the returns already received the following table has been prepared:—

January to December, 1927.

Electrical Undertakings:	Returns available:	Returns not available.	Totals:
Shires	23	3	26
Municipalities	61	11	72
Private Companies	8	36	44
Grand Totals	92	50	142

Returns available:—

Total population	645,000
Total units sold	45,280,000
Units sold per head of population	70·20

Returns not available (estimated):—

Total population	180,000
Total units sold @ 70·20 per head of population	7,580,000

Grand Totals:—

Population	753,000
Units sold	52,860,000

Total Capital Invested, £3,869,000 approximately.—(Includes Burrinjuck Hydro-Electric Development and Port Kembla Electricity Supply).

NOTE.—This return does not include the cities of Sydney and Newcastle.

APPENDIX I.—Sample form used in collection of data.

APPENDIX II.—Map of New South Wales indicating centres with electricity.

X. STAFF.

The staff on 30th June, 1928, consisted of 32 in Head Office and 20 in the field. This represents an increase of 2 in Head Office during the past twelve months. The field officers are principally those engaged in the operation of the Port Kembla and Burrinjuck Electricity Supply Systems.

I would again like to take this opportunity of expressing my appreciation of the efficient and loyal services rendered by the staff during the year and would particularly stress the unremitting devotion to duty displayed by those officers responsible for the maintenance of service on the supply systems. The high character of the public service so rendered is in no small measure due to their efforts.

H. G. CARTER,

Chief Electrical Engineer, Public Works Department.

12th October, 1928.

PART I.

RETURN OF ELECTRICAL STATISTICS.

Holder of Trading Franchise _____ District _____
Statistics for Year ending _____

Type of Station :—Steam (Turbo or Recip), Oil, Suction Gas, Water Power _____
System of Supply :—A.C. No. of Phases _____ Frequency _____ D.C. No. of Wires _____
System Voltages :—Generated and/or Purchased Voltage _____ Distributed Voltage _____ Consumers Voltage _____
Total Capacity Installed _____ k VA or kW. Reticulation Mileage _____
Municipalities, Shires, Counties, &c., supplied by Holder in bulk _____
Name of Bulk Supplier from whom energy is purchased _____
Population at end of year _____ No. of Consumers _____ Maximum demand for year _____ kVA or kW, _____
Signature _____ Date _____

Please fill in all blank spaces on Parts 1 and 2 and forward the Statement as soon as possible to the

UNDER-SECRETARY,
PUBLIC WORKS DEPARTMENT,
PHILLIP-STREET, SYDNEY.

If necessary kindly enclose explanatory letter.

PART II.

RETURN OF ELECTRICAL STATISTICS.

				kWh.					kWh.
No. of Units Generated during year	No. of Units sold for Private Lighting	...	...	...	...
„ Purchased	„ „ Street Lighting	...	...	...	...
					„ „ Public Purposes	...	...	...	...
					„ „ Private and Industrial Power	...	...	...	...
					„ „ Other Purposes (Bulk Supply, &c.)	...	...	...	...
					Total No. of Units sold	...	...	...	...
					No. of Units used on Works, &c.	...	...	...	...
					„ lost and unaccounted for	...	...	...	...
					Total No. of Units sold, used, lost, and unaccounted for	...	...	...	...
Total No. of Units Generated and/or Purchased					

Revenue Account.

									Price per Unit. d.	£
Expenditure.					Income.					
To Generation of Electricity	{ Fuel ...	...	...	...	By Sales of Electricity for Private Lighting...	...	...	...	...	...
	{ Other ...	...	...	...	„ „ Street „	...	...	...	...	...
Purchase of Electricity	...	...	...	...	„ „ Public Purposes	...	...	...	...	...
Distribution (Maintenance, &c.)	...	...	...	...	„ „ Private and Industrial Power	...	...	...	...	...
Management, General Expenses, &c.	...	...	...	...	„ „ Other Purposes (Bulk, &c.)	...	...	...	...	...
Interest and Depreciation	...	...	...	...	Rents (Meters, Motors, &c.), Sales (Fittings, &c.) and sundries	...	...	...	...	...
Balance being excess of Income over Expenditure (Profit)	...	...	...	...	Interest on Investments, &c.	...	...	...	...	...
					Loan Rates levied	...	...	...	...	...
					Balance being excess of Expenditure over Income (Loss)	...	...	...	...	...
Total	...	...	...	...	Total	...	...	...	...	...
To Balance brought down	...	...	...	...	By Balance brought down	...	...	...	...	...
Assets purchased during year	...	...	...	...	Loan Moneys expended during year	...	...	...	...	...
Payments in Reduction of Loans, &c.	...	...	...	...	Sales of Assets, Assets Depreciation during year	...	...	...	...	...
Balance being Surplus carried forward to next year	...	...	...	...	Balance being Deficit carried forward to next year	...	...	...	...	...

Invested Funds.

Liabilities.				£	Assets.				£
Amount of Loans (end of Year)	...	...	...	...	Amount invested in Lands and Buildings	...	...	...	...
Revenue Surplus, invested up to beginning of year	...	...	...	...	„ „ Plant and Machinery	...	...	...	...
„ „ „ during year	...	...	...	...	„ „ Distribution, Cables, Meters, &c.	...	...	...	...
					„ „ Stock and Sundries	...	...	...	...
					Loan Moneys unexpended	...	...	...	...
Balance brought forward from last year	...	...	...	...	Surplus	...	...	Deficit	...
„ for this year	...	...	...	...	Surplus	...	...	Deficit	...
Balance carried forward to next year	...	...	...	...	Surplus	...	...	Deficit	...

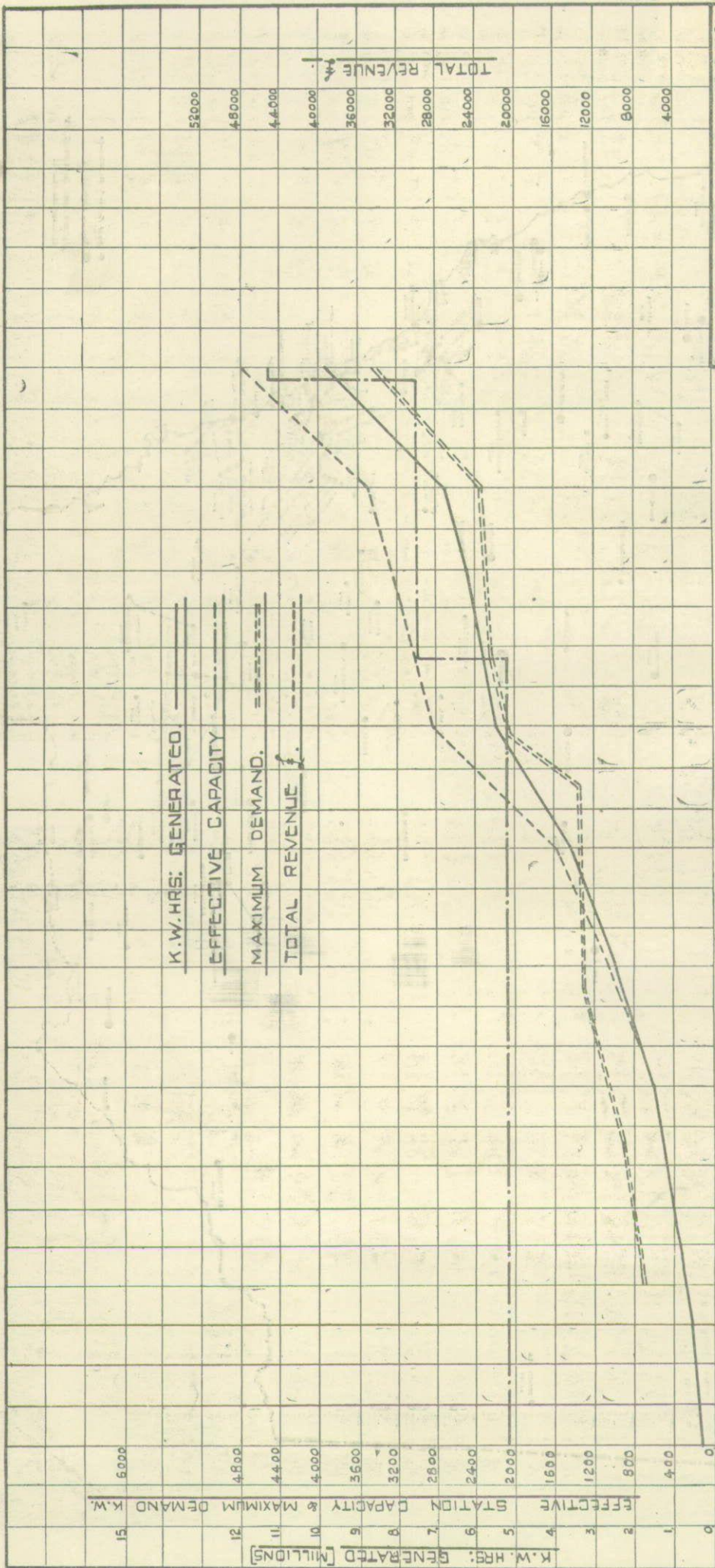
Note.—In all cases, money values to be given to the nearest pound (£).

Balances to be obtained for corresponding Funds, Accounts, Returns, &c.



● Local Authority Sub-stations
● Charging Sub-stations
CUMULATIVE POWER LOSS ABOUT 10%
AND 100 MILES PER HOUR

Wheat
ELECTRIC
BUREAU



DEPARTMENT OF PUBLIC WORKS N.S.W.
ELECTRICAL ENGINEERING BRANCH.

PORT KEMBLA ELEC: SUPPLY.

DIAGRAM SHOWING PROGRESS OF UNDERTAKING.

368.

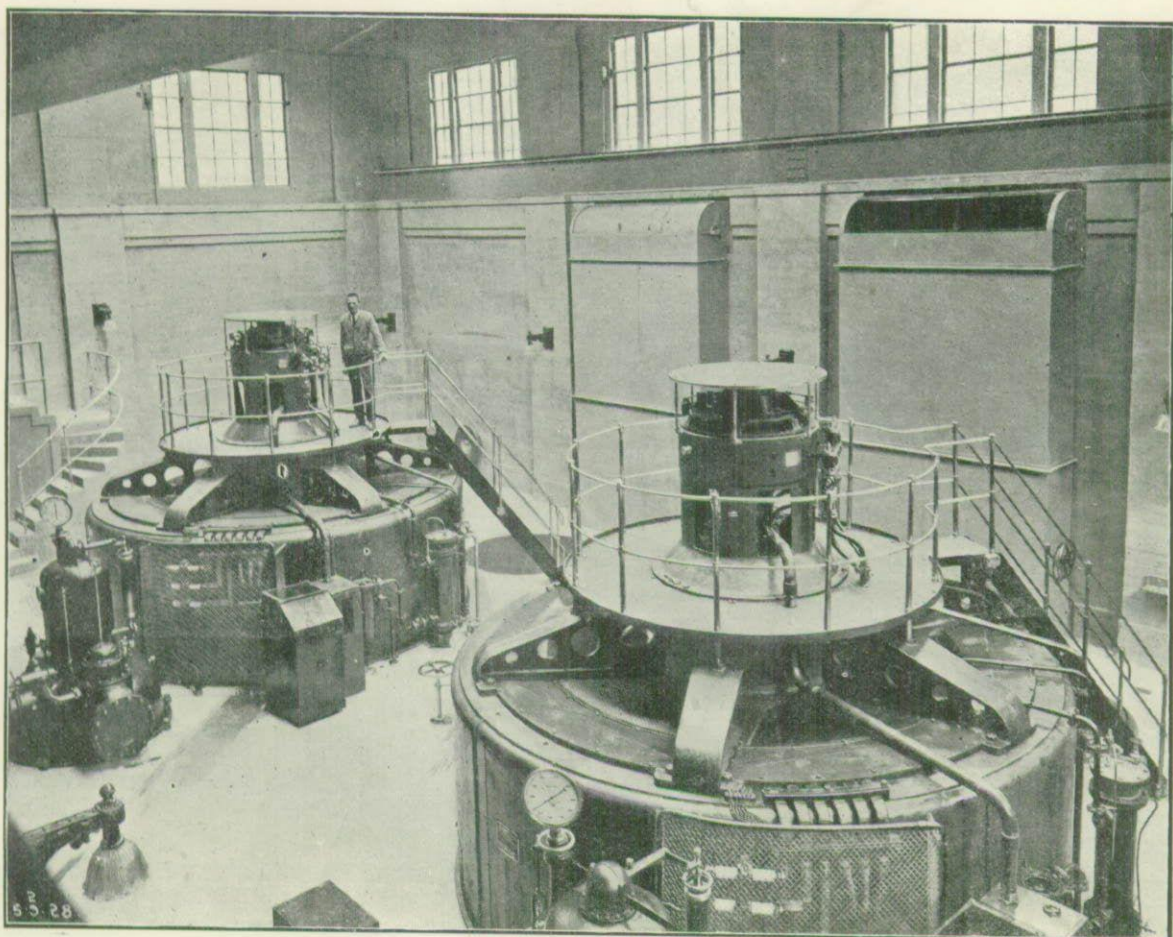
1928. 1927. 1926. 1925. 1924. 1923. 1922. 1921. 1920. 1919.

YEAR ENDING JUNE.

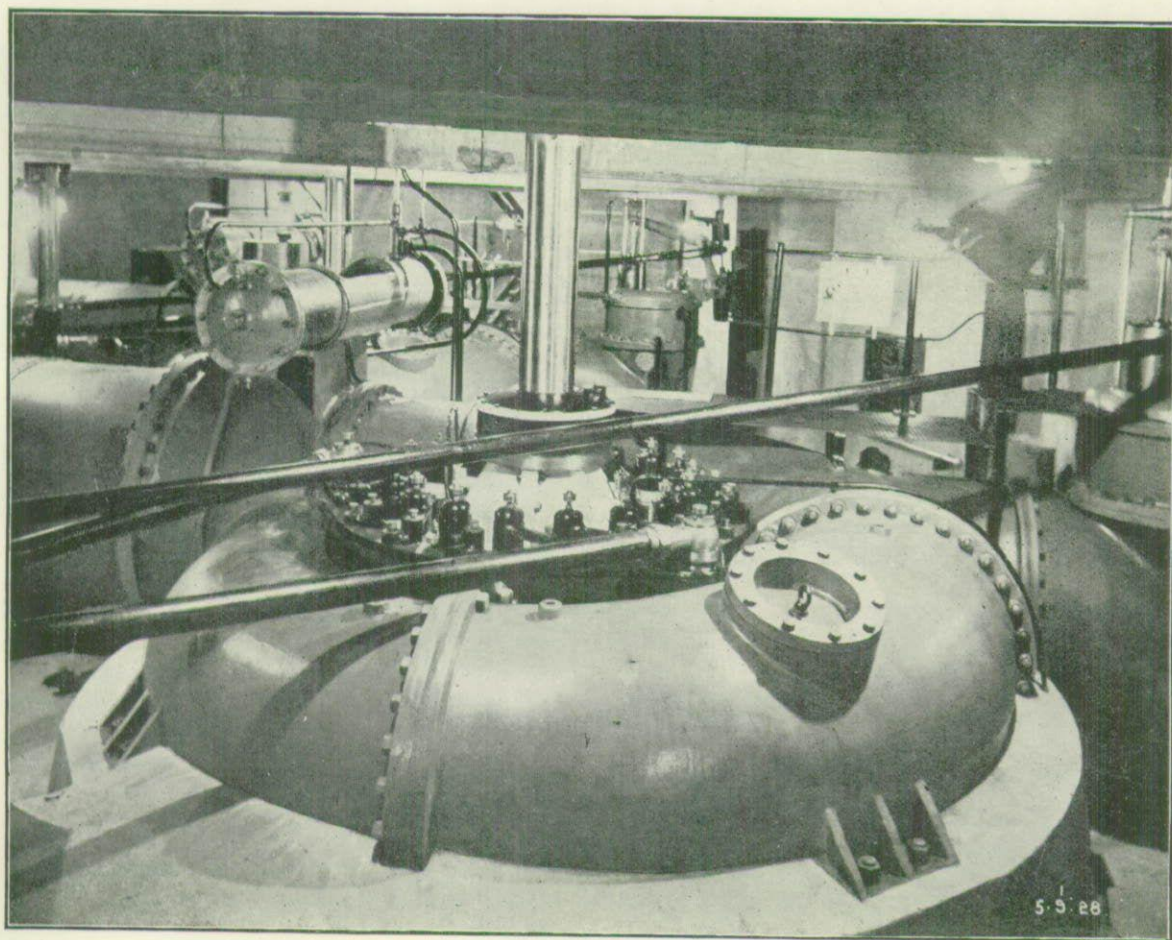
CHIEF ELECTRICAL ENGINEER.

