The cables were supplied by the Northern Electric Co., Limited.

Transformer House.—This building is of reinforced concrete, built on the unit principle, and contains about 1,825 units. It is 228 ft. long, 130 ft. wide and 90 ft. high from basement floor to roof. The load per square foot on all footings is 2,500 lbs. This may appear small, but was due to the nature of the soil, which made heavier loading inadvisable.

In this building are the busbars, with necessary switches, etc., and the step-up transformers for the Massena and Montreal systems. The principal reason for having the step-up transformers removed from the power house was the desire not to have large quantities of oil in too close proximity to the generating apparatus. There was also considerable saving effected in the rock excavation for the power house, and the arrangement permitted easier construction in regard to the exits for the transmission lines.

The auxiliary transformers were supplied by the Canadian Westinghouse Company, Limited.

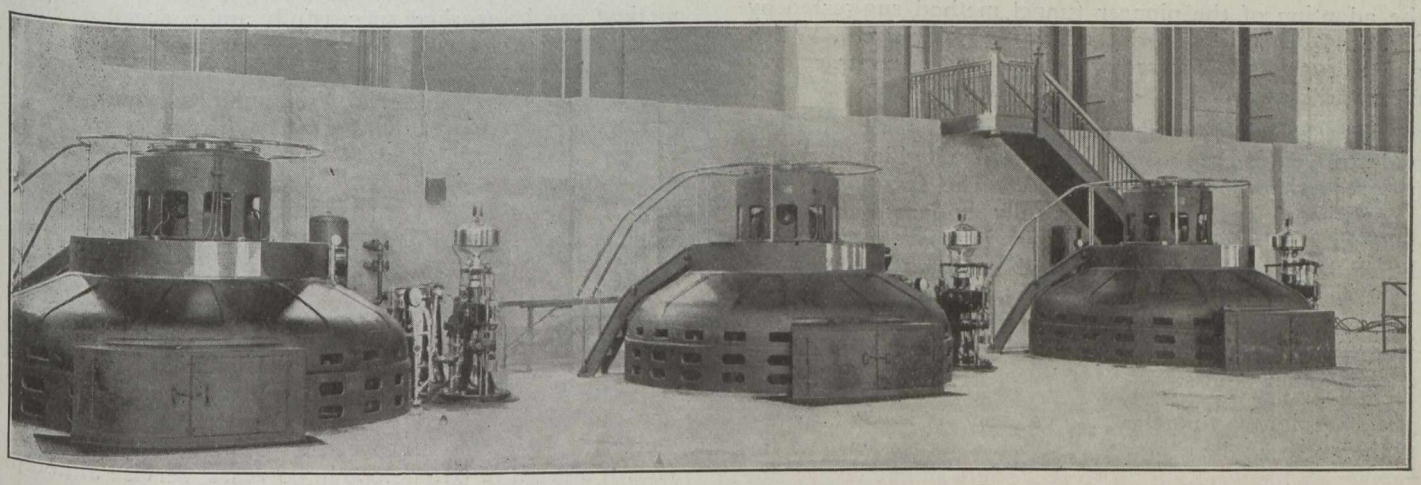
Tests.—The tests carried out on the generating equipment were for efficiency, field characteristics, regulation, heat runs, overspeed, high potential and oscillograph. The efficiency test was made by the method known as the Decelleration Core Loss Test. The field characteristics at different power factors were determined by means of the no-load saturation and the short circuit impedance curve. The regulation was taken as the drop in voltage expressed as a percentage of no-load volts. Heat runs were made with various power factors and loads, with different degrees of ventilation. The overspeed test was made by throwing the water-wheel gates wide open and unit allowed to rotate without load or brakes. A high potential test of 15,000 volts was made on armature windings and 2,200 volts on field coils for one minute. Oscillograph tests were made under all conditions of short circuits, including single-phase and three-phase, as well as tests for wave form under different power factor conditions.

One interesting test was made by short circuit under normal load. It was performed as follows: The unit was loaded by means of a water rheostat, located in the gate house, and the unit short circuited by means of a special oil switch.

At the moment of short circuit the field current jumped from 305 to 560 amperes, and the armature current to about 8 times normal current, the speed of the unit raising from 56 r.p.m. to 66, then back to 53, and finally settling down to 56. The wheel gate opening as a result went through a large variation, causing a considerable water surge in the gate house.

Cost.—The following summary contains the costs of the electrical installation for the first development of 100,000 h.p.:—

	Per kw.
Generators, exciters and blowers	$10.04
Switchboards and high-tension switchgear	2.18
Switch cells and bus structures	.26
Control cables and conduits	.54
Main cables and ducts in power house and transformer house	.23
Feeder cables, ducts and trestle	1.40
Auxiliary power cables and conduits	.28
Auxiliary transformers	.22
Auxiliary switchboards	.37
Storage battery installation	.11
Lighting system	.19
Heating system	.19
Miscellaneous	.24
Total	$16.25



The Exciter Units, with Their Governors.

These costs include engineering supervision and interest during construction.

The total cost of the transformer house, including crane, turn table, transfer truck, etc., was $3.02 per kw. The cost per cubic foot was $0.098; per square foot of floor, $0.251. The floor area is 1.2 sq. ft. per kw.

Operation.—The plant was first placed in commercial operation on December 27th, 1914. The load has been built up gradually until now the plant is operating at its maximum output with a daily load factor of over 90 per cent. Three shifts of 8 men each, and one operating superintendent, comprise the staff. The superintendent is W. G. Hullett. Very little trouble in operation has been experienced to date, everything working out smoothly.

COPPER LINING FOR TUNNEL.

Bids are being solicited by the Board of Water Supply of New York City, calling for furnishing and placing copper lining in a portion of the city tunnel of the Catskill water supply aqueduct. The actual length to be lined is about 1,200 ft. of 12-ft. tunnel. The copper generally will be 5/64-in. in thickness, and the sheets will be joined by brazing and attached to the surface of the existing concrete lining by bolts fastened into the masonry. After completion, the tightness of the brazed joints is to be tested by light water pressure on the back of the copper lining.