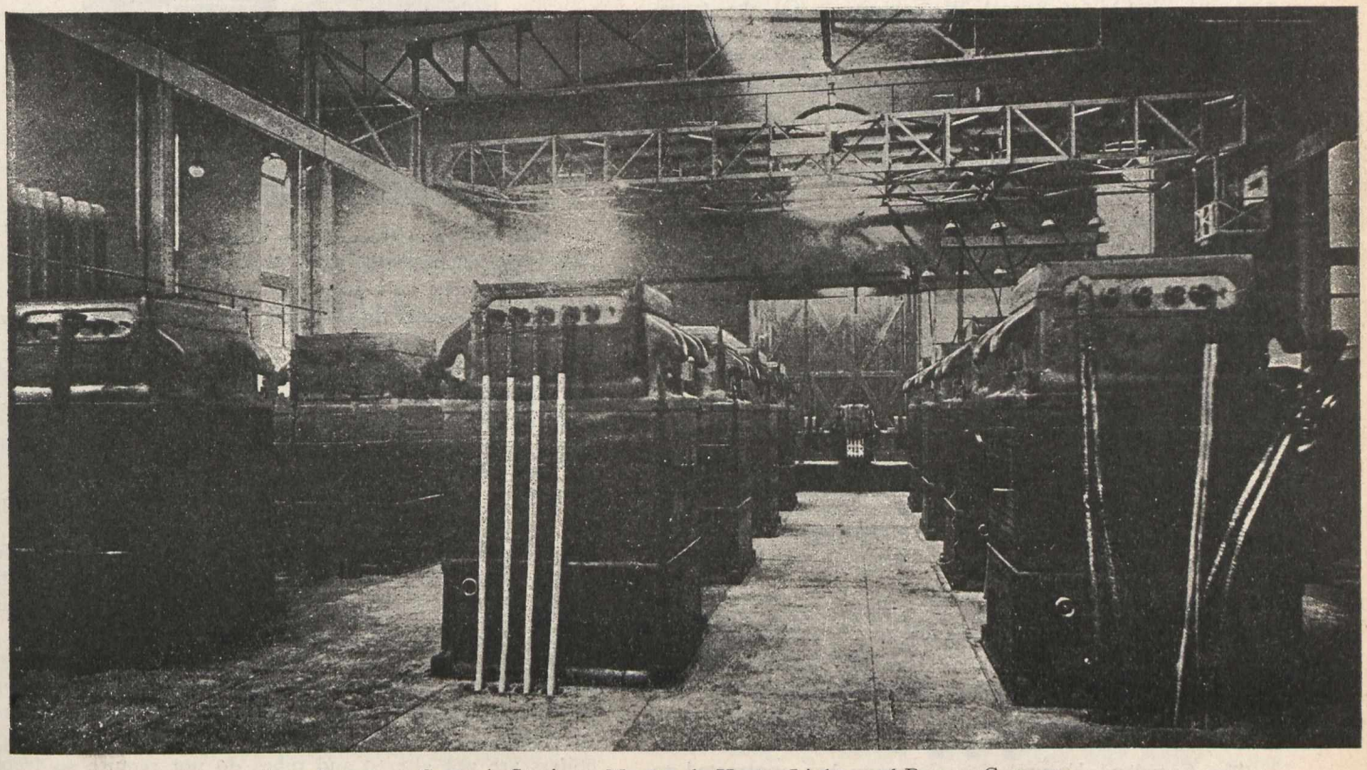
in connected motors was 116-h.p. for those of the direct-current, and 2,176-h.p. for those of the alternating type. To water power must also be traced the strong tendency to consolidation that culminated in 1901.