W. J. Hawkes 1928

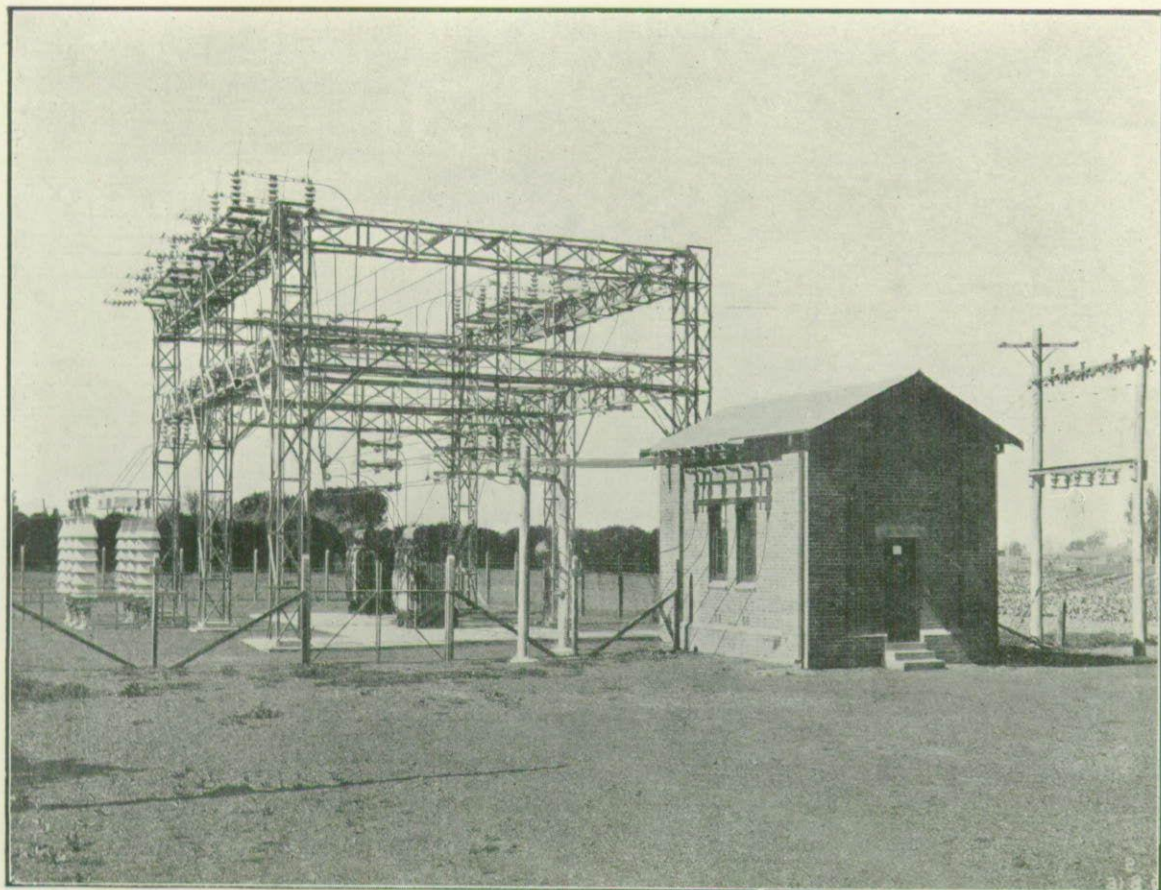
2.V.3.



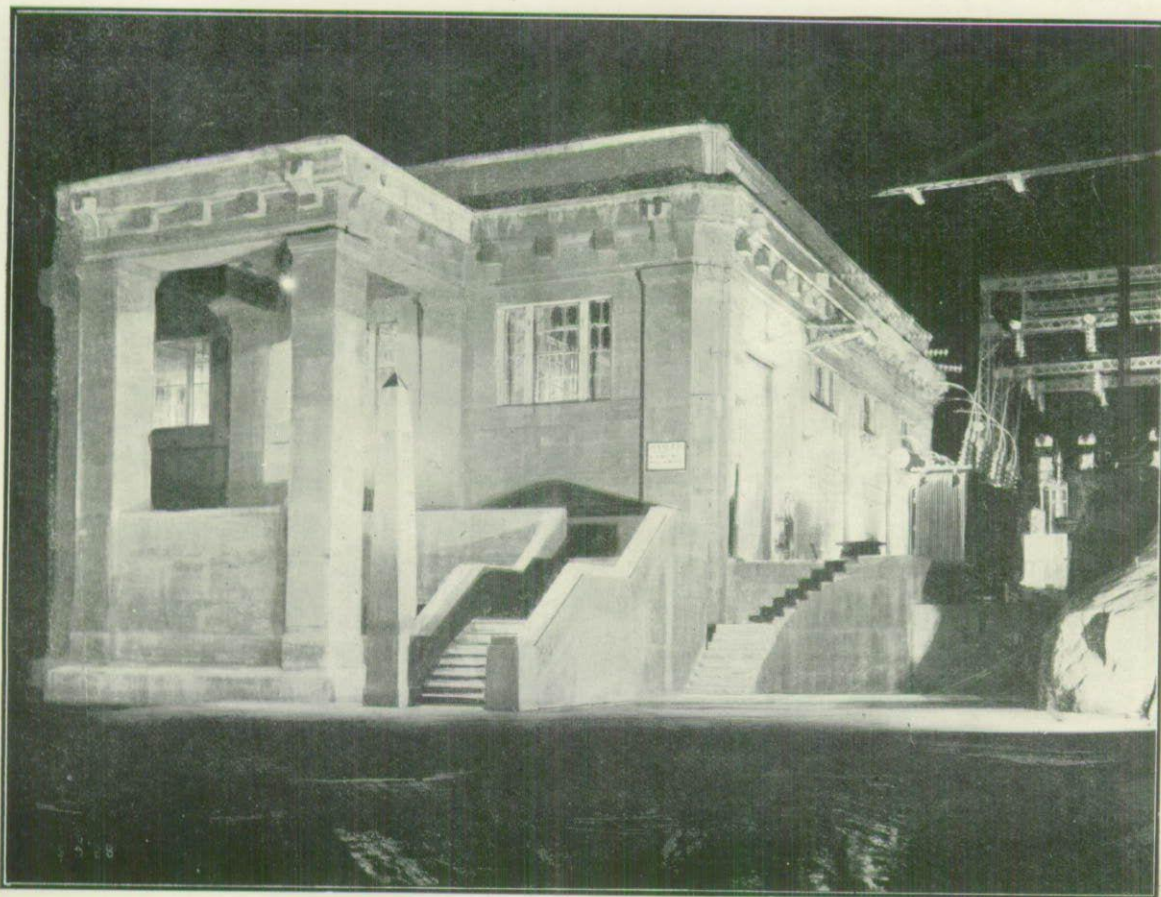
Burrinjuck Power House, Main Generators.



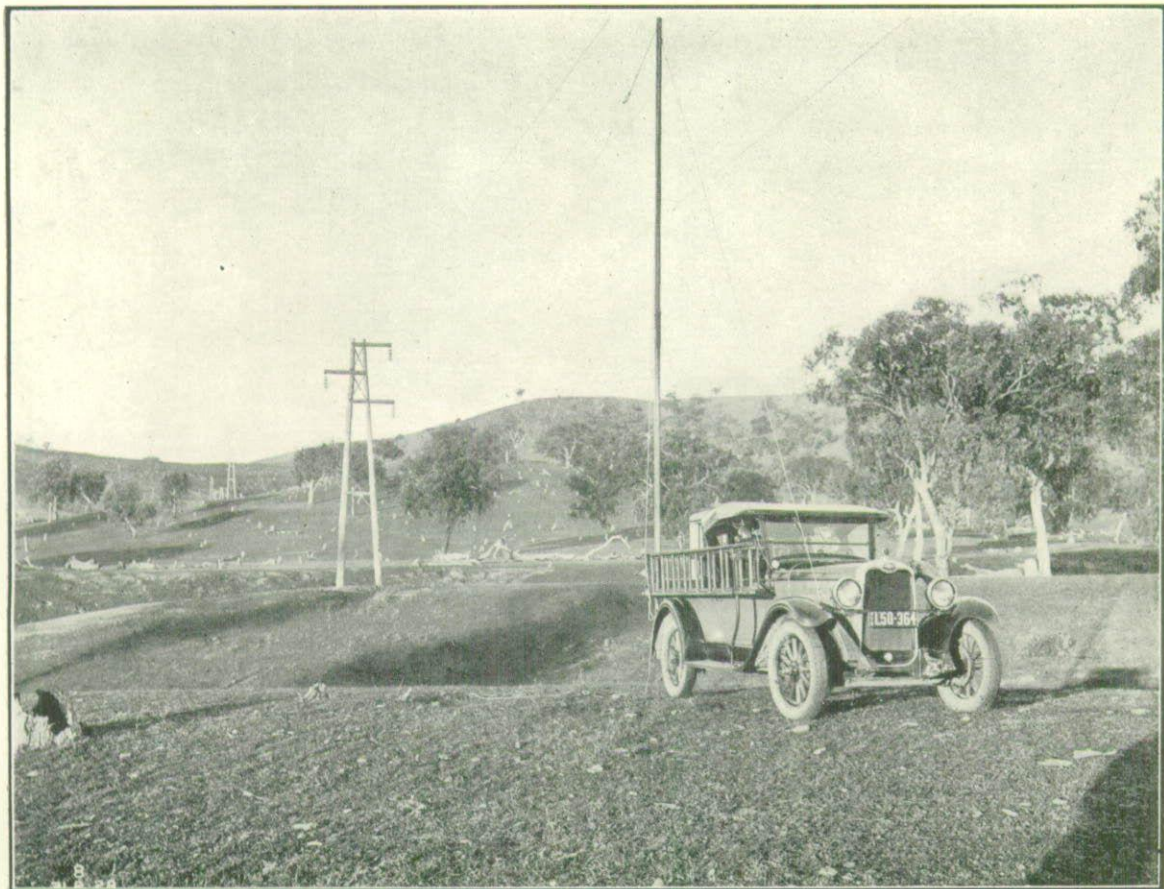
Burrinjuck Power House, Turbines.



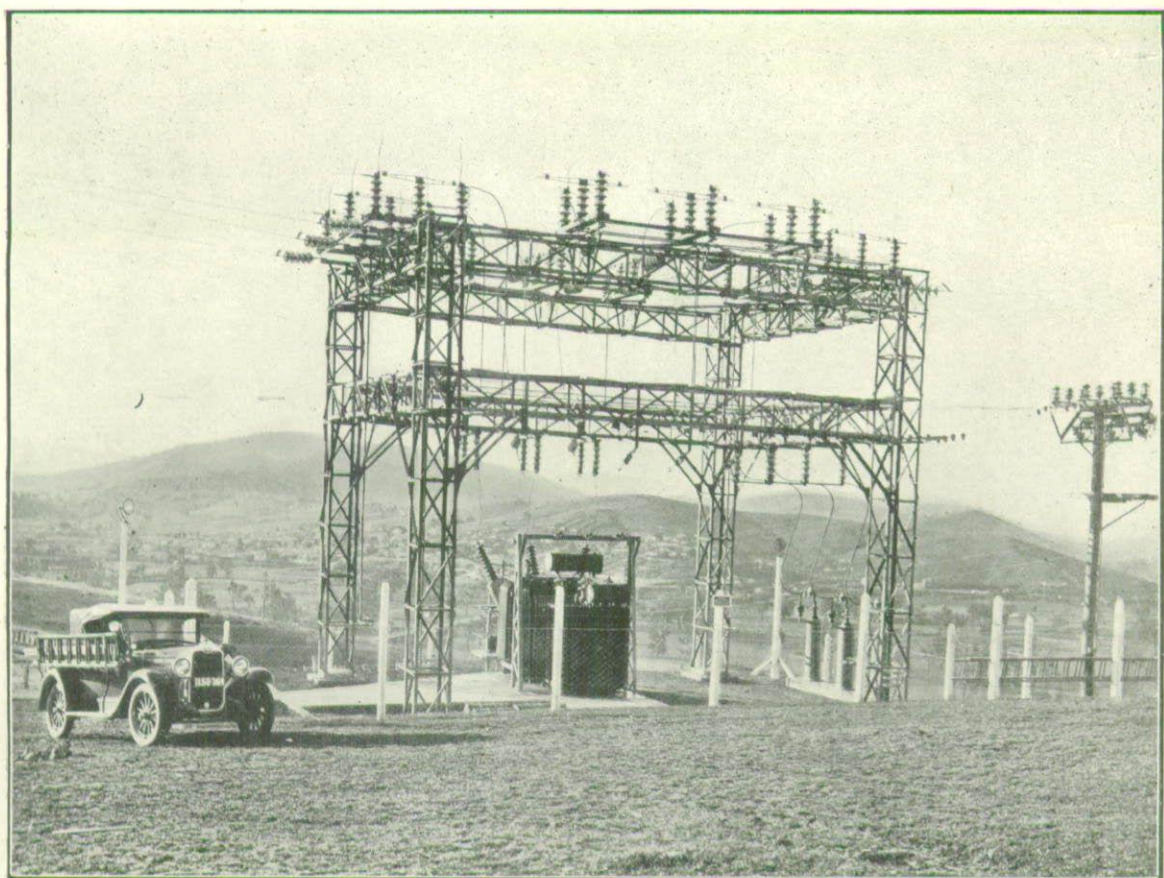
Burrinjuck Hydro-Electric Development, Double Bay Substation, Wagga Wagga.



Burrinjuck Hydro-Electric Development, Power House by Night.



Burrinjuck Hydro-Electric Development, Patrol Car equipped with Wireless.



Burrinjuck Hydro-Electric Development, Single Bay Substation, Gundagai.

Sydney Harbour Bridge Branch.

Report for the year ended 30th June, 1928.

I have the honor to submit the following report on the work of this Branch for the year ended 30th June, 1928:—

I.—CONSTRUCTION OF THE NORTHERN APPROACH.

(a) Tunnels.

The excavation had been completed previously and work was confined to completing the concrete lining of the Down Mosman tunnel flyover, 771 cub. yds. of concrete being poured.

(b) Open Cut Excavation.

The principal excavation works were the abutments for the Burton-street and Fitzroy-street Arch Bridges, foundations for retaining walls, &c.

The total quantity of excavation work carried out on the Northern Approach was 21,832 cub. yds.

(c) Concrete Work.

A large amount of concreting was carried out, the chief items being the completion of the Arthur-street Arch, Fitzroy-street Arch, abutments of Burton-street Arch, pier foundations near Kirribilli Station and several large retaining walls.

The arch ring of the Fitzroy-street Arch contained 2,122 cub. yds. of concrete, and was poured in nine working days.

The total quantity of concrete placed in position was 31,680 cub. yds, and the number of bags of cement used was 112,420.

(d) Demolition of Property.

Practically all resumed property has now been demolished; during the year thirty-seven properties were sold for demolition, the total receipts being £1,799.

(e) General.

There were many incidental works carried out, the chief items being 2,861 lineal feet of fencing, stone crushing, erection of poles for power lines, rehandling and placing in permanent position spoil from tunnels not required for stone crushing, quantity estimated to be 59,561 cub. yds.

The average number of men employed throughout the year was 214.

II.—CONTRACT OF DORMAN, LONG & CO. LTD.

(a) Excavation, Concrete and Masonry.

The construction of the Southern Approach spans was completed, and on the northern side of the Harbour the whole of the Approach Spans, except the steelwork for Span No. 10.

The Moruya Quarry has been the deciding factor in the construction of the main abutment towers. The output of masonry and concrete aggregate was not sufficient to carry on the construction of both towers simultaneously at full speed, consequently Dawes Point abutment tower was taken to R.L. 155.50 before the walls of Milson's Point tower were commenced.

The level R.L. 155.50 is as high as the towers can be built until the main arch span is nearing completion. At this level a reinforced concrete floor has been constructed between each outside and adjacent inner wall which will be utilised for the erection of the steel ramp and creeper crane, and also as a platform for the placing of the cable anchorages.

The granite facing has progressed steadily as supplies came forward from the Quarry, and as cranes could be made available, and on 30th June had reached R.L. 73.00. This work will be carried to R.L. 155.50 whilst the arch is being constructed across the Harbour. The granite facing is 12 inches thick and is fixed to the concrete walls by steel cramps spaced at 6 feet centres in each course, the space between the concrete and the granite being filled with concrete.

Very little work had been done on the Milson's Point abutment tower during the latter part of 1927 on account of the whole output of aggregate from the Quarry being required at Dawes Point. Since the Dawes Point abutment tower has been completed to R.L. 155.50 good progress has been made with the abutment tower at Milson's Point. The remainder of the wall foundations were taken out and concreted, and the walls at the back are now only a few feet below where the sliding bearings for Span No. 10 will be placed. To set the bearings as soon as possible so that Span No. 10 may be completed, the back wall has been advanced ahead of the front wall, and as soon as the bearings are placed, the front, side and internal walls will all be brought to the same level and then carried up together, as was done with Dawes Point abutment tower.

The main bearings at Milson's Point, each weighing 296 tons, were concreted in position towards the end of 1927, thus completing the bearings on both sides of the Harbour.

No masonry had been set on the Milson's Point abutment tower prior to July, 1927, but during the year under review all the large stones to R.L. 41.50 have been placed in position.

At Dawes Point the anchorage tunnel has been concreted and the reinforced concrete saddles for the change of direction of the anchorage cables at the entrances are in course of construction. At Milson's Point the tunnel is completed and shortly the concreting will be commenced.

The following are the quantities of excavation, concreting and masonry carried out during the year :—

Earth excavation	805 cubic yards.
Rock excavation	1,826 "
No. 1 concrete	36,791 "
No. 2 concrete	666 "
Granite masonry	3,639 "
Four cut work on granite masonry	22,215 square feet.

The piers and abutments of the approach spans have now been completed, and the final quantities at schedule rates show a saving of £91,439 19s. 8d. on the contract.

The retaining wall around Hickson-road on the eastern side of the Southern Approach spans was completed during the year. This was not in the contract, but was carried out at the contract schedule rates.

(b) Fabrication of Steelwork.

