30 ft. of the length of the water power station rests on the bank, and the remainder of its 308 ft. of total length is built up from the bed rock of the river. Up and down stream the width of the station foundations is 82 ft., and this narrows to about 72 ft. at the floor level of the generator room and the wheel chambers. On a level with the top of the arches over the wheel chambers, whence rises the upper part of the wall on the upstream side of the station, its width shrinks to 51.5 ft. over both outside walls. The steel roof trusses span these walls and the lowest cords of these trusses are 34.5 ft. above the floor of the generator room. Foundations of this power station are of concrete up to and including the floor of the generator room on the downstream side, and

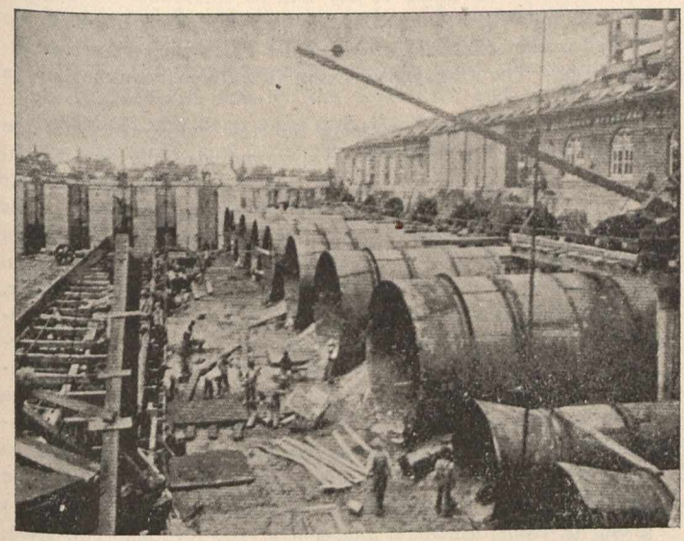

Fig. 3.—Setting the Penstock Tubes.

up to and including the roof of the wheel chambers. These concrete wheel chambers have a total length of 42.5 ft. up and down stream, and of this length 20.5 ft. is outside of the upstream wall of the top portion of the power house. Above the concrete foundations the walls of the power house at Chambly are of brick with vertical steel columns set into them to support the roof trusses. Beneath the upstream side of the power house there are ten wheel chambers for the eight sets of large wheels and two sets of smaller ones. Beneath the downstream side of the power house there are seventeen archways through which the draft tubes of the several sets of wheels pass between the wheel chambers and the tail water.

Each pair of the 51-in. turbines has its own draft tube of 10 ft. 3 in. diameter, and each pair of 27-in. wheels has a draft tube of approximately 5 ft. diameter. There is thus one archway under the generator room for each of the larger draft tubes, and also one archway for the pair of smaller tubes.

At the upstream end of the wheel chambers is the steel rack to keep ice and other floating objects away from the wheels. This rack is 269 ft. long and has a vertical height of 23.5 ft. From the foregoing it may be seen that the flow from head to tail water is directly underneath the power house from the upstream to the downstream side. As at first constructed, the wheel chambers contained the open turbines, but this has recently been changed and a steel penstock with gate has been provided for each set of wheels. Near the river end of the power house a set of waste gates in the dam or forebay wall, through which water may be drawn off into the main channel of the river, are located. The long portion of the dam running up and downstream, as well as the shorter portion that crosses the main channel, was originally built entirely of concrete, save that small iron rods were buried at intervals in the mass to increase its strength. Results of this construction have not been entirely fortunate. Some time after the completion of the dam, that portion containing the waste gates, near the power station, gave way and had to be rebuilt. On December 1st, 1902, that portion of the dam across the centre of the main river channel broke loose and moved some rods downstream in a mass, leaving a clear gap from the bed of the river up for the escape of the water. This detached portion of the dam, bristling with the iron rods that were intended to hold it together, still stands alone in midstream, a monument to its builders. Repair of this break has only recently been completed, and meantime great loss has been sustained through inability to operate the 16,800-K.W. capacity of generating equipment at the power station. While a new section of dam was being constructed in the gap at midstream, a wide apron of timber and stone has been laid along the side, next to the main river channel, of that part of the dam that extends for more than 1,000 ft. up and down stream. As this very large piece of concrete dam work stands, whether from improper design or poor materials, it may fairly be said to illustrate to a conspicuous degree the way not to do it.

Lachine Rapids, on the St. Lawrence river, between the Island of Montreal and the south bank of the stream, is the site of the second water-power station owned and operated by the Montreal Light, Heat and Power Company.

At this station the head of water on the wheels, about 16 feet, was obtained by an unusual construction. The St. Lawrence river at this point passes through a long series of rapids with no great fall in any one place. To render a portion of the water available for power purposes, a large break-water, perhaps a mile in length, was constructed up and down river through the rapids between the Island of Montreal and the south bank, but nearer the former. At a point nearer to the downstream than to the upstream end of this breakwater, a power station and dam was thrown across that portion of the river between the breakwater and the Montreal bank. Water in that portion of the St. Lawrence between the breakwater and the Montreal shore must obviously pass through the power station on its way downstream, and in thus passing it is made to fall through a long row of water wheels. The head of water being so small, only 16 feet, it was necessary to devise some way in which a reasonable speed of revolution could be obtained for the electric generators. The plan adopted was to use single vertical turbine wheels, and to drive each generator direct connected to a long horizontal shaft, which is in turn connected by bevel gears with the vertical shafts of six turbine wheels. As originally designed, each horizontal shaft with its connected generator had a speed of 180 revolutions per minute. Each of the 51-inch vertical turbine wheels geared to this horizontal shaft had a speed of about 77 revolutions per minute.

The total capacity of alternators now at the Lachine station is 6,000-K.W. Four exciting dynamos are provided for

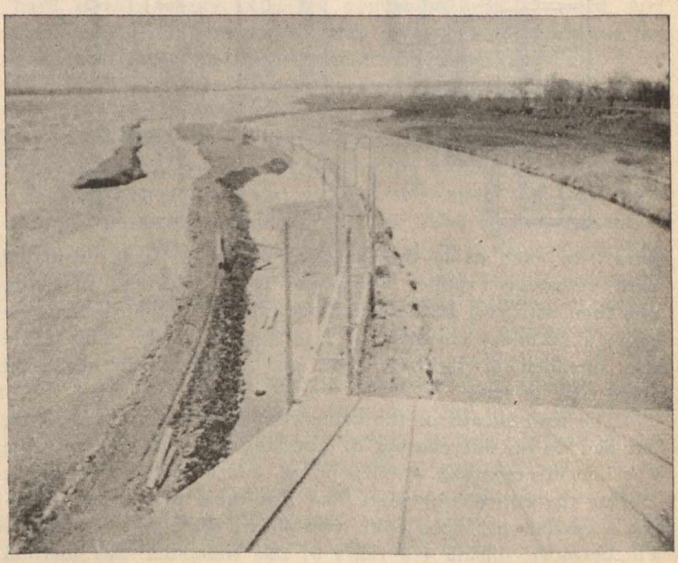

Fig. 4.—View Down Stream from Power House.

these alternators, each being rated at 75-K.W. and 90 to 175 volts. Each exciter is driven at a normal speed of 660-R.P.M. by a belt from a separate water wheel. The wide range of voltage just named was provided for at each exciter because the available head of water at the Lachine power house is subject to much variation, causing changes in the speeds of both the alternators and exciters, and these changes must be compensated for by different currents and degrees of saturation