Electrical supply in Montreal and its suburbs is distributed from three sub-stations, the central, the McCord street, and the Shawinigan sub-station respectively. The central sub-station is nearest to the business centre of the city, the McCord street sub-station is about one-half mile to the west, and the Shawinigan sub-station is approximately three and five-eighth miles to the east. At each of these sub-stations the energy transmitted from the water power plants is transformed or transformed and converted to alternating current at 2,400 volts, 63 cycles per second, and either two or three-phase. At the central sub-station a portion of this 2,400-volt alternating current is transformed to 4,000-volt constant current for the series arc lamps and another portion of the 2,400-volt current is transformed and converted to direct current at 250 volts for a three-wire system of 500 volts between outside wires, that carries a part of the motor load. All three of the sub-stations are tied together by the 2,400-volt feeders, so that the energy received from either water power plant may be delivered to consumers on any part of the distribution system. Constant, direct current is supplied for a part of the series street lamps by means of motor-driven arc dynamos.

an aggregate capacity of 16,556-h.p. giving an average capacity of 28.4-h.p. each,average being 1.36 motors and 38.8-h.p. per customer. This large average horse-power per motor, and per customer, shows the extensive use of alternating motors in manufacturing operations. Some of the alternating motors are of the synchronous, but the greater number is of the induction type, and all are supplied with current of 63 cycles and either two or three-phase. Most of these motors are operated from the 2,400-volt circuits through transformers at a voltage of about 550; but some of the large sizes receive the full line voltage in their windings. 529 direct-current motors are in use by 444 customers, and have an aggregate capacity of 2,616-h.p., the average capacity being almost 5-h.p. each, and the average per customer 1.2 motors and 6-h.p. The average power per customer, and per motor, is nearly six times as great for the alternating as for the direct-current type, thereby showing that the alternating type of motor is more generally applied for large powers. The two largest customers, the Montreal Street Railway Company and the Dominion Cotton Mills Company, use 21 motors of the alternating type of an aggregate capacity of 8,005-h.p., besides some smaller sizes. If these motors and their total capacity are deducted from the total figures for all motors of the alternating type, the result shows a balance of 559 with a combined rating of 8,551-h.p. These last figures correspond to an average capacity of 15.3-h.p. per



Transformers, Central Station, Montreal Heat, Light and Power Company.

Of the arc street lamps, 1,333 are enclosed series alternating, and 384 lamps series open direct-current; all of 2,000-c.p. each. The enclosed alternating arcs operate nominally on 80 volts and 7.5 amp. each, or 480 actual watts. On the direct-current arc lines the rating is 9.6 amp.

Of the 577 incandescent street lamps, 106, 65-c.p., and 273, 32-c.p., are on the constant alternating-current lines, 37, 32-c.p., are on direct-current circuits, 50, 32-c.p., are in multiple on the 220-volt system, and 91, 32-c.p. and 18, 16-c.p. each are in the multiple at 110 volts. As a proportion of the 299,903 incandescent lamps in commercial service are below 16-c.p., the average candle power would be less than 16 per lamp. The constant-potential commercial arc lamps number 1,277 on alternating circuits. Commercial service also includes 23 constant-current, enclosed alternating arcs and 214 direct-current series open arc lamps.

Most notable in this system is the load of stationary motors, because of their large number, great aggregate capacity and the unusual average capacity of each. 580 motors in use by 426 customers are of the alternating type and have

motor, or 2.5 that of the like average for all of the direct-current motors. This again brings out the fact that the alternating motors have been more generally selected for large amounts of power.

The Montreal Street Railway Company has a larger capacity in motors connected to the system than any other users. This capacity amounts to a total of 4,915-h.p. and is made up by seven 2,200-volt, two-phase motors that operate with alternating current of 63 cycles per second. Six of these motors are of the induction type and rated at 700-h.p. each, while the seventh is a synchronous motor of 715-h.p. For the supply of energy to these motors, seven two-phase circuits are run from the central sub-station to the generating station of the Street Railway Company. These motors are believed to be among the largest of this type in use anywhere. It is believed that they require less skill in their operation, and cause less fluctuation of voltage in the electric supply system than synchronous motors of equal capacity. On the other hand, one disadvantage of induction motors, that of a very short air gap between the rotating