

The water would probably have been passed over the Street Railway headrace wall for a much longer period had it not been for the large amount of spray caused by the water falling over the high bank. The weather had become bitterly cold early in December, and this spray froze to the walls of the factory building on the rock in the middle of the channel, to a thickness of nearly five feet, threatening to pull the building down. When the flow was passed over the overflow, this spray was eliminated to a large extent, and the ice was removed by means of steam jets and blasting.

Excavation for the dam was commenced on July 7th, 1910, the first concrete was placed August 14th, and the work completed December 10th.

The Penstock.—The penstock is 663 feet long. It is of steel 5-16 inch thick and in 9 feet 6 inches in diameter. The plates are 8 feet long and were riveted up into sections of



View showing ice formation on walls of factory, (while flow of river was being passed over the old head-race wall).

two at the shops. The penstock is supported by concrete piers spaced approximately 16 feet centre to centre. No expansion joints were used, anchor piers 10 feet x 16 feet on top being placed about 175 feet apart to take care of the expansion and contraction. Three 4 x 5 x 1/2 inch angles bolted around the lower half of the penstock at each anchor pier to provide for the thrust.

The piers were built up to one foot lower than the bottom of the finished penstock. Steel rods aggregating 5 square inch cross-section were left sticking in the concrete to secure a good bond. Timbers were placed on the piers and the penstock sections brought to their proper positions, blocked to exact grade, and riveted. 5 inch wrought iron pipe supports were then substituted for the blocking, and the penstock contractor left the job. The concrete contractor built the forms for the upper portion of the piers, constructed a runway on top of the penstock and finished the concrete work.

This method was not adopted in the case of the anchor piers, which were built after the penstock and the ordinary piers were in place, it being specified that the anchor piers were to be of monolithic concrete. In the case of the power house anchor pier, which contains 115 yards of concrete and is 23 feet high, this could not easily be done. Steel rods aggregating 15 square inch cross-section were used in this pier to secure the best possible bond.

The first 8 piers west of the power house are about 15 feet high and average 25 yards each. The power house anchor pier contains, as above stated, 115 yards of concrete. At the time the forms for these piers were completed, the

overflow section of the dam was being excavated, and no concrete was being placed at the dam.

The Ransome mixer was brought down to the power house and set up in place of the "Brantford." Steam was supplied from the boiler which had been used to operate the unwatering pumps.

A runway was built across the power house foundations which were at that time nearly complete except for a portion of the floor. The concrete was conveyed from the mixer to the piers in the high wheeled 10 cubic foot buggies which were used for this purpose throughout the work. All piers east of Anchor No. 2 were filled in this way.

Soon after the placing of this concrete the Ransome was required at the dam. The power house walls were also well under way by the time the penstock was in place, and it was therefore impossible to adopt this plan in filling the upper portion of these eastern piers.

A 12-foot Smith mixer was obtained and set up on the river bank between the Dufferin Ave. bridge and the power house and the concrete conveyed on the runway on top of the penstock referred to above. No. 2 anchor pier was also filled from this mixer. It was not practicable to use buggies for this work, as it was considered unsafe to put so much weight on the empty penstock. Barrows had, therefore, to be used.

The concrete for the western penstock piers was mixed by the Ransome at the dam.

The lower portion of several of the piers had to be placed in 5 or 6 feet of water. In such cases a wooden chute 2 feet square, and long enough to reach from the runway to rock bottom, was used. The chute was placed on the bottom and filled a little over half full. It was then raised by means of ropes until the concrete dropped a few feet below the half-way mark and the process repeated. No concrete was allowed to drop through free water.

Anchor piers No. 4 and No. 5 and the most westerly supporting piers could not be finished with the rest, on account of the fact that a portion of the river-flow was being passed through the penstock thimble, until after the concrete in the overflow section had set. These piers were completed on December 20th and this was the last concrete placed out of doors.

In all cases where concrete was placed in cold weather, the rock bottom and forms were steamed for several hours before the concrete was put in. The gravel, water and the mixer itself were also heated. Concrete was placed in this way at a temperature of -10° F. All riveting on the penstock was done by compressed air, pressure being obtained from a small electrically-driven compressor which was set up on the north bank near the power house.

The Power House.—The power house is located on the north bank just below the dam of the lower power purchased by the Company and referred to above. Here, as in the case of the dam, it was necessary to provide power for the factories, etc., and tear out the old flumes before the excavation could be proceeded with.

The earth excavation at the power house amounted to 866 yards and the rock to 1,600 yards. This latter was largely in the tailrace. The total length of the excavation in the tailrace is 130 feet. It was carried down 8 feet below river level. A coffer-dam was erected across the east end and the site unwatered by means of a 6-inch turbine and a 3-inch reciprocating pump. The excavated rock was lifted out by means of a derrick. It was placed in side-dumping hand cars and wheeled to the river bank 250 feet down stream where it was dumped.

The power house consists of a main building or power house proper 90 feet by 38 feet, a transformer house and high tension tower 16 feet by 23 feet, a valve room 50 feet by 10 feet, and an oil house and lavatory 10 feet by 16 feet. The power house floor is 21.25 feet above the tail water.