

The contractors who were manufacturing the concrete slabs erected a plant on the site and commenced to deliver slabs early in September. The bottom course of concrete slabs 2 in. in thickness was laid on the sides by the Department as the slabs were finished and cured. The contractors for the bituminous lining commenced operations in October on the floor, and in November on the sides. As the bituminous lining on the floor was laid the Department followed up with the laying of a concrete covering, while the contractors themselves covered the bituminous lining of the sides with 3 in. concrete slabs and grouted the joints. The whole of the lining was completed by the end of March.

The area of the lining done was 35,940 square yards, or nearly $7\frac{1}{2}$ acres. The work included the casting of 5,900 cubic yards of concrete, including over 100,000 hexagonal pre-cast slabs, and the use of 950 tons of bitumen.

Overflow Channel.—The major or lower section of the work in the overflow channel, extending from the drop weir to the upper section of the waterfall structure, was completed during the year, the channel being lined with 1 ft. thickness of reinforced concrete for a width of 150 ft. and a length of 960 ft., the average side-wall height being 9 ft. To date of completion the total quantity of work entailed consists of 11,911 cubic yards of excavation, 17,210 cubic yards of back-filling, 9,179 cubic yards of concrete, 2,649 ft. of porous drains, and 189 tons of steel reinforcement.

Protection of Waterfall.—This section of the work was carried on during the year on three shifts, and was completed simultaneously with the remedial measures. The excavation of the site was completed and the whole structure built of reinforced concrete varying in thickness, according to position, from 10 ft. to 3 ft. At the end of the structure on the downstream side, a concrete cut-off wall was placed, carried down to the solid country at a depth of 74 ft., the wall extending for a width of 200 ft., and having a minimum thickness of 5 ft. The quantity of rock excavation involved in this work was 55,783 cubic yards, and the amount of concrete placed was 23,098 cubic yards. A large amount of cement grouting work, coupled with the use of reinforcing steel in the grouting holes, was done for the purpose of tightening the country rock and tying the whole together.

The channel and waterfall structures were brought into service on the 6th April, 1932.

Observations, &c.—During the year a precise survey was made, covering the whole of the area occupied by the works; and permanent stations and benchmarks were established.

Since the start of the filling of the lake the dam and drainage tunnels have been kept under continual observation and careful records made of all discharges from porous drains, galleries, &c.

Power-house Extension.—During the year the steel lining of No. 4 penstock tunnel, the concreting between the lining and the country, and the installation of No. 4 unit were completed. The concrete used in lining the tunnel amounted to 1,542 cubic yards, and in the foundations of the unit 1,020 cubic yards.

The pipe-line and headgate and the installation of the two auxiliary units were also completed. This involved the excavation and removal by cableway of 15,225 cubic yards of rock from above river-level, and 437 cubic yards from below. The concrete in the foundations amounted to 643 cubic yards. To accommodate the units the end wall of the power-house had to be underpinned and carried on temporary trestles, which will remain in position until the building is extended, when further major units are installed.

General.—The greatest number of men employed during the year was 810, the average number being 482. Now that the remedial works are practically complete the number has dropped to 67 men. To relieve distress in the district 68 men have been employed during the last two months in planting trees and clearing up and improving the reserves owned by the Department round Arapuni. These men are working under the No. 5 Unemployment Relief Scheme, the work being supervised by the Department.

Horahora Power Scheme.—A certain amount of erosion of the river-channel has been going on below the spillway weirs and gates across the river, and during the year it was decided to cover the country in front of each of the three gates by a protecting slab of concrete. This work is now in hand.

WAITAKI RIVER POWER DEVELOPMENT.

Dam.—In my last annual report it is noted that the extension of the base of the dam by an apron 25 ft. downstream for the full length of the north cofferdam had just been completed. Immediately on completion of the apron the pumps were removed from the downstream to the upstream section of this cofferdam, and the construction of the deep cut-off wall and external inspection gallery was commenced.

The cut-off wall extends on an average to a depth of 25 ft. below the original rock surface immediately upstream of the dam, and upon it is built the inspection gallery in the form of a concrete arch. The lower levels of the cut-off wall were excavated partly as tunnels and partly as open trenches 3 ft. to 4 ft. in width. Concrete was placed in lifts of about 6 ft., and the cut-off wall is now completed from the middle of the river to the original north river-bank, a length of 240 ft.

As it had not been possible, for reasons given in last year's report, to commence the cofferdam for the construction of the river section of the dam adjoining the Otago bank, it was decided to place the cut-off wall in position along this length of the dam by tunnelling under the river.

From a shaft on the Otago bank a heading has been driven with its bottom at the full depth of the cut-off wall. This heading is 6 ft. high, and it is intended to place the concrete in the cut-off wall by successive lifts 6 ft. in height by driving headings above those already concreted. By this means it is hoped to complete the cut-off wall to within a few feet of the bed of the river, thus reducing the amount of work to be done when the Otago section of the river bed is unwatered.

From the original Canterbury bank of the river—that is, north of the section of the dam in the river built up to summer river-level within the north cofferdam—the dam has been completed to its