During the year there were 6,295 tons of carbon steel delivered at Milson's Point, of which 4,061 tons were rolled in England and 2,234 tons at Newcastle by the Broken Hill Pty. Co. Ltd., and in addition there were delivered 3,684 tons of silicon steel rolled in England.

To the end of June, 1928, there were 19,306 tons of material delivered to the workshops.

During the year 650 tons of rivets and 3,288 gallons of paint were delivered to the workshops.

The fabrication of the first arch member was commenced on 13th March.

The largest rivets in the main arch are $1\frac{3}{8}$ in. diameter, the shanks being 15 in. long. The holes for these rivets are $1\frac{7}{16}$ in. diameter and the maximum grip 12 in. These rivets are the largest ever used in bridge construction and are driven with an 80-ton hydraulic riveting machine. These large rivets are heated to a bright orange colour, viewed in direct sunlight, then carefully scaled and dipped in water to a depth of about 4 inches until the ends of the rivets were a dull red and then driven.

To expedite the fabrication of the steelwork of the main span, a second shift was commenced in the fabricating shops on 7th May, and at the end of June 58 men were engaged on the second shift, while 407 were employed on the day shift.

The total weight of steelwork fabricated during the year was 8,096 tons, bringing the total to 13,049 tons. The highest monthly output was 1,117 tons for August, 1927, when fabrication of the Northern and Southern Approach spans was being carried out. More recently the shop output has decreased owing to the commencement of the fabrication of the main arch members. This work is of a much heavier nature than that previously encountered and the amount of preparatory work before the complete assembly of the finished member involves much time and labour.

The graph herewith shows the quantities of material delivered, fabricated, erected in place and completely riveted since the first delivery.

(c) Erection of Steelwork.

The erection of the five Southern Approach spans was completed on the 9th February with the exception of deck riveting.

The erection of the Northern Approach was continued, and during the year Spans 6, 7, 8 and 9 were completely erected and three panels of Span No. 10 had been completed up to 25th May, when work on the Northern Approach was temporarily suspended. It was not possible to proceed further with the erection of this span until the back wall of the pylon had reached the proper level for the sliding bearings.

The total tonnage erected during the year on the North and South Approaches amounted to 8,822 tons.

The attached drawing shows the position of the construction of the main bridge at intervals of three months from 30th September, 1926, up to 30th June, 1928.

On 14th March, 1928, a commencement was made with the erection of the South Pylon steelwork, which was completed ready for the creeper crane ramp on 28th April.

During the year the main bearings on the Northern side were completely erected, the four main bearings now being complete.

III.—CONSTRUCTION OF THE SOUTHERN APPROACH.

During the year work has been augmented and is now proceeding over the whole section from the south end of Dorman, Long & Co.'s contract to the north end of Wynyard Station.

(a) Tunnels.

The double track tunnel for the Shore local tracks under Jamieson-street was completed, while the double track tunnel for the Shore tracks was partly excavated and a commencement made with the concreting.

Both of these tunnels are in poor rock, having little cover, consequently heavy timbering was necessary.

During the year 5,699 cubic yards of excavation and 749 cubic yards of concrete lining were completed.

(b) Excavation.

The total quantity of excavation was 86,136 cubic yards, the principal items being the Jamieson-street to Grosvenor-street cutting, 11,632 cubic yards, the Grosvenor-street to Essex-street cutting, 26,083 cubic yards, and between Argyle-street and the end of the contract, 35,658 cubic yards.

(c) Concrete work.

The cut and cover work on the new Scots Church site was completed, and the site was ready for the Scots Church authorities on 30th June, 1928, as promised. Excluding the tunnel lining there were 5,488 cubic yards of concrete poured and the number of bags of cement used being 26,228.

(d) *Alterations to Existing Services.*

Several water mains, including the 12-inch and 10-inch mains in Grosvenor and York streets, were deviated and capped clear of the cuttings.

Telephone cables in conduit across Grosvenor-street were replaced by aerial lines.

Several gas mains were deviated and removed from Grosvenor-street.

Electric light aerial and underground cables were deviated.

Where thought desirable the Sydney Harbour Bridge Branch collaborated with the various authorities and carried out excavation work, back filling of trenches, recovery of old mains, &c.

(e) *Demolition of Property.*

During the year 190 properties were sold for demolition, the total receipts being £5,218.

(f) *General.*

The whole of the girder reinforced roof under the new Scots Church site was waterproofed with bituminous sheeting, total area 1,123 square yards.

A considerable amount of temporary fencing was carried out, total length 3,870 feet.

Around the Hickson-road retaining wall the kerbing and guttering was completed.

A drinking fountain, erected by the City Council in 1857, was removed to the grounds of the Fort-street Girls' High School.

The average number of men employed during the year was 184, while at the end of June there were 248.

IV.—FINANCIAL REVIEW.

(a) *Land Tax.*

To defray one-third of the capital cost of the land resumptions and construction of the Sydney Harbour Bridge and Approaches, a land tax of one halfpenny in the pound was imposed upon the unimproved capital value of all ratable land within the city of Sydney, the Municipalities of North Sydney, Mosman, Manly, Lane Cove, and Willoughby, the Shires of Warringah and Ku-ring-gai and portion of the Shire of Hornsby.

The tax was first imposed in the year 1923; the rates for the years 1923–28 are as shown on table appended. Of the amount due to 30th June, 1928, £720,683 8s. 7d. was paid to the Special Deposit Fund, leaving a balance of £183,098 2s. 6d. to be paid before 31st December, 1928.

Interest due is calculated on the daily balance, and from 1923 to 30th June, 1928, a total of £64,478 17s. 5d., has been credited to the rates account as interest.

The table shows the details of the rates due since the tax was first imposed, the payments to 30th June, 1928, and the balance outstanding at 30th June, 1928.

(b) *Expenditure.*

The total expenditure up to 30th June, 1928, is shown in the following table. The total cost of the Bridge and Approaches, including land resumptions, interest on construction, and all expenditure prior to 1st July, 1923, is £3,348,908 6s. 5d.

It will be seen that the wages variation to date on the contract of Dorman, Long & Co. for the main bridge and ten steel approach spans is slightly greater than 9 per cent. of the total amount paid to the Contractors for construction.

RATE LEVY—YEARS 1923 TO 1928.

Rates Due.

	1923.	1924.	1925.	1926.	1927.	1928.	Total.	Payments to 30th June, 1928.	Balance outstanding at 30th June, 1928.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Council ...	74,035 19 1	91,666 4 1	92,149 5 0	92,512 6 1	124,928 15 1	127,522 19 9	602,815 9 0	468,078 15 9	133,836 13 3
Hornsby Shire Council ...	3,072 18 4	3,203 11 0	3,326 17 9	3,348 5 6	3,872 0 7	3,851 9 8	20,675 3 0	17,934 16 9	2,740 6 3
Ku-ring-gai Shire Council ...	6,259 11 2	6,625 0 7	7,703 0 5	7,739 4 8	7,917 16 7	12,075 15 10	48,320 9 3	38,244 13 5	10,075 15 10
Lane Cove Municipal Council ...	2,400 6 14	2,440 14 1	2,440 0 6	3,012 1 11	3,027 18 10	2,971 1 5	16,292 3 7	14,912 6 6	1,379 17 1
Manly Municipal Council ...	5,051 12 7	6,362 16 8	6,437 19 6	6,494 8 4	7,611 12 11	7,478 8 7	39,436 18 1	33,159 13 10	6,277 4 3
Mosman Municipal Council ...	5,357 7 4	5,854 17 3	5,850 3 4	5,900 4 0	6,737 13 11	6,696 1 3	36,396 7 3	32,257 5 7	4,139 1 8
North Sydney Municipal Council ...	9,646 10 2	9,699 12 4	10,943 12 1	10,838 14 3	10,700 8 5	12,537 16 9	64,366 14 0	53,624 17 4	10,741 16 8
Warringah Shire Council ...	3,919 10 7	4,661 2 7	5,707 7 2	7,022 12 1	7,103 18 5	7,878 11 8	36,293 2 6	28,372 6 5	7,920 16 1
Willoughby Municipal Council ...	5,024 10 1	5,294 11 4	5,389 14 5	7,931 11 10	7,824 7 7	7,820 9 1	39,185 4 5	33,198 13 0	5,986 11 5
	114,768 6 0	135,808 9 11	139,948 0 2	144,699 8 8	179,724 12 4	188,832 14 0	903,781 11 1	720,683 8 7	183,098 2 6

EXPENDITURE to 30th June, 1928.

Work.	To 30th June, 1923.	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Bridge—Salaries, &c. ...	17,058 7 4*	1,581 5 9	15,821 18 8	12,703 0 0	16,120 17 10	22,093 10 4	85,378 19 11
Dorman, Long and Co.'s Contract	6,769 4 2	100,029 14 6	450,265 2 1	674,409 5 11	1,231,473 6 8
Dorman, Long and Co.'s Wages—Variation	10,101 13 5	38,827 8 8	64,493 11 2	113,422 13 3
Approach	91,651 13 6	103,503 3 2	58,758 8 6	62,493 13 2	131,857 13 8	448,264 12 0
Approach	30,375 10 0	23,767 13 11	131,533 19 11	185,677 3 10
Options	46,195 0 0	73,753 8 7	245,382 3 5	278,799 7 2	432,175 11 7	1,076,305 10 9
Derby Bay Station	43,730 18 0	58,704 9 2	3,274 5 6	4,535 19 4	Cl. 28,469 4 3†	81,776 7 9
Station Expenditure	22,619 19 3	35,266 13 1	68,572 19 11	126,459 12 3
at Moruya	150 0 0	...	...	150 0 0
Totals ...	17,058 7 4	183,158 17 3	258,552 3 9	483,394 14 7	910,076 15 3	1,496,667 8 3	3,348,908 6 5

* This amount includes all costs involved from the inception of the work in 1900 to 30th June, 1923.

† A credit of £31,395 0s. 10d. was received from Railway Department in June, 1928, in adjustment of amounts over-debited during previous years.

V.—SCHEME FOR IMPROVEMENT OF TRAFFIC AVENUES.

With the consent of the Minister I gave evidence before the Traffic Advisory Committee and submitted various schemes for the improvement of the existing traffic avenues and for the establishment of additional ones to provide for the increased traffic consequent upon the completion of the Sydney Harbour Bridge. All the schemes submitted were favourably reported upon by the Traffic Advisory Committee.

Among the schemes was the provision of a roadway above the Quay Station to carry traffic from the Bridge Highway to Macquarie-street, thus providing a direct outlet from the Bridge to the eastern side of the City. This scheme was strongly recommended by the Traffic Advisory Committee.

VI.—STAFF.

The number of men directly employed on the Sydney Harbour Bridge and Approaches as at 30th June, 1928, was approximately 1,450. Dorman, Long & Co. employ 240 at Moruya Quarry, and in transporting material from Moruya to Sydney; about 700 are employed in placing concrete and masonry, fabricating steelwork in the workshops and in erecting the steelwork, whilst some 500 men are employed on the construction of the Approaches under the Public Works Department.

As reported at various times, great difficulty has been experienced in obtaining suitable draftsmen. During the year there have been several resignations, draftsmen leaving to get higher salaries.

Applications have been repeatedly called, but it was found not possible to obtain suitable men in New South Wales because of better salaries offering elsewhere, whilst Graduates in Engineering of the University of Sydney can apparently do better outside the Public Service. The result has been that draftsmen have been brought from Victoria, South Australia, and in one case from Tasmania.

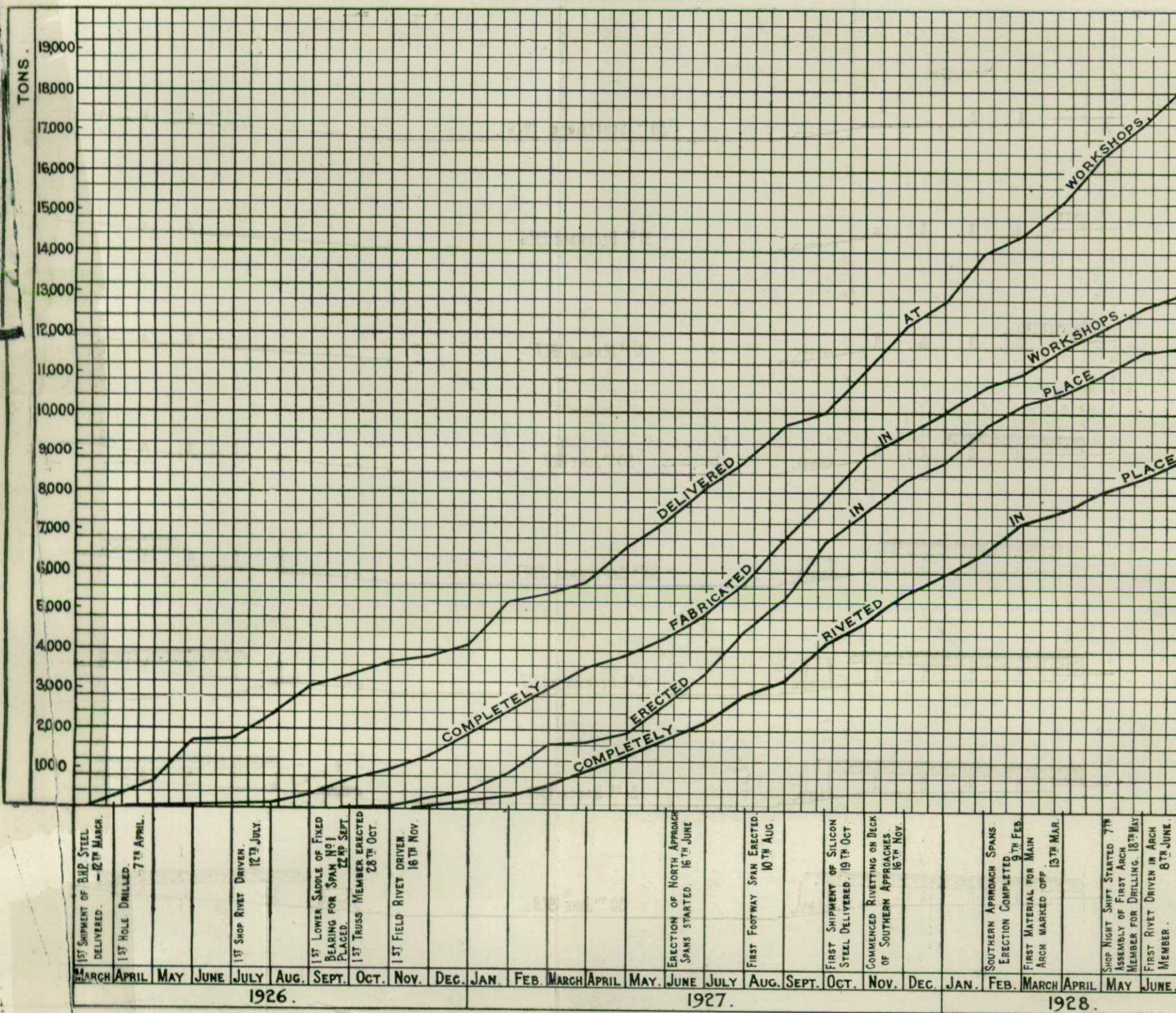
I desire to thank the Superintendent of Stores, Mr. Peterson, and his staff for their co-operation and assistance in the work of this Branch, whilst the work of the Bridge Branch Staff has been carried out thoroughly and efficiently, and I wish to place on record my appreciation of their work during the year.

J. J. C. BRADFELD,

Chief Engineer, Sydney Harbour Bridge.

16th October, 1928.

SYDNEY HARBOUR BRIDGE.



Graph showing the quantities of steelwork delivered, fabricated, erected in place, and completely riveted in place since the first steel delivery.

SYDNEY HARBOUR BRIDGE.

