Much trouble was experienced in building these dams, owing to the raging current which at several places swept away 75 per cent. of the material, consisting of large boulders, etc., as fast as it was dumped in. The fact of their having been built of such large stones has also given the dams a tendency to leak badly, in spite of banking with earth mixed with pea-straw, etc.

CRIBWORK.

The cribwork dams were then commenced. These consist of, first, a high crib 360 feet long (Fig. 6) built of 12 x 12-inch face timbers laid to 2-inch joints with 8-inch flatted ties laid 8 feet apart in each course and 8-inch longitudinals, and, second, 3,305 feet of overflow crib with 12x12-inch longitudinals and purlines. The top is hipped up with an easy slope on the shore side and covered with 2-inch plank and 8-inch tamarac split poles with the bark on. The slope on the side towards the river is steeper, and is covered with 8-inch tamarac squared on three sides and laid on purlines. The vertical face of the whole dam on the shore side is sheeted with two layers of 2-inch plank and an ample talus of gravel is laid along the shore side. Both cribs are filled with carefully placed stone of moderate size, and are scribed and bolted to the rock when above the grade adopted for the bottom of the head race, 12 feet below the top of the main dam. Below this it is considered that the stone filling is ample security, and the cribwork is merely scribed to fit closely to the rock. The wing dam cribwork, above the main dam, is 20 feet wide at the bottom, and the cross ties are run entirely through wherever possible.

The masonry ice breaker at the upper end of the wing dam is 40 feet long and 20 feet wide; it is built on a concrete foundation two-thirds the depth of the water (which is 21 feet deep at this point), of rough bush-hammered masonry. The top is bevelled to 5 feet below the water line, and 1½-inch chains are imbedded in the concrete to fasten the upper boom.

piers. The piers are 4 feet thick by 48 feet long, 21 feet 6 inches c. to c. for both flumes and waste weirs.

POWER HOUSES (FIG. 9.)

The power house walls are built in a similar manner, and contain between them massive concrete foundations for the generators. The walls are four feet thick along the front and sides to the line of the down-stream end of the piers; beyond this the masonry is only 3 feet thick and 3 feet high, with a 16-inch brick wall up to the top of the piers.

The generator foundations are constructed in the form of heavy columns with arches between, and afford every facility for getting at the holding down bolts of the generators.

Vacant spaces between and behind the foundations are filled with stone flushed over with eight inches of concrete up to the same level as the flume floors or tail water. These spaces will be utilized for heating apparatus, storage, etc., and will be accessible by a spiral staircase and a hatchway 4 x 5 feet.

SHORE ABUTMENT.

The shore abutment (Fig. 15) is also built of masonry four feet thick, and from the line of the rack runs into the bank in a sloping direction. This sloping portion is backed with three feet of clay puddle up to the frost line, four feet below the ground level. There is also a wing wall 12 feet behind this of concrete, three feet thick, running 23 feet into the bank.

The portion of the abutment next the flume is backed with concrete four feet thick, running up six feet above the flume floor, and with clay puddle three feet thick above this up to the frost line. These precautions are taken to preclude any possibility of leakage around the back of the abutments.

A cribwork embankment is carried along the shore from the corner of the abutment to a point about 50 feet up-stream. All ties in this crib are kept so that the ends will be below the frost line.

