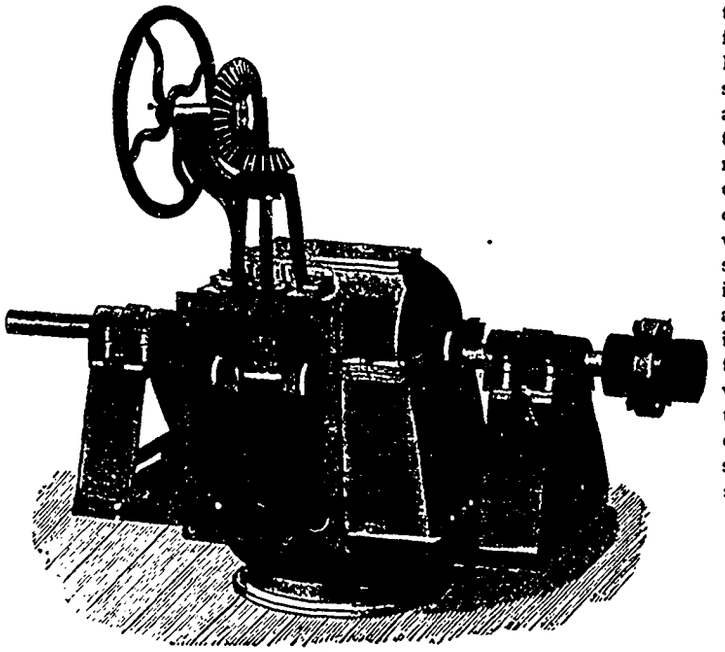
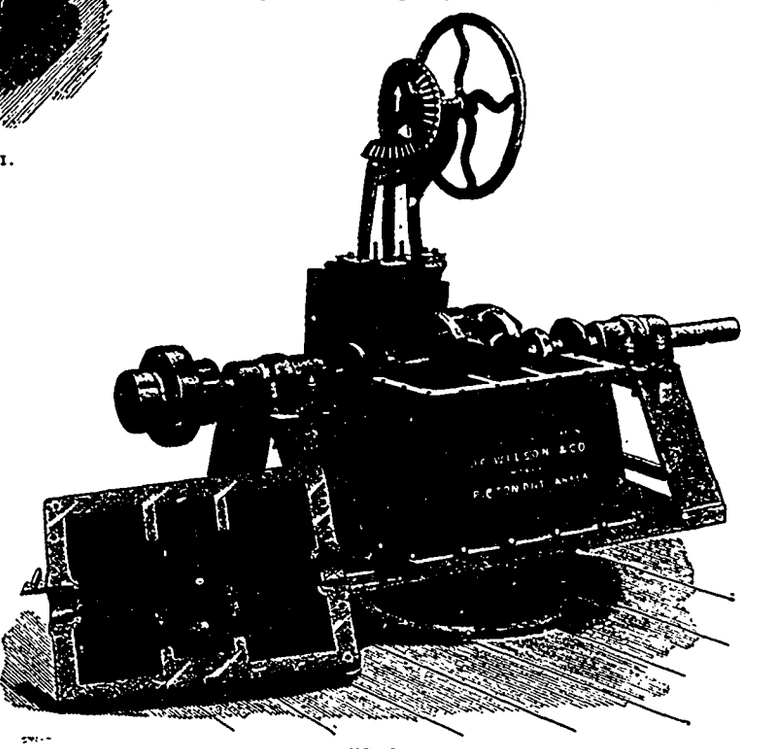
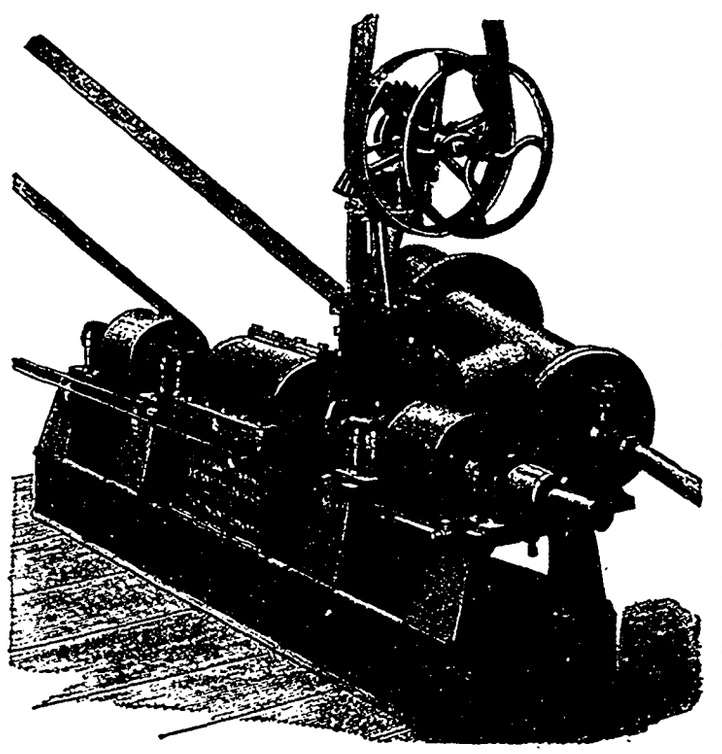


