

A permanent flood water spillway having a net opening 50 feet wide by 10 feet deep below the high-water level of the reservoir, was excavated in solid slate bed-rock around the north end of the dam. The spillway cut was about 350 feet in length by 35 feet maximum depth, with side slopes $\frac{3}{4}$ to 1. The larger part of the work was done under contract before sluicing was started, the rock being placed in the downstream toe of the dam.

Six concrete piers were erected in the throat of the spillway, against which timber stop-logs can be set horizontally to hold the pond at any desired level. A platform or runway extends from pier to pier, and an overhead cable with traveling tackle is provided for handling the stop-logs. The floor of the spillway is paved between piers and downstream for a distance of 10 feet. A concrete cut-off wall extending into impervious solid rock, is provided at the upstream end of the spillway piers. A second concrete cut-off wall, founded on bed-rock, extends from the south abutment to the puddle core of the dam.

The total quantity of material removed from the spillway was 11,267 cubic yards, of which 10,431 cubic yards was rock, and 836 cubic yards earth.

The masonry used in the piers, cut-off walls, paving, etc., amounts to 110 yards.

The material was placed in the dam by sluicing, except the rock from the spillway cut, and the material excavated from the cut-off trench, the material not sluiced amounting to 13,985 cubic yards in all.

A gravity supply of water for sluicing was obtained from a small creek on the north slope of the valley near the dam site. A storage reservoir was built on the ridge near the headwaters of the stream in which about 1,500,000 cubic feet of water were stored, sufficient to operate the sluices for a period of 5 to 7 days, depending upon weather condition. The water was taken from the creek at a point about two miles below the storage reservoir in a 10-inch spiral wound woodstave pipe, 1,300 feet in length, discharged into a head box from which a rivetted steel slip joint hydraulic pipe No. 12 gauge, 8-inch diameter, was laid to the borrow pits, the water being delivered at the nozzles with a static head of from 150 to 200 feet.

Owing to the necessity of completing the dam in time to store water for use at the power station during the summer of 1912, and in order to preclude, as far as possible, interruptions in sluicing from failure of the gravity supply, a pumping plant was installed below the dam near the creek, and pipes laid from the pumps to the borrow pits, all arranged to permit changing from gravity to pumped supply with small loss of time. The plant consisted of two 3-stage centrifugal pumps, 6-inch discharge, capacity 1,000 gallons per minute each, driven with steam engines. Four 50-h.p. boilers were installed, and wood from the site was used for fuel. The pumping plant was put into service whenever the gravity supply ran low.

Sluicing flumes for carrying the material were erected from the borrow pits, and extended the full length of the dam. The grade of slope of the boxes was 6 per cent. on the main flumes, the size of box being 16 inches wide by 18 inches deep, built of 2-inch plank, and lined in the bottom with wood paving blocks 4 inches deep. The lateral or distributing flumes were given a grade of from 7 per cent. to 9 per cent., were not lined, and were built with lap or telescopic joints to facilitate moving.

Three decks or levels of flume were used as the work progressed, the maximum height of supporting trestle being 70 feet. The trestle posts were round poles, cut on the site. The total length of flume erected for the work was:

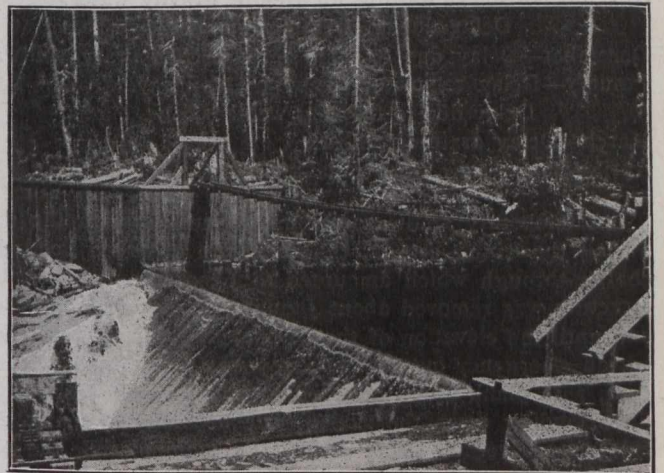
First of lowest deck 1,050 feet
Second deck 1,150 "

| | |
|----------------------------------|------------|
| Third deck | 1,400 " |
| Lateral or distributing flumes.. | 3,000 " |
| Total | 6,600 feet |

About 360,000 board feet of lumber were used in the course of the entire work, the larger portion of which was in the sluicing flumes.

Sluicing was started September 1st, 1911, and carried forward night and day during the winter and spring until April 15th, 1912, when the fill was completed. More or less serious delays, due to freezing weather, snow-fall, maintaining temporary spillway through the dam for discharging flood water, and minor interruptions, were experienced; but in spite of these the average progress was better than anticipated, the estimated date of completion being May 15th.

The water in the reservoir was raised gradually as work of building the dam proceeded, no run-off being wasted after March 1st, 1912. At the date of completion the water level in the pond stood at the elevation of the spillway floor. Extremely dry weather conditions prevailed during the spring, and the basin failed to fill, the highest level reached being about 7 feet below the high-water level. The storage ob-



Diversion Dam on the Jordan River Development.

tained, however—250,000,000 cubic feet—is sufficient for normal plant operation with one machine during the summer. The second unit which is being installed by the company will not be ready for service before the coming of the wet season.

The quantities and classification of material in the dam are:—

Excavation measurement:

| | |
|--|------------------|
| Rock from spillway and gravel cut-off trench.. | 13,985 cu. yds. |
| Material sluiced from borrow pits | 129,364 cu. yds. |

| | |
|-------------|------------------|
| Total | 143,349 cu. yds. |
|-------------|------------------|

| | |
|--|------------------|
| Embankment measurement, completed structure | 148,390 cu. yds. |
| Excess of embankment over excavation measurement | 5,041 cu. yds. |
| Excess of embankment over excavation measurement | 36 per cent. |

No attempt was made to break the hard-pan formation in the pits with the water from the monitors. Powder was used throughout the work for breaking down, holes being gophered in the base of the bank to a depth of 10 to 16 feet. A gang of men was kept constantly at work with picks, breaking up the larger masses to assist the action of the monitor stream. In fact, it was endeavored at all times to