

and at the same time opportunity was taken to repair the old tunnel. For this purpose a bulkhead was built at the outlet of the tunnel at the surge-chamber, in order that the original pipe-lines and turbines could be kept in operation. This work was completed in January.

During the year the operation of the new units has not been altogether satisfactory, considerable trouble having been experienced with the turbines of both No. 2 and No. 3 units. Lubricating troubles were successfully overcome, but the erratic governing was a serious matter and was not overcome until considerable alterations were made. The effect on supply was serious, and there were numerous complaints regarding frequency and voltage, particularly during December and early January, when the new units were on occasions supplying the total load. The longest period of interruption during the year—viz., 15½ minutes—was due to failure of the governor on one of these units. These troubles were rectified in May, 1928, and up to the 30th June the sets have operated satisfactorily.

In order to tide over the period between the time when it may be possible that the present installation at Lake Coleridge is fully loaded and the bringing into operation of the Waitaki development, contracts have been entered into for the supply and erection of an additional pipe-line and turbo-generating set. This set will be of 7,500 kw. capacity, and will then bring the total capacity of Lake Coleridge up to 34,500 kw. Contracts were let for both pipe-line and generating-set in May, 1928.

GENERAL.

A 3,000-volt line was erected in August on behalf of the Railway Department to supply the Middleton marshalling-yards, and also the signalling-system between Addington and Rolleston.

To cope with the increased demand at Addington Workshops, a new bank of transformers of 1,500 kv.a. capacity has been installed on behalf of the Railway Department.

In order to supply power for the electrification of the railway between Lyttelton and Christchurch, arrangements were made to erect a special duplicate 11 kv. line between Addington and Woolston, and the erection of a concrete substation to house the necessary switch-gear and machinery to supply the Railway Department with direct current at 1,500 volts. The contract for the conversion machinery was let in August, 1927, and the building contract was let in April, 1928.

At the same time opportunity will be taken to remove the old Woolston Substation and install ironclad switch-gear of the self-closing type on all the Department's outgoing feeders. The present 3,000-volt and 400-volt supply will be changed to 11,000 volt, and work has already commenced on the change-over. The contract for the ironclad switch-gear was let in April, 1928.

The work of erecting the 33 kv. line between Addington and Southbrook to supply the North Canterbury Power Board was postponed, but the route has been pegged out, and the work will be commenced at the beginning of July, 1928.

The North Canterbury Power Board, which was formed in March, 1927, was granted its license in June, 1928, and will take supply from the Department as from the 1st July, 1928.

RAINFALL.

The rainfall at the power-house for the year was 37·64 in. For the three months ended 31st March the weather was the driest on record, only 2·43 in. of rain falling.

MANGAHAO ELECTRIC-POWER SYSTEM.

FINANCIAL RESULTS.

The capital outlay at the close of the year was £2,373,921, as against £2,242,871 for the previous year, an increase of £131,050, which is analysed in Table G. The net revenue for the year was £44,111 15s. 2d., as against £101,897 1s. 4d. for the previous year, a decrease of £57,785 6s. 2d., or 56·79 per cent., the decrease being due solely to the large amount—viz., £111,744 14s. 11d.—paid for power purchased. Working-expenses were £33,914, an increase of £6,993, mainly due to the coming into operation of Napier substation and maintenance work on transmission-lines.

OPERATION AND MAINTENANCE.

Headworks and Power-house.

Towards the end of the year No. 3 dam was completed and ready for storage of water, but owing to the light rainfall experienced very little water has been available for storage. During the year the water-level indicators at Nos. 1 and 3 dams were overhauled, and are now working satisfactorily. The water-level indicator at the surge-chamber has been put into commission. Further work has been done to reduce the leakage from the automatic gates on Mangahao No. 1 dam, and new operating hand-gear was installed. Painting has been carried out on the pipe-line and the power-house roof steelwork as weather permitted. One of the transformers on the headworks 3,000-volt line broke down during the year and repairs were carried out on same. The turbines have operated well during the year, practically all trouble being due to cracked and broken buckets. Twenty-three buckets have been replaced during the year, repairs to the damaged buckets being done by the electric welding plant at Mangahao. A complete new equipment of bronze buckets has been ordered for No. 5 turbine. Also, in order to cope with the increase in load on the station, a new set of nozzles, slightly larger than the originals, has been ordered. These are expected to increase the capacity of the machines by 5 per cent. The oil in the bearings and governors was filtered during the year, and oil-pipes cleaned and painted.