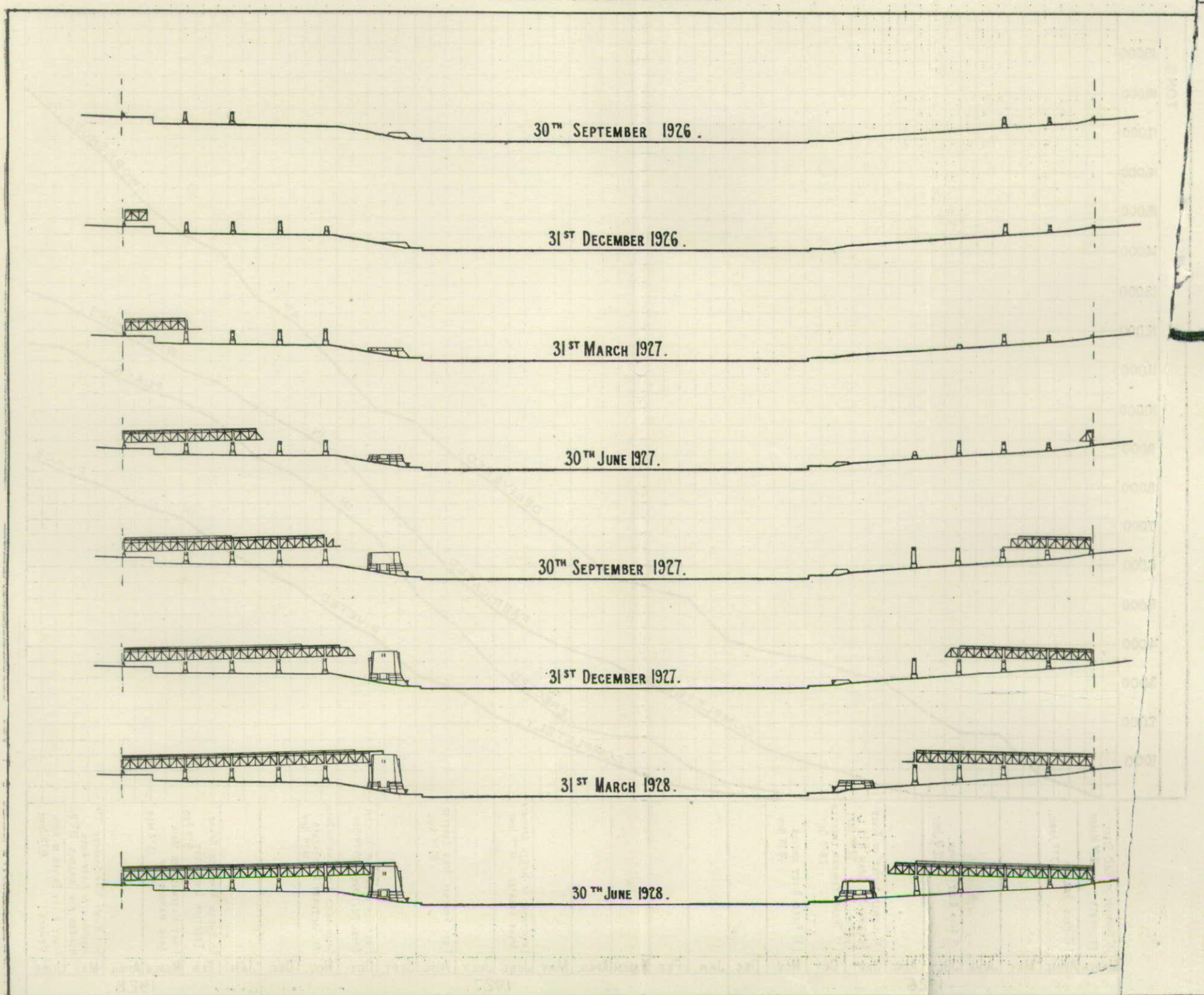
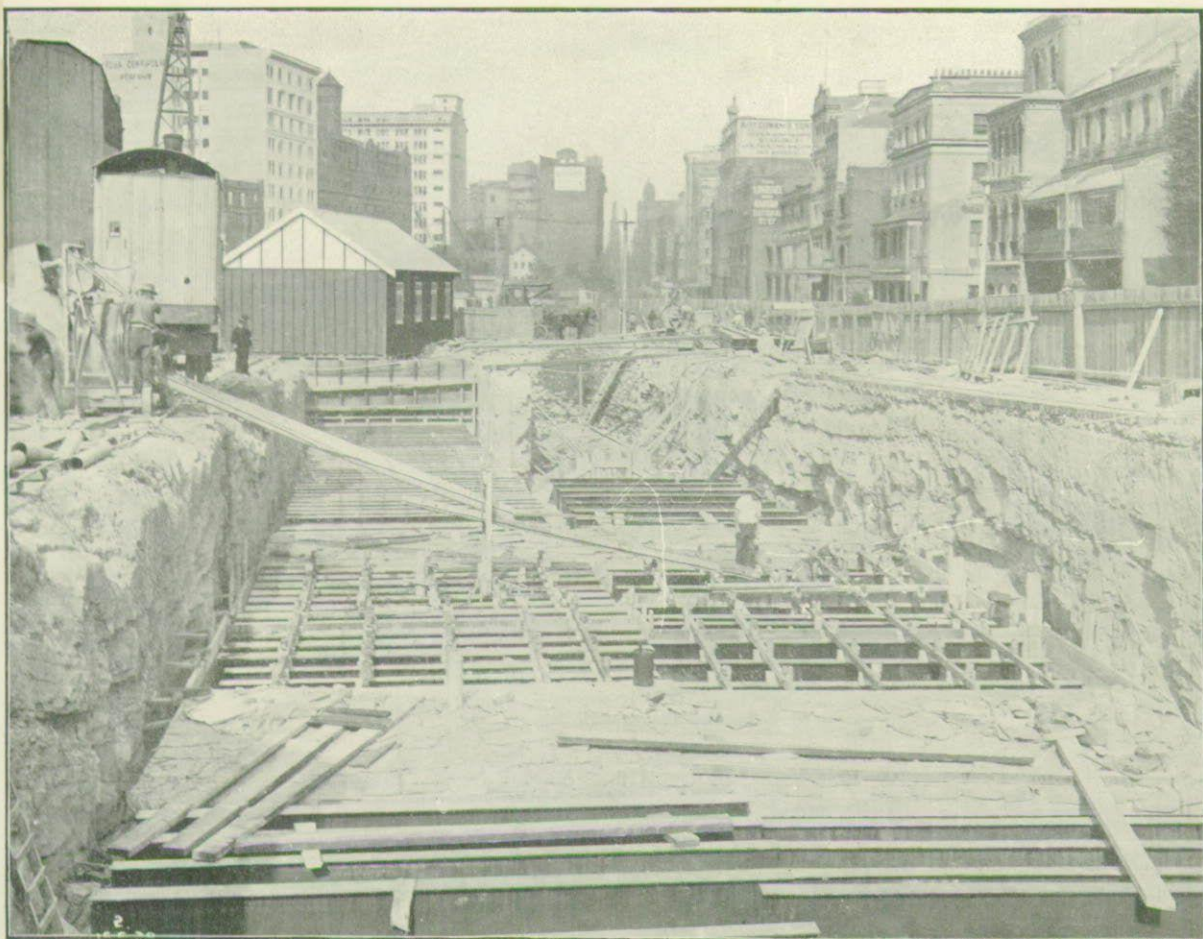


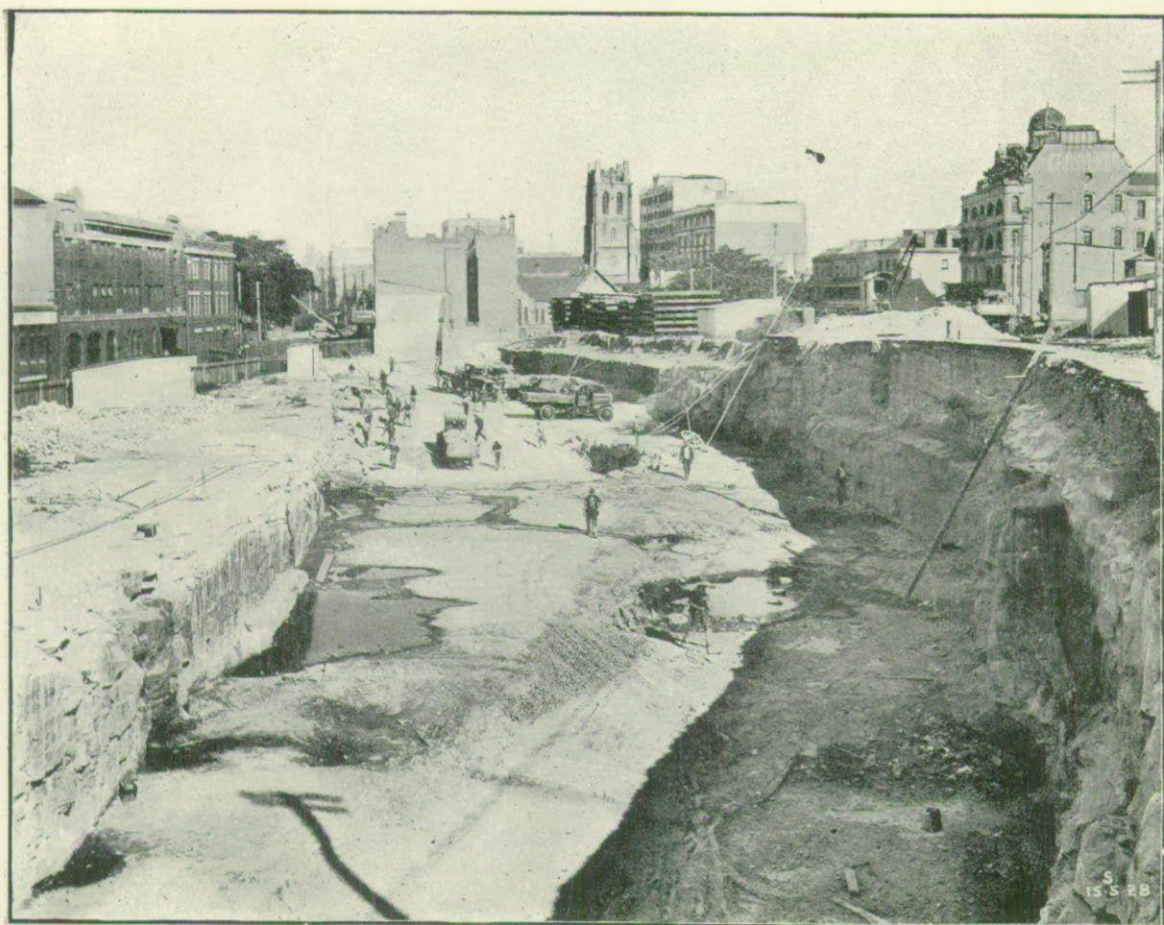
Diagram showing the progress of construction at each three monthly period.



Double and single tracks between Margaret-street and Jamieson-street roofed with steel beams upon which the new Scots Church will be constructed.



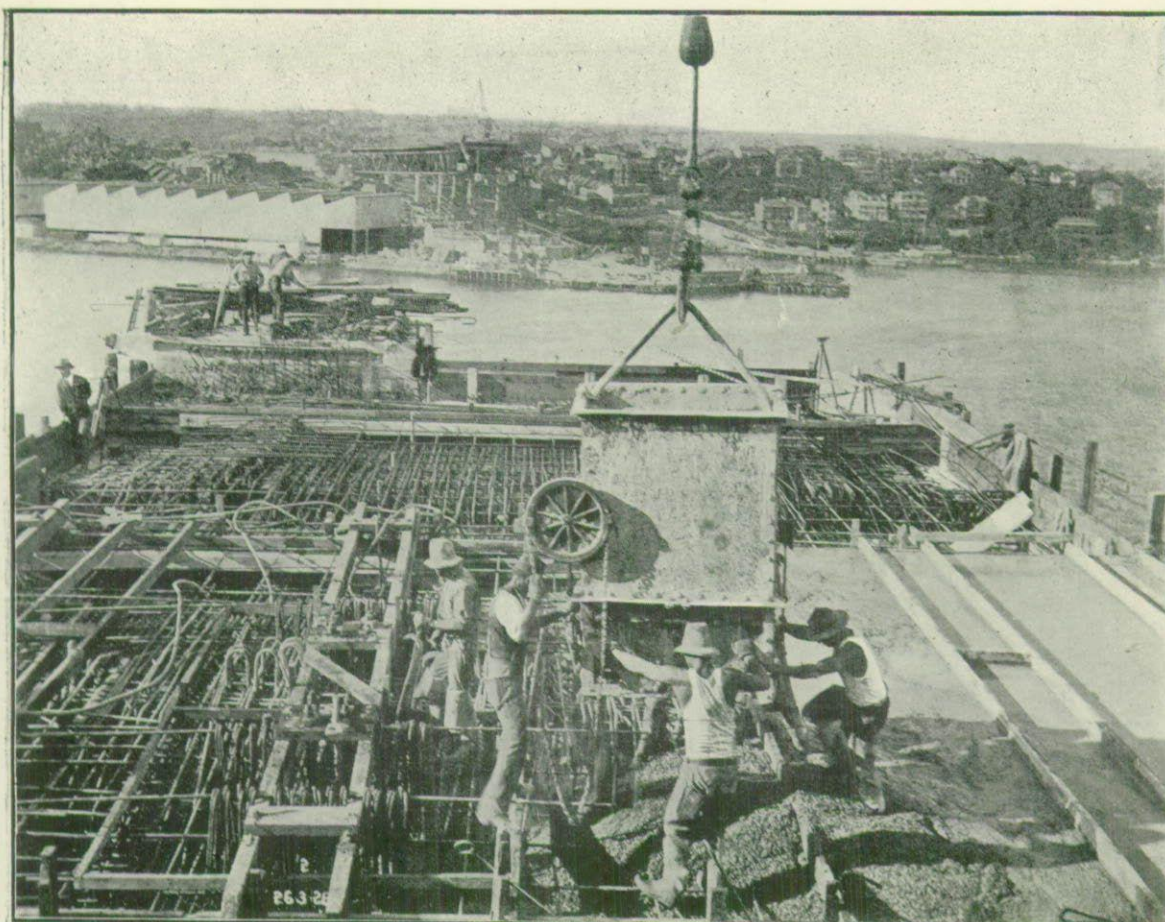
The double track construction, providing for four railway tracks under York-street.



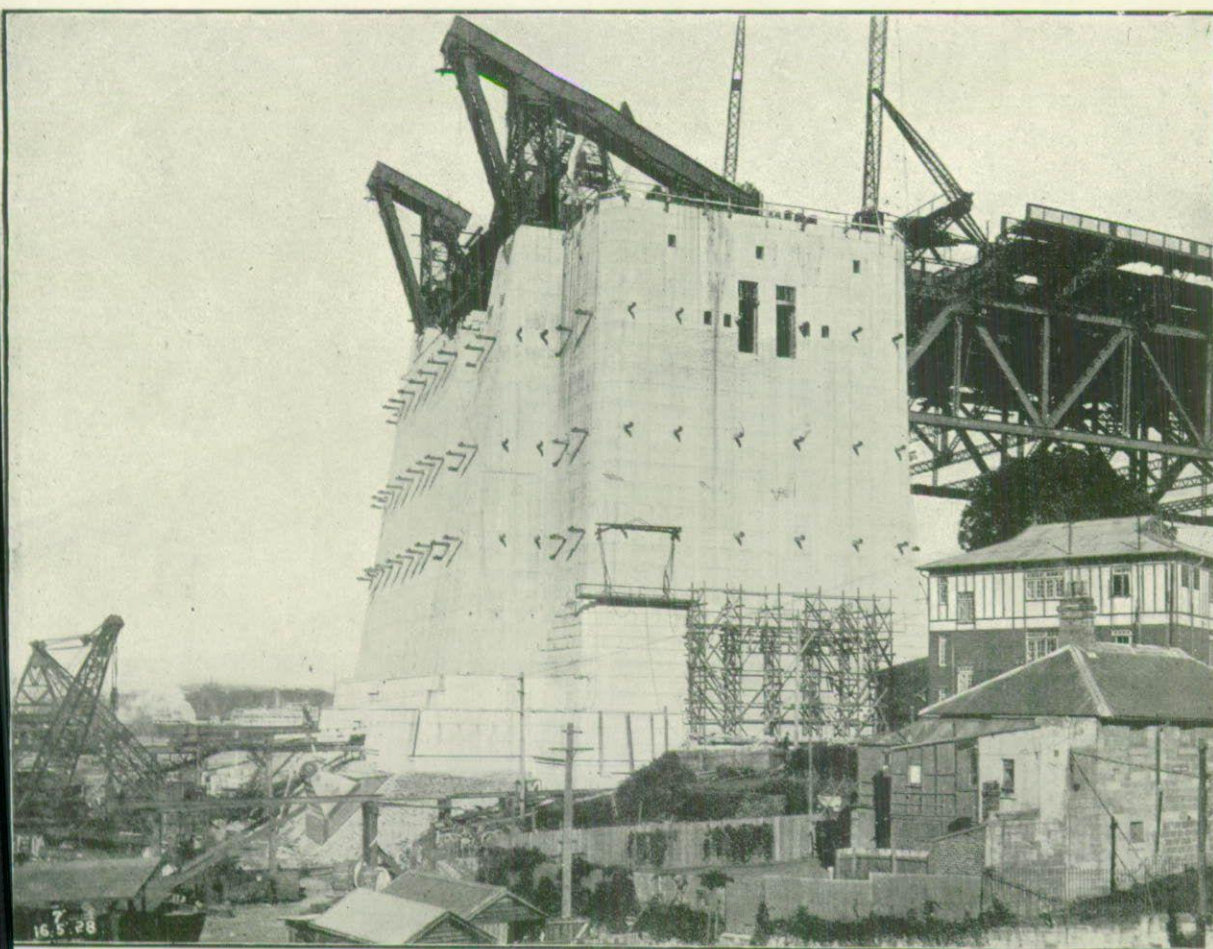
The open cut excavation near Grosvenor-street; this will be roofed with the steel beams shown in the distance and the Bridge-avenue will be constructed above.