"LITTLE GIANT" WATER WHEEL, NO. 1.

the gate mechanism. Along one side of the room the numerous wheels are arranged in a row from which belts are driven, at an angle of 45 degrees, to the dynamos on the floor above. The water is taken from the receiver in this room, and is discharged partly into the tail race emptying into the St Lawrence, and partly into the 48" inch steel pipe which supplies water to the wheels in a neighboring cotton mill. The dynamos occupy the second floor, and the room is very skilfully planned. While the single phase system is simple and reliable, it lacks range and flexibility; it lacks a motor which fills the commercial requirements of power distribution, and it lacks means of convertibility into direct currents for railway and other work. The multiphase systems developed within the last few years supply the required flexibility, while the induction motor supplies the missing element for commercial power, extending its uses beyond what has been realized by the direct current motor; and when the two or three-phase rotary transformers are brought in, we have an almost ideal system for long transmission as well as central station work. The particular system here adopted is the S. K. C. (the Stanley-Kelly-Chesney), as applied by the Stanley Electric Co., of Pittsfield, Mass., whose machines are manufactured in Canada exclusively by the Royal Electric Co., Montreal and Toronto. The generators are in the north side of the dynamo-room, and the bed plates of the machines are fixed by lag-screws set into the timbers which form the insulating cap, and which were boiled in paraffine to remove all moisture. Each generator delivers alternating currents, differing in phase by 90 degrees, to two independent circuits at an electromotive force of 5,200 to 5,700 volts, which force can be varied within these limits by rheostats placed in the fields of the generators. The frequency is 66 periods per second—that is, the current is reversed about 8,000 times a minute. This frequency was selected in preference to 133 periods per second (16,000 alternations); for, while the loss in the core of the transformers was increased from 20 to 30 per cent., and the regulation of the generators from a total of 2 per cent. to a total of 3 per cent., the self-inductive drop in the transmission line was such an important factor that the lower frequency was considered preferable, as giving, on the whole, a better regulating and more economical system. Two separate transmission lines run to Quebec, and provision is made for a third. All the lines are overhead, supported by wooden poles, except at the crossing of the Charles River, where the poles are iron 125 feet high. The line wire is No. 0, B. & S. bare copper. The drop, due to the ohmic resistance of the wire, is 8 per cent., which is increased by the self-induction to 10 per cent. On the extreme ends of the top cross-arms of each pole line are strung galvanized iron wires, which are grounded at every third or fourth pole. These iron wires, together with lightning arresters, placed at each end of the transmission lines, give such complete protection from lightning storms, that a discharge in either the generating station or sub-station is practically unknown.



NO. 2.



NO. 3.

The lines enter the city in St. Rochs, in the centre of which industrial district is the sub-station. This building contains the company's offices, and the transformer house is part of the structure. The switchboard which here receives the transmission lines contain special high-voltage switches, mounted on marble and fitted with self-enclosing boxes designed to cut off any possible arc that may be formed on opening the 5,000-volt circuits. From the transmission lines, the current is carried to the step-down transformers, where it is transformed into the distributing electro-motive force of 2,000 volts. These are indoor Stanley transformers, arranged on a rack in two tiers, five wide and two deep, and placed so as to admit of free ventilation. They are 50 k. w. and connected in pairs. Each is wound for a primary force of 2,500 volts, and a secondary one of 1,000 volts. The primaries of each pair are connected in series for receiving 5,000 volts, and the secondaries in series for delivering 2,000