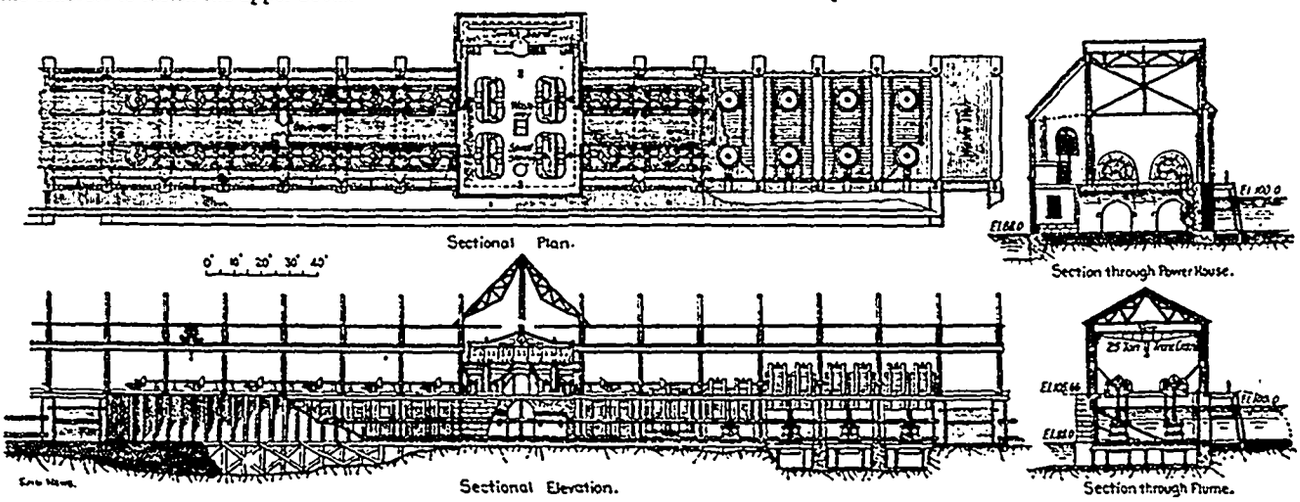

FIG. 9—DIVISIONS THREE AND FOUR OF MAIN DAM, SHOWING PLAN, ELEVATION AND SECTION OF POWER HOUSE AND TURBINE SETTINGS.

MAIN DAM.

The main dam piers (Fig. 7) are built of rough bush-hammered masonry 4 feet thick, laid on a concrete foundation 4 feet 6 inches thick, which runs up to the level of the flume floor. The rock under the wheel pits was first excavated and levelled off, and owing to its shaly and unreliable nature a layer of concrete 1 foot thick, composed of 2 parts sand, 1 part Portland cement, and 6 parts stone (these proportions were used throughout the work), was laid over it, holes being left to receive the columns supporting the flume bottoms Caissons (Fig. 8) of 2 x 4-inch stuff, laid on the flat and well tied through, were then run up to the level of the underside of the timbers supporting the flume floor. These timbers of 12 x 15-inch pine were then laid, running back 15 inches into the concrete, and were bevelled off so as not to weaken the foundation.

The caissons were brought up to the level of the flume floor and filled with concrete. Two longitudinals of 10 x 12-inch British Columbia fir were run under the floor timbers and 15 inches into the caissons along the front of the flume. These are each supported by six 6-inch I-beam columns placed in holes in the wheel pit bottom above mentioned, which were then flushed up. Masonry was then laid on this foundation to a height of 17 feet above the flume floor. This masonry is of a very high class character, the blocks being extremely large and averaging about 2 feet in thickness; they are laid in cement mortar, composed of 2 parts of sand to 1 of cement.

Two recesses, 12 x 8 inches, 36 feet apart, are provided for the gates and stop logs, the down-stream one being 6 feet from the back of the piers, and the up-stream one being 4 feet from the front of the

WASTE WEIRS (FIG. 10).

The floor timbers and flooring for the waste weirs are finished in the same way as the flumes, 12 x 12-inch stop logs are laid in the up-stream check, and the upper four of these can be taken out and replaced to suit the level of the head water. A heavy timber slide is built over the floor for ice, etc.

Arrangements were made to drain the water through the waste weirs under the flooring during construction. This was done by omitting the concrete wall along the front from the rock bottom up, and by placing slides into which one set of 12x12 stop logs, and one set of 2x4 stop logs will be dropped and the space between filled with concrete, when the construction is completed.

HEAD GATES.

Each flume is provided with a set of two head gates of pine, 5 inches thick, for a height of 5 feet, and 4 inches thick above, with an iron sliding filling gate in each, and two 8x4 inch uprights with a cross piece between fitted with wrought-iron shackle to raise the gates by. The head gates move in slides fitted into the check in the masonry and fastened to an upright in the centre of the flume consisting of a 15-inch I-beam and an 8-inch channel into which a strip of wood is fitted, and to this the distance piece between the two gates is screwed. This upright is braced just at the water line by a 20 inch I-beam running across the flume and 11 inches into the wall on each side; it is securely fastened at the bottom to an iron plate nine feet long, two feet wide and half-inch thick, rag-spiked to the floor timbers.