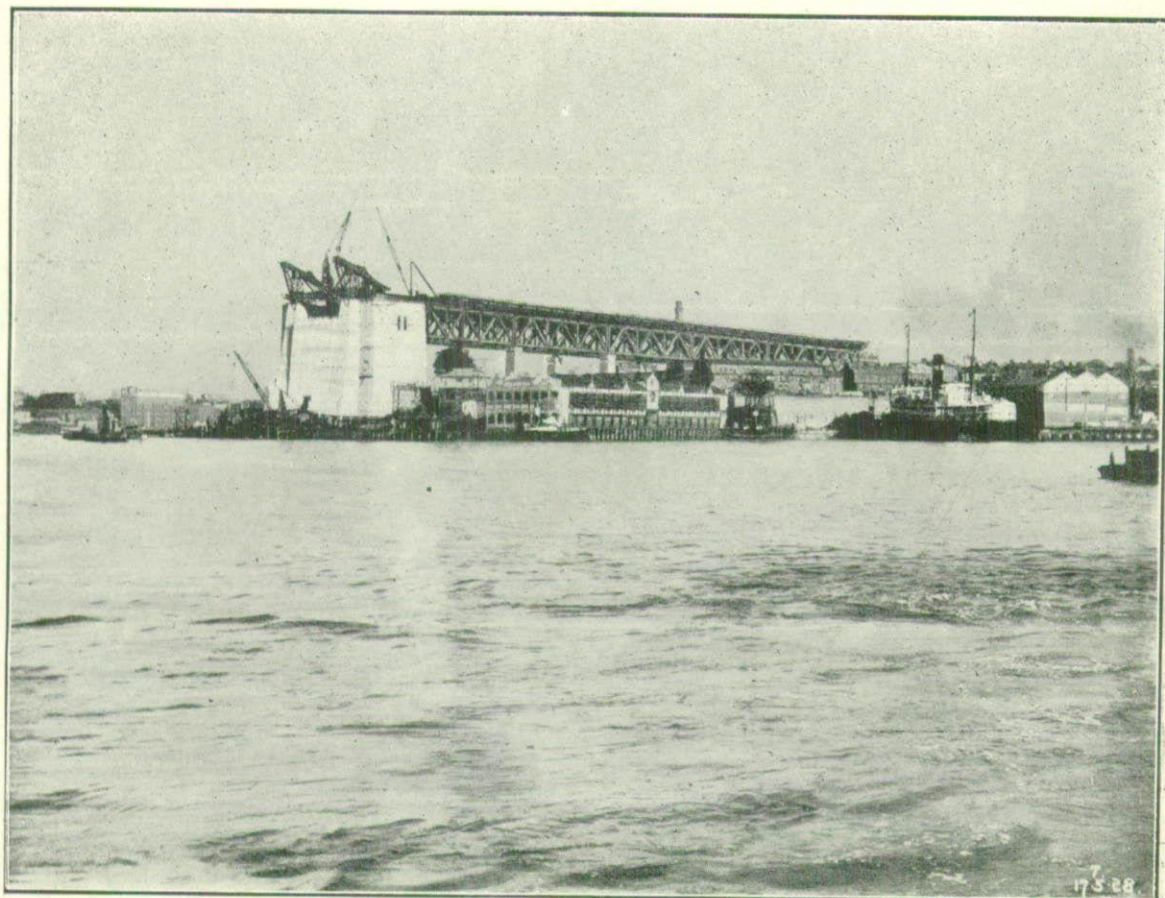
The Tunnel Cable Saddle; each pipe is $4\frac{1}{2}$ -inch diameter and will take one anchorage cable. There are 128 cables in all, 3-inch diameter.



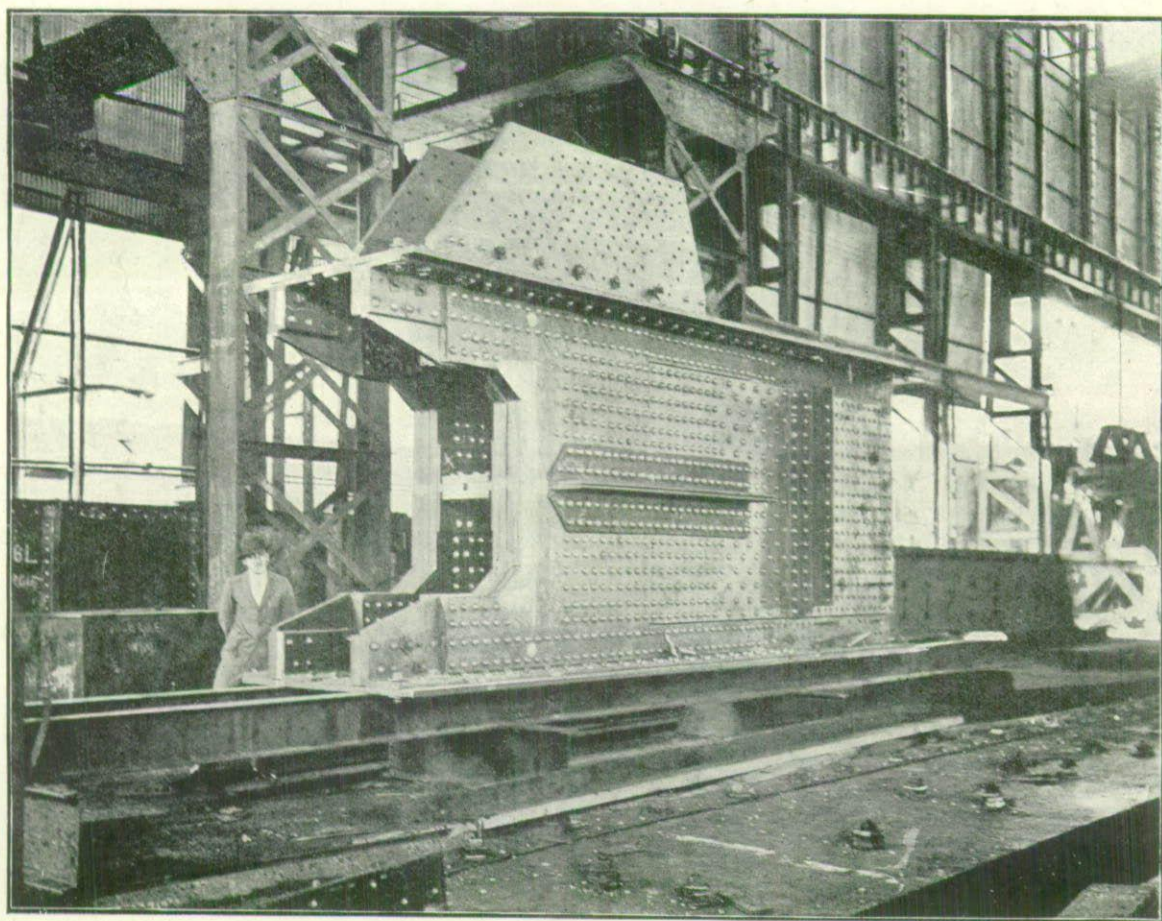
Pouring the reinforced concrete floor of the South Abutment Tower.



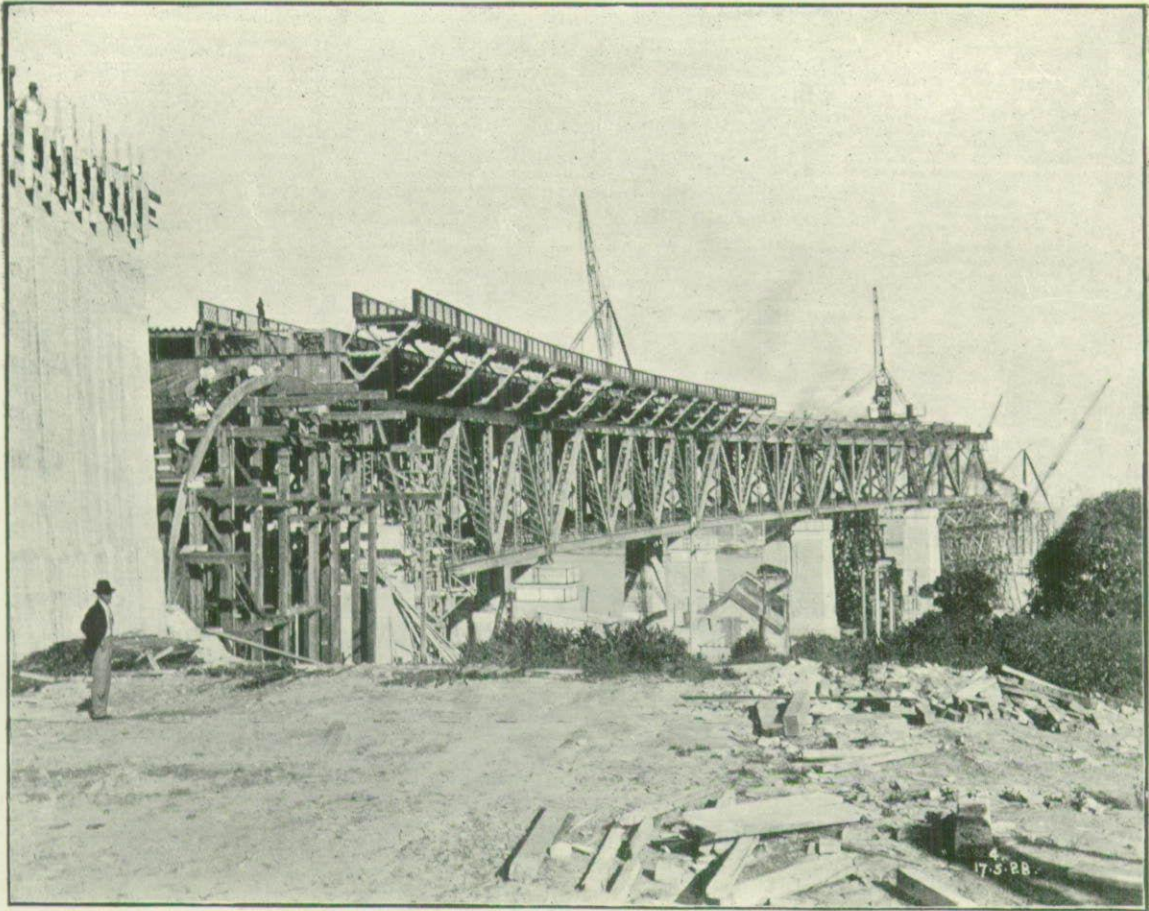
The South Abutment Tower showing the temporary ramp upon which the creeper crane will be erected.



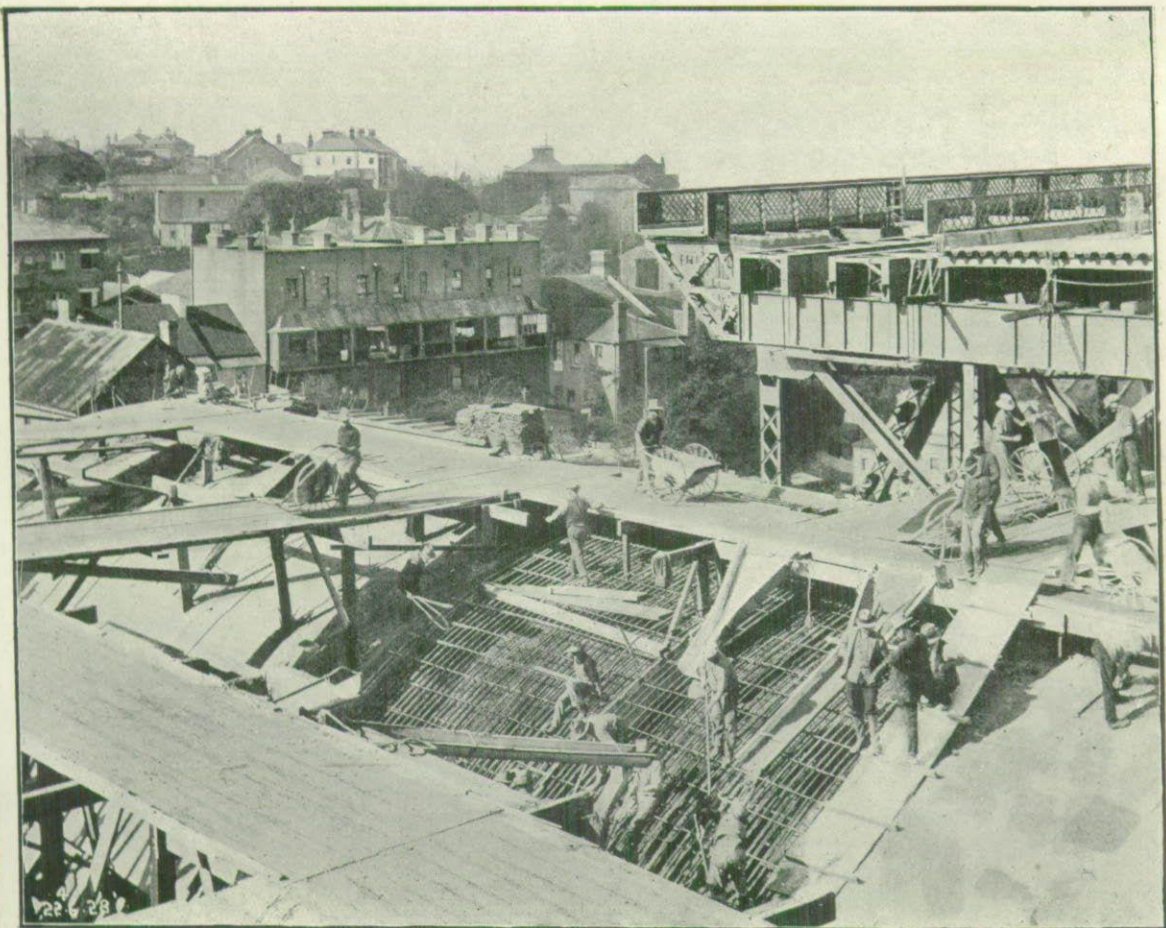
The Southern Approach from the Harbour (near McMahon's Point).



Portion of the first fabricated section of the Main Arch, weight 78 tons.



The Northern Approach showing Span No. 10 nearing completion.



Pouring the Arch Ring of Fitzroy-street Arch.

Government Architect's Branch.

Report for year 1927-28.

Report of the operations of the Government Architect's Branch for the year ending 30th June, 1928.

The certified expenditure is set forth hereunder and for the purposes of comparison that of the two preceding years is also scheduled.

Vote or Account.	1925-26.		1926-27.		1927-28.	
	£	s. d.	£	s. d.	£	s. d.
Loans	98,647	5 8	88,849	6 11	82,811	1 3
Consolidated Revenue.....	71,018	5 11	65,233	18 6	62,236	2 5
Public Works Fund	70,435	11 5	92,195	12 7	91,979	8 6
Special Deposits	6,337	5 6	24,011	7 0	27,321	18 4
Other Departments	134,084	0 5	107,100	1 2	215,463	6 11
	£380,522	8 11	377,390	6 2	479,811	17 5

Officers of this Branch have also supervised for the Department of Education the erection of a number of school buildings in the country districts of the State, the total cost for the twelve months amounting to £209,552 6s. 8d.

DRAWING OFFICE.

Contract Drawings.

The following works, for which contract drawings, estimates and specifications have been prepared, are the most important of those dealt with during the year :—

Crown-street Women's Hospital, New Isolation Block and Laundry.—To meet the demand for accommodation, a new isolation block is necessary, and plans have been prepared for a fireproof brick structure of five floors on the corner site of Riley and Fitzroy streets, and will be connected to the main hospital building by a long ramp. The accommodation provides for thirty-six patients, and is complete with waiting, consulting, examination, preparation, labour and operating rooms.

In addition, quarters have been provided for a resident Medical Officer and rooms for matron, doctors and students, and all the usual duty room and laundry accommodation. Staff dining rooms have been arranged on the ground floor, and the two upper floors have been designed as quarters to accommodate twenty-three nurses, and are complete with sitting rooms and all conveniences.

Plans have also been prepared for a laundry and boiler house forming a separate block, together with mattress sterilizer, mortuary and pathological laboratory.

The total cost of both these buildings has been estimated at £50,000.

Manly Peace Memorial Hospital, Additional Buildings.—During the year plans have been prepared for the men's quarters, boiler house, laundry block and isolation block.

The men's quarters are conveniently situated and consist of bedrooms and a large sitting room and the customary conveniences generally arranged for in a small residence. In addition, ample verandah space is provided.

The boiler house is to serve all buildings in the completed scheme, and accordingly will be placed centrally, and has been planned to provide a large boiler room, workshop, pump room, engineer's office and lavatories. In addition ample coal bunkers have been allowed for. The chimney stack has been designed 100 feet high to prevent a smoke nuisance to the ward blocks situated on higher ground.

The laundry block will comprise large washing accommodation, receiving, delivery, sewing, and patients' clothes rooms and adequate lavatories. A mattress sterilizer will also be provided. The isolation block has been planned to meet the advantages of a site from which magnificent harbour views are obtained, and will give accommodation on somewhat the usual lines, having two small wards and two single rooms with access to wide verandahs. In addition, a small operating ward will be provided for minor operations.

The buildings are all of brick with tile roofs, and it is estimated that a sum of £17,500 will be needed for their completion.

Orange Mental Hospital.—Plans for further buildings have been prepared towards completion of this scheme, consisting of an operating block, sewing room block and mortuary. Amended plans have also been prepared for two blocks for unrecovered patients.

The operating block will comprise an operating theatre, anaesthetic, sterilising and doctors' rooms.

The sewing room block will provide accommodation for a large sewing room, a machine room and general reading and sitting rooms. In addition, there are large verandahs, storage rooms, and lavatories.

The mortuary and chapel will have viewing and post-mortem rooms opening on to large entrance porches, and is designed in simple Gothic treatment.

The buildings for unrecovered patients will be two-storey structures, containing two large dormitories, eleven single rooms, dining and day rooms, and all necessary conveniences. These buildings will be of brick construction, with tile roofs, and are estimated to cost about £49,000.

Junee Hospital, New Buildings.—This additional group of new buildings includes a main ward block with accommodation for twenty-four beds, a children's ward block of eight beds, and kitchen, operating and laundry blocks.

The buildings are single-storey structures of brick and mottled tile roofs, and generally have been designed to conform to the colonial style, with wide sleeping-out verandahs, to which direct access is obtained from the wards.

It is estimated that the cost of these buildings will be about £23,000.

