

north abutment. This section consists of 140 ft. of spillway, 54 ft. of bulk head, and a core wall 64 ft. in length. These have all been completed to full height, together with a massive concrete retaining-wall on the downstream side of the dam. A relatively small area of the base of the spillway section remains to be concreted to form a protective apron, the design of which is now being determined by experiments with models.

Simultaneously with the work on the cut-off wall in the river sections and the completion of the dam on the Canterbury Section, excavation has been in progress between the Otago river-bank and the power-house. This is called the Otago Section, and consists of 487 ft. of spillway, and a 50 ft. non-overflow block, containing two permanent steel sluice-gates. This portion of the dam is now the chief work in progress, and the main purpose of the current year's work is to complete it to a level that will give a safe margin above floods. It is being constructed in blocks or monoliths, ten in number, 54 ft. to 57 ft. in length, and separated from one another by bitumen expansion joints. The present position is that one monolith has been completed to the full height, six others are concreted to various levels, and, for the remaining, three excavations for the foundations are in progress.

The cut-off wall has been in progress along the Otago Section and power-house at points where it was convenient to get access to it for excavating or for concreting. In front of the power-house three vertical shafts were sunk, and from the bottom of these horizontal headings have been driven and filled with concrete. Two complete lengths 6 ft. high have been excavated and concreted, whilst a third lift is now being excavated. A heading in front of the spillway of the Otago section of the dam has been driven northwards from the north-west corner of the power-house, whilst another heading has been driven southwards from a shaft on the river-bank to meet it, there being a gap of 200 ft. between them at present.

The total concrete now placed in the dam is 67,277 cubic yards, of which amount 40,000 cubic yards were placed during the past year.

The total quantity of earth and rock excavated for the dam, exclusive of that in the cofferdam, is, to date, 221,000 cubic yards.

*Tail-race.*—As stated in my last report, excavations for the tail-race have, as far as possible, been carried out by hand-labour in order to give employment to a fair number of men. A relatively small amount of pumping has allowed the excavation to be carried out in this way to finished floor-level (about 15 ft. below river water-level) at a cost which compares favourably with mechanical methods. Practically the whole of the aggregates required for the dam and power-house has been derived from excavations essential for other purposes, and of these the tail-race has been the chief source of supply. The supply of shingle from the tail-race is now, however, almost exhausted, and a cableway drag scoop is being installed to excavate future requirements from the river.

The quantity of rock, gravel, and earth excavated from the tail-race to date is 136,000 cubic yards.

*Power-house.*—The most urgent work in the power-house construction was the completion of the generator-room, in order to allow work to be carried out on the installation of the turbines, generators, and other equipment. The virtual completion of this room after the roof was fixed in position was attained in February last. Direct railway access to allow heavy parts of the machines weighing upwards of 20 tons, to be brought right to the power-house was completed, and the 120-ton overhead-travelling crane required to handle these parts was erected on its runways, which are supported on the columns of the power-house. Once this important stage of the work was reached there was less urgency to complete the remainder of the power-house, and for the last six months the number of men employed thereon has been reduced to about one hundred, or one-third of the total employed last year.

Work is in progress on the intake structure, and the annexe building. The present position on the former is that opposite units 4 and 5, form work is completed, and concrete is poured to within 5 ft. of the top, leaving one lift to complete; opposite units 2 and 3 concrete is completed to within 9 ft. and form work to within 5 ft. of the finished level; unit 1 is concreted to within 17 ft. and form work fixed to within 13 ft. of the finished level. The auxiliary units intake is completed practically to the level of the invert of the openings. In the annexe building the concreting of the battery-room floor has just been completed and form work is being erected for the pouring of the cable-room floor. Other important work completed during the year includes the transformer-platform, with concrete pads, railway, and turntable. A length of the retaining-wall which supports the tail-race batter at its junction with the power-house was completed sufficiently far to allow railway access to the power-house.

The whole of the accessible area of the exterior of the walls of the generator-room has received a first coat of special cement wash, which is applied after the marks of the form work have been removed.

The total excavation required for the power-house amounted to 65,000 cubic yards. To date 41,700 cubic yards of concrete have been placed, 1,292 tons of reinforcing-steel have been bent, and 1,430 tons fixed in position. In the profiling and false work 1,607,000 superficial feet of timber has been used.

*General.*—During the year six 9-ton and one 20-ton locomotives have been in continuous operation, some of them on three shifts, transporting material from Kurow to the works, and distributing materials throughout the work. Since the railway service commenced from Kurow in December, 1928, it has handled 38,000 tons of materials and goods, and 3,750,000 superficial feet of timber.

The bridge over the Waitaki River at Wharekuri, mentioned in my last report as necessary to give access to properties cut off by the reservoir, was delayed to some extent by non-delivery of the steel central span on the due date under the contract. The concrete piers and road approaches are