Royal North Shore Hospital, Nurses' Quarters.—It has been found necessary to prepare fresh plans for this work, in order to meet the hospital committee's requirements for additional accommodation to that already provided in the original plans. This has been met by an additional floor having accommodation identical with that of the floor below it, and which increases the number of bedrooms for nurses and staff from 114 to 167. The new scheme has increased the original estimate by £12,300, and the estimated cost in accordance with the amended plans will be about £67,300.

Parramatta District Hospital, New Ward for Children.—This building will be a single-storey structure with provision for sixteen beds in a main central ward, at each end of which are wings containing treatment rooms, special and staff rooms and the usual lavatory accommodation. The ward has been designed on the most modern lines for the treatment of children, with access front and back on to verandahs 15 feet wide, and at front special provision has been made for a sun area. The building will be constructed of brick, cement rendered externally, and having stone dressings and tile roof. The estimated cost is £10,500.

Griffith Court-house.—This building will occupy the north-west end of an island site in the principal and most elevated portion of the town.

To meet the request of the Irrigation Commission that this building might form a definite part of a future group of buildings, a simple classic treatment has been adopted, and each facade treated to harmonise with the proposed designs of the other contemplated buildings.

The building has been planned somewhat on the usual lines, allowing for a central court room, and the customary provision of rooms for the Magistrate, C.P.S., Sheriff, jury, witnesses, and counsel. It is of brick construction, with cement dressings, and the main roof of slate, and is estimated to cost £13,000.

Newcastle Mental Hospital, Additions to Nurses' Quarters.—The plans prepared for the additions to the existing nurses' quarters make provision for twenty-two extra bedrooms, two recreation rooms, sleeping-out verandah and balcony, dining-room, kitchen and all the necessary lavatory accommodation and other offices.

The work to be carried out also includes the renovation of the existing nurses' quarters both externally and internally.

The estimated cost is approximately £11,200.

Hotel Kosciuszko, Additional Accommodation.—To meet the increasing demand for accommodation by tourists, a further extension has been found necessary to the hotel. The plans prepared allow for an addition to the existing main building, by extending the southern side in timber construction on concrete foundation walls and iron roof to correspond in all respects with the existing work.

The accommodation will be provided in two floors, and consists of single and double bedrooms, and suites containing bedroom, sitting room, bath and lavatory conveniences. In addition, a separate bathroom and lavatory block of reinforced concrete construction will serve each floor and will be complete with all modern conveniences.

Extensive improvements will also be carried out to the southern courtyard, including the filling to permanent levels and paving with concrete to form an area directly accessible from the main building.

It is expected that the additions will be completed for approximately £6,000.

Police Depot, Bourke-street, Redfern.—Residential additions to existing store, consisting of two additional floors and flat roof, with staircase annex and necessary alterations and additions to the store.

A total of twenty-eight single bedrooms is now provided together with a large common room and adequate bath room and lavatory accommodation.

On the third floor in addition to the bedrooms is a band practice room, instrument room, and lavatory for the use of members of the New South Wales Police Band.

The building is of brick with concrete floor and staircase and faced externally with fine roughcast, and is estimated to cost £8,000.

Wollongong District Hospital.—Plans have been prepared for additions to the existing nurses' home. The present building is a two storied brick structure roofed with single tiles. The new work will provide for twenty additional bedrooms from which access will be obtained to wide sleeping-out balconies. A large recreation room, private laundry, kitchenette, and full lavatory accommodation will also be provided.

The extensions have been designed to harmonise with the existing building and will have concrete floors; the corridors being finished with cork tiles.

The estimated cost is £8,800.

Installation of Carillon, Sydney University.—The Carillon of sixty-two bells purchased from Taylor's of Loughboro, as a memorial to members of the University who fell in the Great War, has been installed in the Great Tower of Sydney University, together with an electric clock with new faces on all four sides of tower.

The work of preparing the tower to take the installation consisted chiefly of strengthening the existing structure, which is of ashlar sandstone, with ferro-concrete beams and slabs, and the provision of suitable foundation beams to carry the weight of the new bells and frame. This entailed the removal of existing floors and roof, and the addition of a new roof and gallery over the bells.

Liverpool State Hospital, Additional Verandahs and Sanitary Annexes.—The buildings at present used as ward blocks at this hospital are amongst the earliest erected in the State, and are far from satisfactory in the accommodation provided to meet present modern requirements. To overcome the difficulty plans have been prepared for additions consisting of wide verandahs and balconies to wards "A", "B", "C", "D", "G," together with sanitary annexes containing duty, sink and bath rooms, and lavatory conveniences for both patients and staff. A mattress sterilizing room will also be provided in the basement.

The additions are to be constructed of brickwork with reinforced concrete floors and iron roofs, at an estimated cost of £8,300.

Yass District Hospital, Remodelling.—The work comprises alterations and additions to increase the accommodation to twenty-five patients, and includes five single bed wards, wide verandahs, duty rooms, and new sanitary annexes. The nurses' quarters will be added to, and quarters provided for domestics. A new operating room with anæsthetic and doctors' room will also be provided.

The total cost is estimated at £15,000.

Waterside Workers' Federation, Additions to Building.—An extension to the waterside workers' building in Sussex-lane, Sydney, has been erected at an estimated cost of £7,500, and provides a hall for meetings on the ground floor. Official quarters and reading room on the first floor with caretaker's quarters over.

The building is of fireproof construction, built in very simple design to match the existing building.

Turramurra Police Station.—Plans have been prepared for a new police station at Turramurra, providing accommodation for living room, four bedrooms, and the usual offices, together with an office for police purposes.

The building is to be erected in brick, cement rendered on stone foundation and with tiled roof.

The estimated cost is £3,800.

Gulgambone Court-house and Police Station.—This building combines a court-house, police station and a lock-up keeper's residence. The accommodation provides for a large court room and magistrate's room, a charge room and office, and cells and exercise yard, and quarters for a single constable.

The residence is attached to the main building, and is a conveniently arranged home for a man with a family and allows for the usual accommodation and conveniences.

Constructed of timber framing sheeted externally with weatherboards and lined with fibro-cement, and having a tiled roof.

The estimated cost is £4,800.

Campsie Police Station and Lock-up Keeper's Quarters.—This building is to be erected on a site adjoining the court-house, and comprises a police station having the usual accommodation of charge room, office, muster room, and conveniences, and, connected thereto, a residence of five main rooms, kitchen, and offices. Provision has also been made for cells and an exercise yard, and necessary garages.

The estimated cost of the complete scheme is £5,670.

Mascot Police Station.—Plans have been prepared for a new building comprising a police station, cell range and residence to be erected with the main northern frontage facing Mile-street. The accommodation provides for a charge room, office, and the customary storage and lavatory conveniences, and a residence of four rooms, kitchen, and usual offices with garages situated at the rear of the site.

The building will be a brick structure with tiled roof, and is estimated to cost £5,000.

Plans and specifications were prepared for the following works estimated to cost £1,000 or over:—

Australian Museum	...	...	...	...	New room over spirit store.
Bigga Police Station	...	...	...	...	New building.
Brentwood Hospital, Muswellbrook	...	...	...	...	New isolation block.
Burrinjuck Hydro-Electric Scheme	...	...	...	...	Overseer's residence.
Burrangong Hospital, Young	...	...	...	...	Additional treatment plant.
Byron Bay	...	...	...	...	Wharfinger's residence.
Camden District Hospital	...	...	...	...	New home for nurses.
Collarenebri Hospital	...	...	...	...	New home for nurses.
Condobolin District Hospital	...	...	...	...	Alterations to nurses' quarters.
Cessnock Police Station	...	...	...	...	Sergeant's quarters and cells.
Cootamundra District Hospital	...	...	...	...	New staff block.
Dubbo Gaol	...	...	...	...	Additions and alterations.
Dubbo Gaol	...	...	...	...	New residence for warder.
Euston	...	...	...	...	Resident engineer's residence.
Gunnedah District Hospital	...	...	...	...	New isolation block.
Harden Police Station	...	...	...	...	New buildings.
Merriwa District Hospital	...	...	...	...	Additions to nurses' quarters.
Mudgee District Hospital	...	...	...	...	New isolation block.
Moruya District Hospital	...	...	...	...	Additions.
Murrumburrah-Harden Hospital	...	...	...	...	New quarters for nurses.
Mandurama Police Station	...	...	...	...	New building.
North Sydney Police Station	...	...	...	...	Alterations and additions.
Long Bay Penitentiary	...	...	...	...	New residence for warder.
Rylstone District Hospital	...	...	...	...	New treatment block.
Royal Prince Alfred Hospital	...	...	...	...	Remodelling for clerical and casualty department.
Regent-street Police Station	...	...	...	...	Additions.
Trundle Court-house	...	...	...	...	New building.
Urunga Pilot Station	...	...	...	...	Boatman's cottage.
Walcha Hospital	...	...	...	...	Alterations.
Wingham Court-house	...	...	...	...	Additions.
Wee Jasper Police Station	...	...	...	...	New building.
Wallsend Police Station	...	...	...	...	Alterations and additions to sergeant's quarters.
Wallsend Mining Hospital	...	...	...	...	Additions to boiler-house and laundry.
Yass Police Station	...	...	...	...	Inspector's residence.

SKETCH PLANS:

List of the more important works for which sketch plans and estimates have been prepared:—

Public Buildings.

Department of Agriculture	...	...	...	...	New building.
Parliament House	...	...	...	...	Additional accommodation for Opposition.
Board of Health	...	...	...	...	Additions.
Agricultural Hall for the Department of Agriculture	...	...	...	...	Building at R.A.S. Ground.

Hospitals.

Bega District Hospital	...	...	...	...	New quarters for nurses.
Balmain District Hospital	...	...	...	...	Outpatients' Department.
Balmain District Hospital	...	...	...	...	Medical officer's quarters.
Balmain District Hospital	...	...	...	...	New maternity block.
Collarenebri District Hospital	...	...	...	...	New X-ray room.
Coonamble District Hospital	...	...	...	...	New maternity block.
Cooma District Hospital	...	...	...	...	New maternity block.
Griffith District Hospital	...	...	...	...	Conversion of existing farm colony buildings.
Lidcombe State Hospital	...	...	...	...	Additions.
Leeton District Hospital	...	...	...	...	Increased accommodation.
Lidcombe State Hospital	...	...	...	...	New epileptic ward.
Lower Clarence Hospital, Maclean	...	...	...	...	Remodelling.
Narromine District Hospital	...	...	...	...	New building.
Portland District Hospital	...	...	...	...	New isolation block.
Prince Albert Memorial Hospital, Tamworth	...	...	...	...	Remodelling.
Royal Prince Alfred Hospital	...	...	...	...	Alterations to administrative block.
Royal Prince Alfred Hospital	...	...	...	...	New psychiatry block.
St. George's Hospital, Kogarah	...	...	...	...	New ward for children.
Stockton Mental Hospital	...	...	...	...	Junior Medical Officer's residence.
Tumut District Hospital	...	...	...	...	New maternity block.
Tamworth District Hospital	...	...	...	...	Addition to nurses' quarters.
Wentworth District Hospital	...	...	...	...	New maternity block.
Wollongong District Hospital	...	...	...	...	New isolation block.
Scarba Welfare Centre	...	...	...	...	New admission block.
Newcastle Hospital	...	...	...	...	New V.D. and outpatients' block.

Police Stations.

Cessnock Police Station	...	...	...	...	Sergeant's quarters.
Coff's Harbour Police Station	...	...	...	...	Alterations and additions.
Gulgong Police Station	...	...	...	...	New building.
Gilgandra Police Buildings	...	...	...	...	New building.
Griffith Lock-up and Lock-up Keeper's quarters	...	...	...	...	New building.
Harbord Police Station	...	...	...	...	New building.
Kearsley Police Station	...	...	...	...	New building.
Leeton Police Station	...	...	...	...	Sergeant's quarters.
Mandurama Police Station	...	...	...	...	New building.
Mudgee Police Building	...	...	...	...	New quarters.
Menindie Police Building	...	...	...	...	New building.
North Stockton Police Station	...	...	...	...	New building.
Pymble Police Station	...	...	...	...	New building.
Rappville Police Station	...	...	...	...	New building.
Sutherland Police Station	...	...	...	...	New building.
Strathfield Police Station	...	...	...	...	New building.
Tamworth Police Station	...	...	...	...	New building.
Vaughan Police Station	...	...	...	...	New building.
West Tamworth Police Station	New building.

Court-houses.

Wallsend Court-house	New building.
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Other Buildings.

Yarragobilly Caves House	New kitchen block.
Hotel Kosciusko	Additions.
Newcastle City Morgue	...	...	...	...	New building.

SPECIAL DRAWINGS.

Many perspective and other special drawings have been prepared, particularly in regard to the construction of, and the alterations to, the Aquarium at the Zoological Gardens, Taronga Park, the Sydney Harbour Bridge and Approaches, and the Avon Dam.

A number of poster and advertising pictures were designed for the Government Tourist Bureau, and perspective pictures of the Memorial Hospitals at Manly and Canterbury prepared.

INSPECTIONS, VALUATIONS, AND REPORTS.

As in former years, the Branch has made available to the Fair Rents Court, the Water, Sewerage, and Drainage Board, and the Sydney Harbour Bridge authorities, the services of officers for the purposes of making inspections and valuations, furnishing reports and investigating claims as required.

STATISTICAL SUMMARY.

Plans prepared :—									
Originals	...	...	...	...	...	...	...	...	976
Copies	...	...	...	...	...	...	...	...	5,123
Total									6,099
Specifications :—									
Drafts	...	...	...	...	...	...	...	...	236
Copies	...	...	...	...	...	...	...	...	1,342
Total									1,580

METROPOLITAN DISTRICT.

Court-houses and Police Stations.

Katoomba Court-house.—A new and spacious court-room with additional office provision has been added to the old court-house, and the old premises have been remodelled. The improvements are a distinct addition to the architecture of this Mountain resort, the completed cost of the work being £4,920.

Darlinghurst Court-house.—Extensive remodelling of the existing premises for the purpose of providing additional accommodation for jurors has been carried out at the cost of £2,673. This work has met the pressing need for further and more convenient accommodation.

Collaroy Police Station.—A new brick structure has recently been completed at Collaroy. Residential and office accommodation, together with cell provision, have been included in the building, which has been erected at a cost of £5,536.

Clarence-street Police Station.—At a cost of £6,285 the old police station in Clarence-street has been remodelled and added to in order to meet the police activities in this section of the city. Two additional storeys were erected, and facilities have been installed throughout to enable police operations to be carried out under much more favourable conditions than hitherto.

Central Police Barracks.—Extensive alterations and additions are in progress in connection with the barracks, at a cost of £12,380. The new provisions will greatly improve the living conditions of the police resident in the building, and will meet further accommodation requirements. Gymnasium space is being provided for on the flat roof.

State Hospitals.

Coast Hospital.—A new operating block is in course of erection at the cost of about £6,100. The block comprises two theatres and their necessary adjuncts, all planned and equipped on modern lines.

Callan Park Mental Hospital.—At the cost of about £11,550 a new brick pavilion has been erected in association with this institution. The building is for the housing of patients under arrangement with the Repatriation Department of the Commonwealth Government.

Subsidised Hospitals.

Sydney Hospital.—A new building in steel and concrete is being erected at the Sydney Hospital for casualty ward and operating purposes. The structure comprises a basement and six floors, the contract amount being £70,000.

The building is situated on the Domain frontage of the hospital site amidst comparatively quiet surroundings, and is to be equipped with all modern appliances necessary in hospital work.

The ground floor will be allocated to casualty requirements.

On the fifth floor two operating theatres, with their necessary sterilizing and other rooms, will be located. This theatre section is based upon the most modern lines and will be a valuable addition to the institution.

The intermediate floors are taken up with wards.

Mechanical requirements such as heating, sterilizing and hot water provisions are being installed throughout the building.

Manly Peace Memorial Hospital.—The first section of this new hospital, comprising administrative ward, kitchen, and operating blocks, is now nearing completion, at the cost of about £61,800.

Situated on the area adjoining the quarantine grounds the institution is being erected on the heights overlooking the Harbour. It is contemplated that the erection of the remaining section will be undertaken almost immediately.

The new buildings are being erected of brick with mottled French pattern tile roofing.

Royal Prince Alfred Hospital.—A new block for isolation purposes is being erected at the cost of £11,336. Planned and equipped on modern lines the block will provide much needed accommodation for patients in isolation.

Designed on the lines of the Georgian period of architecture the building presents a handsome external appearance. Brick walls with roof of slating have been adopted in the erection of the structure.

Canterbury District Memorial Hospital.—A new hospital, practically a complete institution, is just nearing completion at Canterbury at the cost of about £21,273.

Modern in all respects, the hospital will present a pleasing appearance in its Georgian style of architecture. A tower and small hall under same have been treated as a Soldiers' Memorial Section, the hall constituting the main entrance to the institution.

Tourist Resorts.

Hotel Kosciusko.—A new concrete building of four storeys has recently been completed in connection with the hotel. The structure is of concrete with a view to fire prevention, and comprises a well equipped laundry on the ground floor, rooms for accommodation of the staff on the first and second floors, and a large recreation hall on the third floor. In this building new boiler arrangements have been installed for the purposes of meeting the steam, hot water, and heating provisions of the hotel. Oil fuel has been adopted for the boilers, and in this connection a new system of heating has been installed throughout the hotel premises, with the result that winter conditions internally are much more comfortable for guests than hitherto.

An extension of the main section of the hotel has recently been made at the cost of £6,454, thus making provision for twelve additional bedrooms and further lavatory accommodation. Associated with some of the bedrooms are much needed private bathroom provisions.

Buildings Generally.

National Library.—Additions are in progress in connection with this building and comprise a new basement section as a nucleus of a new wing on the eastern end of the complete scheme as planned, and also a new wing to house the Dixon collection. The extensions are being carried out on the same lines as the original section of the building as far as design is concerned. The stone comprising the face work is from the State Quarries. The estimated cost of the extensions is £60,000.

Waterside Workers' Institute.—Extensive additions and alterations have been recently completed in connection with the Waterside Workers' Institute. The additions provide for a large assembly hall, a minor assembly hall, a business section, and also a caretaker's quarters section. The work involved an expenditure of about £7,500.

CONTRACTS OVER £500 COMPLETED OR IN COURSE OF COMPLETION DURING YEAR AND SUPERVISED FROM THE HEAD OFFICE.

Particulars of Work.		£	s.	d.
Hotel Koscziusko—staff accommodation, laundry, recreation hall	...	22,328	0	0
" " additions to southern end (twelve bedrooms)...	...	6,454	0	0
National Library—extension of Dixon wing, &c. ... ..	...	60,000	0	0
Australian Museum—room over spirit store... ..	...	1,726	0	0
Sydney University—structural alterations to tower ... ..	...	2,200	0	0
Wentworth House—restoration work completion ... ..	...	1,250	0	0
Government Tourist Bureau—erect counters, screens, &c. ... ..	...	1,177	11	8
John Storey Dispensary—erection ... ..	...	6,582	0	0
Balmain District Hospital—renovate and remodel cottages ... ..	...	1,280	0	0
Callan Park Mental Hospital—renewal of guttering ... ..	...	688	10	0
" " " " —buildings for Repatriation Department ... ..	...	11,546	18	1
Canterbury Hospital—new buildings... ..	...	21,273	0	0
Coast Hospital—operating block ... ..	...	6,103	0	0
" " —lock wards ... ..	...	7,369	7	3
Katoomba (Blue Mountains) Anzac Memorial Hospital—erection ... ..	...	17,470	19	0
Marrickville District Hospital—additions and alterations ... ..	...	19,772	14	2
Manly Peace Memorial Hospital—erection ... ..	...	61,842	0	0
Lidcombe State Hospital—new dining rooms for wards ... ..	...	5,450	0	0
" " —erection of forage shed ... ..	...	3,524	7	2
Rachael Forster Hospital—V.D. clinic ... ..	...	1,062	0	0
St. George District Hospital—new operating block ... ..	...	954	0	0
Waterfall Sanatorium—workshops for vocational training ... ..	...	998	0	0
" " —laundry and boiler house ... ..	...	7,471	10	6
Royal Prince Alfred Hospital—isolation block ... ..	...	11,336	2	6
Sydney Hospital—additional accommodation for medical officers ... ..	...	3,885	0	0
" " —new casualty wards block ... ..	...	70,000	0	0
Balmain Court-house and Post Office buildings—painting ... ..	...	890	0	0
Burwood Court-house—alterations and additions ... ..	...	1,303	6	10
Cook's River Lock-up—alterations ... ..	...	1,404	14	7
Gosford Police Station—additional accommodation ... ..	...	769	0	0
Katoomba Court-house—alterations ... ..	...	4,920	11	8
Central Police Barracks—additions and alterations ... ..	...	12,380	0	0
Parramatta Court-house—additions and alterations ... ..	...	633	0	0
Regent-street Police Station—additions and alterations ... ..	...	636	10	0
		£376,682	3	5

METROPOLITAN WORKS OVER £500 COMPLETED OR IN COURSE OF ERECTION DURING YEAR AND CARRIED OUT BY DAY LABOUR.

<i>Particulars of Work.</i>				£	s.	d.
Callan Park Mental Hospital—repairs, roofs generally	...	...	...	1,444	0	0
" " " " —repairs to iron roofs	...	...	...	251	10	0
Coast Hospital—repairs and painting new pavilions	...	...	...	1,168	0	0
Gladesville Mental Hospital—Hill Branch, repairs ...	...	...	...	568	0	0
Family Endowment Offices—accommodation for ...	...	...	...	1,312	10	9

	£	s.	d.
Prince of Wales Hospital, Randwick—providing accommodation for patients from Liverpool	1,002	0	0
Marrickville Hospital—alterations, kitchen block	1,108	0	0
Darlinghurst Court-house—repairs and accommodation for prisoners awaiting trial	536	0	0
Darlinghurst Court-house—accommodation for jurors	2,673	0	0
Collaroy Police Station—erection	5,536	6	10
Clarence-street Police Station—remodelling	6,285	0	0
Chancery Square Courts—Industrial Courts accommodation	670	0	0
Police Traffic Offices—lavatory accommodation	879	0	0
Waterside Workers' Institute—alterations and additions	7,500	0	0
Police Traffic—alterations	2,510	0	0
Parramatta District Hospital—laundry block	1,331	16	8
Woolloomooloo Day Nursery—play shelter.	747	0	0
Lamington Hall—removal and re-erection of wall	700	0	0
Government House—renovations and repairs to out-buildings	520	0	0
Public Works Department—additional accommodation for ladies retiring room	1,048	7	0
	£37,790	11	3

COUNTRY DISTRICTS.

District Office Returns.

The Officer administering the work carried out by the District Officers reports the following particulars of expenditure on architectural work during the year :—

District.	Public Works Department Buildings.	Education Department Buildings.
	£ s. d.	£ s. d.
Armidale	2,518 19 10	12,904 16 7
Bathurst	48,603 16 3	6,115 19 11
Bourke	1,118 4 0	.....
Broken Hill	1,304 10 6	3,428 1 3
Coff's Harbour	1,721 4 8	1,117 0 0
Cootamundra	26,921 17 11	61,700 9 7
Dubbo	13,631 3 10	7,686 7 6
Goulburn	17,378 15 11	14,383 19 6
Hay	1,848 8 6	993 0 0
Kempsey	3,191 3 1	5,025 8 0
Lismore	9,668 3 6	12,524 4 11
Moree	2,816 12 10	3,309 13 2
Newcastle	37,165 9 11	39,506 8 6
Port Kembla	3,776 17 7	39,679 7 9
Tamworth	13,802 1 8	1,177 10 0
Totals	£185,467 10 0	£209,552 6 8

WORKS IN COUNTRY COSTING OVER £500 COMPLETED OR IN COURSE OF CONSTRUCTION DURING THE YEAR.

	£	s.	d.
Orange Mental Hospital—water supply	1,716	6	5
" " " —sewerage	2,514	6	5
Broken Hill Police Barracks	922	0	1
Portland Hospital—laundry block, additions	758	12	0
Prince Albert Memorial Hospital, Tenterfield—new nurses' quarters	2,855	19	10
Dunedoo Court-house	2,330	10	0
Kurri Kurri Hospital—boiler house	812	0	0
Burrowa District Hospital—nurses' quarters, erection	1,523	10	0
Broken Hill Police Buildings—non-commissioned officers' quarters	3,023	16	0
Gundagai District Hospital—new laundry and sterilizing room	704	19	2
Lismore District Hospital— isolation block	6,752	11	3
Kenmore Mental Hospital—ward 6 repairs	500	0	0
Wellington District Hospital—nurses' quarters, additions	2,068	18	6
Collarenebri Hospital—maternity block	1,348	10	0
Young Court-house—erection	12,081	18	4
Grafton Land Board Office—additions &c.	1,402	11	10
Coonamble District Hospital—X-ray room	660	4	3
Deniliquin Hospital—sewerage	1,340	0	0
Newcastle Mental Hospital—roof repairs, nurses' quarters	429	18	9
Tamworth District Hospital—women's wards and morgue	9,730	8	0
Kurri Kurri Hospital—alterations, &c.	17,466	0	0
Berrima District Hospital— isolation block	4,663	12	0
Orange Mental Hospital—matron's cottage	2,189	9	10
" " " —gatekeeper's lodge	2,173	0	7
Dubbo District Hospital—new ward block, &c.	7,849	0	0
Lismore District Works Office—additions, &c.	1,579	17	6
Cessnock District Hospital—sewerage	833	0	0
Yeoval Police Station—new cells, &c.	825	3	0

	£	s.	d.
Tamworth Police Station—stables, &c.	1,566	8	0
Wagga Wagga Police Buildings—erection	9,988	0	0
Goulburn Court-house—repairs and painting	534	15	0
Narrabri District Hospital—repairs and painting	890	10	0
Cowra Hospital—additions	4,450	0	0
West Kempsey Police Station—new residence and gaol	4,448	0	0
Braidwood District Hospital—sanitary annexes and verandah	1,630	3	9
Maitland District Hospital—nurses' quarters	17,500	0	0
Orange Mental Hospital—sick and infirm blocks	39,500	0	0
Braidwood District Hospital—water supply and sewerage	824	3	5
Orange Mental Hospital—operating block	1,020	0	0
Newcastle Works Office—additions	2,234	10	0
Dungog Police Buildings—sergeant's residence	1,286	3	0
Quirindi Court-house—additions	632	2	0
Newcastle Reception House—repairs and painting... ..	693	8	10
Bourke Hospital—sewerage	729	5	0
Wentworth District Hospital—additions	647	12	6
Scone Police Buildings—repairs and painting	560	0	0
Bodalla Police Station—re-erection of buildings from Nerrigundah	565	0	0
Nyngan Hospital—sewerage	637	0	0
Bourke District Hospital—sewerage	729	5	0
Newcastle Pilot Boatman's Terrace—repairs	726	0	0
Newcastle Hospital—new nurses' quarters	27,994	3	2
Goulburn District Hospital—new nurses' quarters	9,809	10	8
Brewarrina Hospital—additions and alterations	2,165	10	0
Orange Mental Hospital—mortuary and chapel	1,500	0	0
Cootamundra Hospital—sewerage	1,624	0	0
Broken Hill District Hospital—septic tank	3,004	5	6
Newcastle Police Station—additions	2,123	16	11
Orange District Hospital—X-ray room	602	1	1
Maitland District Hospital—nurses' quarters, sewerage	850	0	0
Griffith Court-house—new building	13,125	0	0
Condobolin District Hospital—additional accommodation, &c.	1,093	0	0
Orange Mental Hospital—wards for unrecovered patients	30,000	0	0
" " " —new nurses' quarters	16,000	0	0
Coolabah Police Station—new building	2,100	0	0
Gravesend Police Station—new building	2,285	0	0
Coonabarabran District Hospital—new laundry block, &c.	744	0	0
Bega District Hospital—nurses' quarters	1,649	0	0
Byron Bay Wharfinger's residence	1,247	17	0
Swansea, Lake Macquarie—cottage for Navigation Department	875	0	0
Trundle Court-house—erection	1,425	0	0
Wallsend Police Station—alterations, &c.	619	0	0
Urunga Pilot Station—boatman's cottage, erection of	888	0	0
Woolgoolga Jetty—boatman's cottage, erection of	1,220	0	0
Cooma District Hospital—additions, &c.	750	0	0
Ariah Park Police Station and Court-house	4,829	0	0

ENGINEERING DIVISION.

	Electrical.	Mechanical.	Total.
	£ s. d.	£ s. d.	£ s. d.
(a) Works not proceeded with—Estimates, reports, recommendations.	97,604 16 5	33,161 12 6	130,766 8 11
(b) Works in progress.....	71,086 18 5	69,315 7 2	140,402 5 7
(c) Works completed	28,896 7 3	36,836 12 0	65,732 19 3
Total	197,588 2 1	139,313 11 8	336,901 13 9

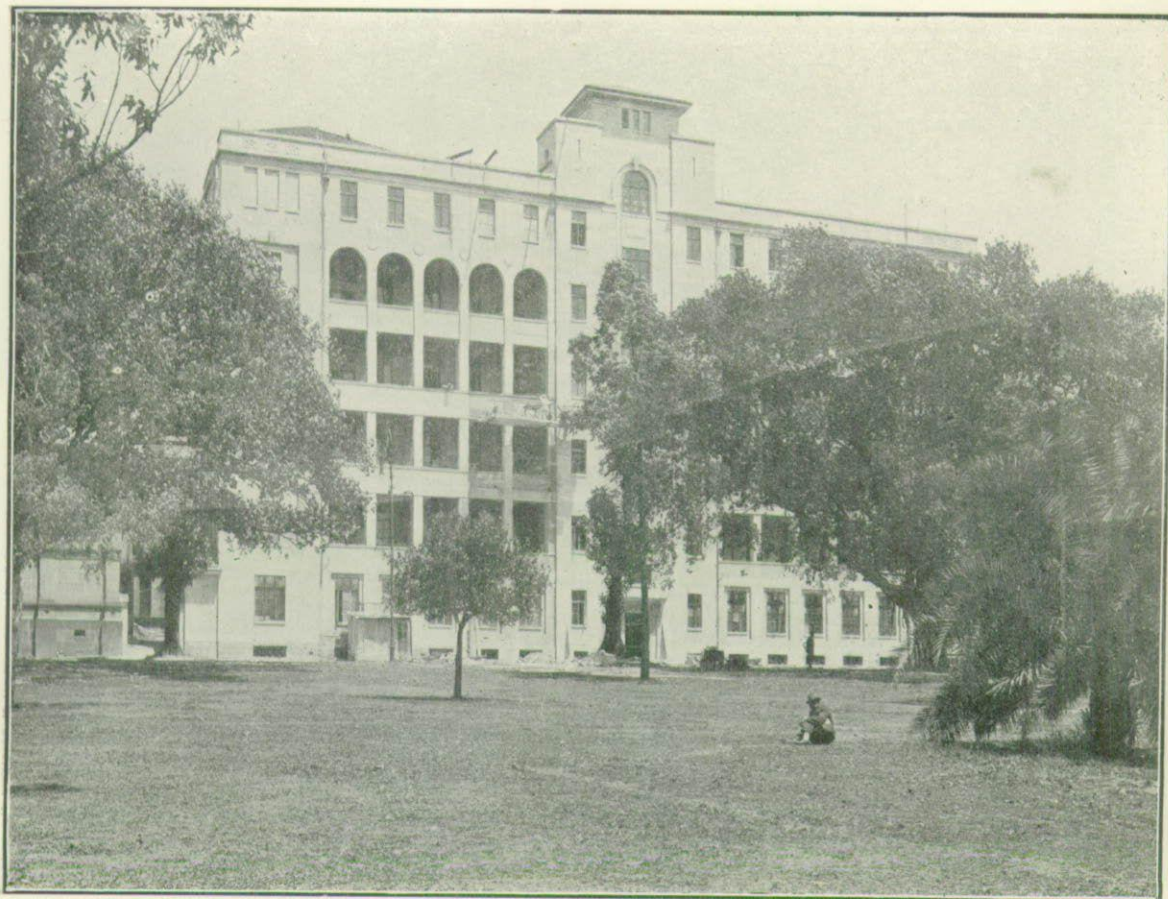
The above statement for the year shows, under convenient dissections, the work of this division of the Branch during last financial year.

A comparison of the totals over the last three years reveals a phenomenal growth in this particular section of the Department's activities :—

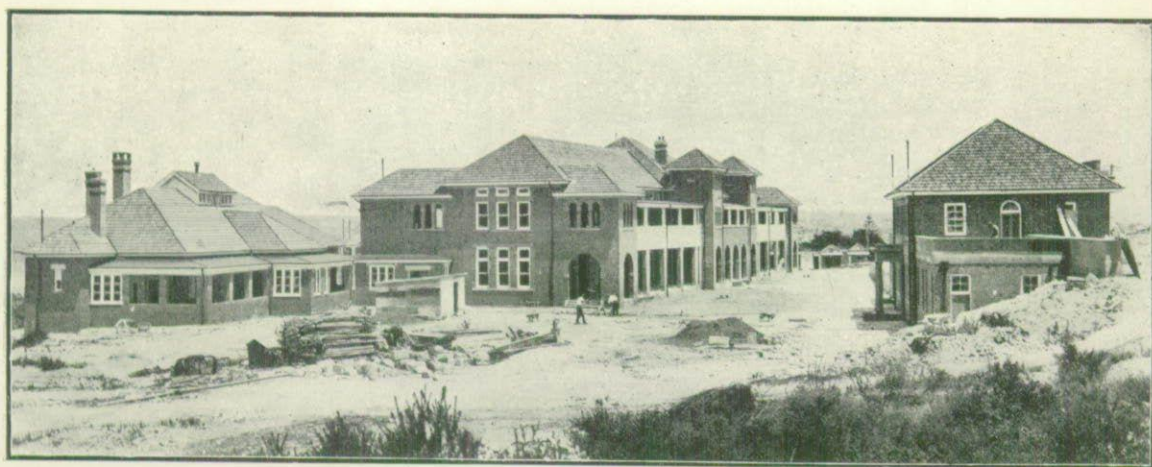
				Period.				Per cent. Increase.
					£	s.	d.	
Year ended 30th June, 1926	168,469	10	6	.....
" " " "	221,984	15	4	32 per cent.
" " " "	336,901	13	9	51 per cent.

This advance is obviously attributable to the general application of all sources of power and heat in Hospitals and State institutions, together with the exercise of a supervisory and maintenance control over all plants in State institutions.

The full effect of the latter has only recently become apparent in the sense that Departments and Institution Managers are daily looking more to this Department for maintenance advice and guidance in the operation of plant having a total capital value of well over half a million pounds.



Sydney Hospital, New Casualty Block.



Manly Peace Memorial Hospital.

The introduction of improved method with a continuous review over monthly log sheets has resulted in accumulated savings over the last two years ended 30th June, 1927, amounting to £13,376. These figures represent the reduction in cost of all sources of power and heat (fuel, electricity and gas) over the period mentioned for those institutions in which the present system of control could be effectively asserted.

The work of the engineering section of the Branch has very considerably increased with the undertaking of annual boiler inspections over all Crown boilers within the State, totalling 368 boilers located in sixteen districts. Steps have been taken to inspect by means of licensed inspectors in all coastal districts, and a recommendation made to examine boilers in the metropolitan, north-western and south-western districts with Head Office inspectors.

R. M. S. WELLS,
Government Architect.

13th December, 1928.

Testing and Inspection Branch.

Annual Report, 1927-28.

The high pressure of work that has been experienced during the last few years' operations of the Testing Branch was maintained during the year ended 30th June, 1928, and the records created during the previous year have been exceeded, notwithstanding that in some of the branches there has been a slight falling off; on the whole, however, both as regards value of the material inspected and tested at the manufacturers' works and at Head Office, and the amount of fees charged for the work carried out, the figures show a high increase over that of the previous year. To accomplish this, the staff was kept at high pressure during the whole of the period under review.

The work may be classified under the following headings:—

- (a) Material sampled at the manufacturers' works or stores and tested at Head Office laboratory prior to despatch.
- (b) Material tested and inspected during the course of manufacture at the works and sent forward.
- (c) Samples forwarded to Head Office for testing by Constructing Authorities for Public Works and by the general public.
- (d) Repairing the departmental instruments in use by the field officers and others.

The estimated value of the material sampled, tested, and inspected before being sent forward from the various manufacturers amounted to £1,118,894, an increase of £173,052 over the previous year.

Expenditure and Receipts.

The total expenditure for the year amounted to £9,154 14s. 5d., of which £8,065 0s. 11d. represented salaries and wages for an average staff of twenty-four, and £1,089 13s. 6d. general expenses; this is an increase of £1,527 8s. 7d., principally owing to the necessary increase of the staff and additional plant.

The fees charged for the work carried out amounted to £7,359, an increase of £2,030 on the previous year.

As no fees were charged for inter-departmental work it may be assumed that the amount received in fees from other sources is a very good return for the expenditure incurred. It may be mentioned that from 1st July, 1928, the system of not charging fees for departmental work has been discontinued; in future all work carried out by the Branch will be charged to the various works concerned at a moderate fee, which will, it is estimated, give a return equivalent to the whole working and establishment costs of the Branch.

Cement Testing.

The manufacture and use of cement is still on the upward grade. Three million and twenty-eight thousand seven hundred (3,028,700) bags, of an estimated value of £908,609, were sampled and tested during the year; the actual number was, however, greater by 60,500 owing to the use of paper bags, but as the bulk of the material handled consisted of jute bags, the number given is the equivalent of number of jute bags of cement tested. This is an increase of 592,360 bags over the previous year, which bears out my previous report, in which I anticipated that the record then created would be exceeded during the year just closed. One thousand and sixty-four (1,064) certificates covering the cement tested were issued. Fees amounting to £6,219 were charged for the work carried out; this is an increase of £1,309 over the previous year.

Steelwork Inspection.

Ten thousand and fifty-six (10,056) tons of pig-iron, structural steel, cast-iron pipes and castings, in addition to 3,178 valves and hydrants, and 81 miscellaneous jobs, were tested and sent forward from manufacturers at Newcastle and Lithgow.

Sixteen thousand one hundred and ninety-five (16,195) cast-iron pipes and castings were accepted and sent forward to various country water supply works. Three thousand two hundred and seventy-eight (3,278) tons of structural steel and rivet bars were forwarded for use in the Sydney Harbour Bridge, and one thousand nine hundred and thirty-five (1,935) tons of structural steel to the Government Dockyard, principally for the new floating dock. The tonnage handled showed a slight reduction on the previous year, particularly in the pig-iron section. Amongst the most important of the miscellaneous jobs may be mentioned the new ferry punt for George's River, pumping plant for Taree and Wingham water supply, and steelwork required by the Electrical Branch for the transmission lines at Port Kembla and Burrinjuck; seven hundred and forty-five (745) consignments in all were despatched. The estimated value of the material forwarded was £180,594; fees charged for the work carried out amounted to £718.

Miscellaneous Investigations.

Nine hundred and fifty-three (953) reports, covering 2,796 tests (which is almost identical with the last year's return), covering the testing of concrete, iron and steel bars, road material, asphaltum, &c., were carried out. Eight hundred and twelve thousand six hundred and forty (812,640) gallons of asphaltum, of an estimated value of £28,781, were sampled, tested, and issued, also 10,000 feet of fibro-cement pipes valued at £1,000 were inspected and tested prior to despatch. Fees charged to the general public for work carried out amounted to £237 15s. 7d. The sales of standard Nepean sand, as anticipated, showed a considerable increase, realising £184.

One hundred and sixty-eight (168) instruments, which is slightly above the general average, were overhauled and repaired.

SUMMARISED details of the work of the Branch are given in the following statement :—

Particulars of Service.	Unit.	Quantity.	Reports.	Tests.	Estimated Value.	Fees.
Cement Testing	Bags	3,028,700	.....	1,064	£ 908,609	£ s. d. 6,219 0 0
Steelwork Inspection—						
Pig-iron	Tons	2,879	.....	.....	20,152	
Rails and fishplates	"	22	.....	.....	249	
Structural steel	"	5,692	.....	.....	85,808	
Cast-iron pipes and castings	"	1,397	.....	.....	27,940	
Steel pipes	"	66	.....	.....	3,100	
Valves and hydrants	No.	3,178	.....	.....	13,224	
Miscellaneous	Job	84	.....	.....	30,121	
Miscellaneous Investigations						718 13 11
Concrete			382	1,385	.....
Sand			22	35	.....
Stone			9	27	.....
Road material			43	45	.....
Asphaltum	Gallons ...	812,640	155	471	28,781	
Fibro-cement pipes	Feet	10,000	2	2	1,000	
Iron and steel bars			177	590	.....
Paints, oils &c.			45	81	.....
Coal			19	20	.....
Miscellaneous			99	140	.....	237 15 7
Standard sand	Cwt.	85	.....	.....	.....	184 0 0
Instrument repairs	No.	169	.....	.....	.....
Total.....					1,118,984	7,359 9 6

In view of my early retirement from the service and this being my last annual report as Officer-in-charge of the Testing and Inspection Branch, I desire to place on record my high appreciation of the efficient work and loyalty of the staff under my control.

Survey Drafting Branch.

I have the honor to submit herewith my report on the work carried out by this Branch during the financial year ended 30th June, 1928, and to state that general survey drafting, heliographing, plan-mounting and recording have been carried out in connection with the following works:—

Murray River Waters Act.

Hume Reservoir, lock and weir sites Nos. 12, 13, 14, and 17.

Country Towns Water Supply.

Ardlethan, Armidale, Balranald, Ballina, Blackheath, Boorowa, Broken Hill, Cargelligo, Cowra, Coonabarabran, Condobolin, Culcairn, Forbes, Gerringong, Gosford, Gunnedah, Hillston, Hunter District (Chichester River Scheme), Junee, Katoomba, Kiama, Kyogle, Leura-Wentworth Falls, Macksville, Moree, Morisset Mental Hospital, Moss Vale, Muswellbrook, Narrandera, Nyngan, Orange, Parkes, Peak Hill, Scone, South-West Tablelands, Wauchope, Werris Creek, Woy Woy, and Yass.

Sewerage.

Albury, Balranald District Hospital, Bowral, Botany Sewerage Farm, Canterbury-Bankstown, Casino Hospital, Cessnock, Forbes, Gladesville Mental Hospital, Goulburn, Gunnedah District Hospital, Hay, Katoomba, Kenmore Mental Hospital, Kiama District Hospital, Lismore, Lithgow, National Park Accommodation House, Narrandera Extensions, Newcastle Amplification, Northern Suburbs Ocean Outfall Sewer, Parkes, Rydalmere Mental Hospital, Walcha Cottage Hospital, and Yanco Agricultural High School.

Stormwater Channels.

Cottage Creek, Gosford, Newcastle, Terrigal, Throsby Creek, and Picton.

National Roads.

Abercrombie Caves, Byron Bay, Hume Reservoir Road Deviation, Ku-ring-gai Chase to Bobbin Head, Maroubra Bay Roads, and Wee Jasper to Taemas Bridge.

Bridges.

Cook's River, Gostwyck, Murrumbidgee River at Eurolie and at Taemas, and Parramatta River at Rhodes.

Harbours and Rivers.

Botany Bay, Byron Bay, Clarence River, Coff's Harbour, Cook's River, Lake Macquarie, Moruya River, Narrabeen Lagoon, Newcastle Harbour, Port Kembla, and Port Hacking.

Swamp Drainage.

Carr's Creek Drainage Union.

Electric Schemes.

Burrinjuck, Kiama to Moss Vale, Kiama to Nowra, Port Kembla to Kiama, and Swampy Plains River Scheme.

Public Watering-places.

Plans and descriptions have been prepared in connection with the establishment of fifteen watering-places; seven others were revoked and thirteen partly revoked.

General.

Miscellaneous drawings, including plans, sections, diagrams, capacity curves, and tables totalling 240 have been prepared, together with 423 plans and descriptions for resumptions, easements, appropriations, &c., also sixty-seven detail sheets were drawn and tracings prepared.

Helios to the number of 41,997 were printed and 3,055 maps were mounted. This includes (as well as the work for this Department) heliographing work and plan-mounting for the Railways and Tramways, and for the Education, Valuer-General's, and Fisheries Departments.

In the plan room 2,036 new plans and 345 field and level books were registered and 13,860 plans &c., were issued and returned. The number of files of papers dealt with was 3,325.

D. R. ALDERTON,
Chief Survey Draftsman.

15th October, 1928.

Under-Secretary.

Government Dockyard, Newcastle, N.S.W.

Annual Report for 1927-28.

The plant at Walsh Island, which was originally installed mainly for the industry of ship construction, has now been adapted to the stage when it is busily and successfully employed on the manufacture of steel railway carriages, trucks, colliery skips, bridges, electrically-welded steel pipe-lines, cast-iron pipes, ship repairs and general engineering work.

The work of constructing the Walsh Island floating dock commenced in November, 1927, and the main or middle section has been practically completed. The second and third sections are being fabricated and the first unit of two sections will be ready to lift vessels up to 10,000 tons by April next. The third and last section will be ready as a separate unit for lifts of 5,000 tons, and when linked up with the other two sections, for 15,000 tons, by August, 1929.

For the financial year under review the Walsh Island activities have been successful in the dual aims of—

- (1) Showing a satisfactory financial position at the end of the year;
- (2) In service to the New South Wales Government, by showing a saving on contract figures as compared to the next tenders and generally stabilising the market for the Government's engineering requirements.

Steel railway carriages had hitherto been imported to New South Wales in complete bodies, but the industry of wholly locally constructing steel railway carriages has now been thoroughly established and deliveries can be maintained at the rate of one steel railway carriage per working day, as compared to one steel railway carriage per week earlier in the year. One hundred and thirty-two (132) of these carriages had already been delivered to the Railway Department at 30th June, 1928, and there remained at that date of the several contracts in hand one hundred and sixty-eight (168) cars still to be delivered. In this industry great savings have been shown against the previous costs of imported carriages to the Government, to a total to date of over £100,000. This is based on the next best tenders received.

In order to maintain deliveries required, a greater output from the machines was necessary, and the men were compensated by a system of payment by results. The additional output obtained through this system greatly reduced the overhead charges of the establishment, and altogether provided the principal factor in showing a profit for the year's activities.

However, after this system had been working for several months, the Boilermakers' Society eventually decided to strike against it, and in spite of the six weeks' strike which prevailed and the ultimate closing down of the place for a period of one week, the benefits of this system and its many indirect advantages resulted in showing the best year in the history of the establishment.

Various industries at the Dockyard are now thoroughly established on efficient lines, and there is every indication of an even better financial position in the year to come.

The pilot steamer "Birubi" was completed during the year and handed over to the Navigation Department, and the vehicular ferry for George's River was constructed and delivered.

The position of ship building in Australia should be stressed in this report, for at the present time there are no ships under construction in Australia. The Tariff Board has been approached in this regard and every phase of the position has been carefully outlined in the evidence given, and it is hoped that this important industry can be revived in the Commonwealth.

Other work worthy of mention carried out at Walsh Island during the year included bridges for the Kyogle-Richmond Gap railway, bascule bridge over Cook's River, bridge over the Paterson River at Gostwyck, several heavy cranes and structural steelwork for various parts of the State. The mild steel electrically-welded pipes manufactured during the year included pipes of 13 feet and 9 feet diameter for Hume Reservoir and other pipes for the Port Kembla power supply and Chichester gravitation scheme.

Many improvements have been introduced to the cast-iron pipe foundry, with the result that this department is now a valuable and paying adjunct to the establishment and successfully producing cast-iron pipes for the various works throughout the Commonwealth.

The gross profit from the working of the establishment after meeting all charges, including maintenance, depreciation, and interest on bank overdraft, has been £42,690 11s. 7d., and the cost of good-conduct and statutory holidays in the amount of £20,525 5s. 9d. has been met as an appropriation from this profit, leaving a net credit balance for the year of £22,165 5s. 10d.

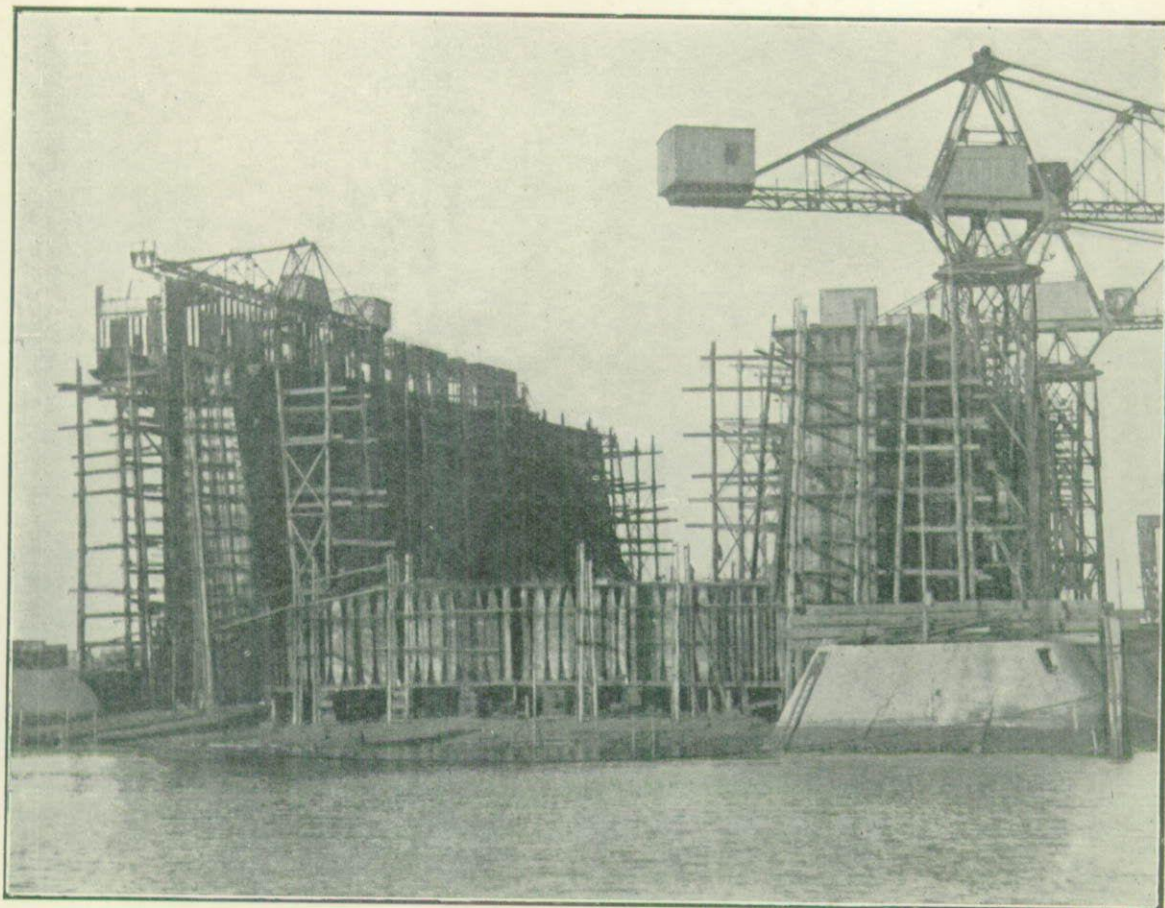
The number of men employed throughout the year has ranged from 1,300 to 2,300, and a corresponding activity is practically assured for the ensuing year.

Little or no reflection should be made on the Walsh Island employees as far as the strike was concerned, for we had definite evidence at the establishment that practically the whole of our employees were in favour of the piece-work system; and in the arduous task of bringing about the various improved conditions for Walsh Island Dockyard, which heretofore has been a losing proposition to the Government, mention should be made of the hearty co-operation of all those employed at the establishment.

A. C. WATERS,
General Manager.

6th September, 1928.

[14 plates.]



Main Section Floating Dock under construction at Walsh Island.



Walsh Island Dockyard and Engineering Works, Newcastle, N.S.W.
Pilot Steamer "Birubi"—Built at the Walsh Island Dockyard for Department of Navigation.