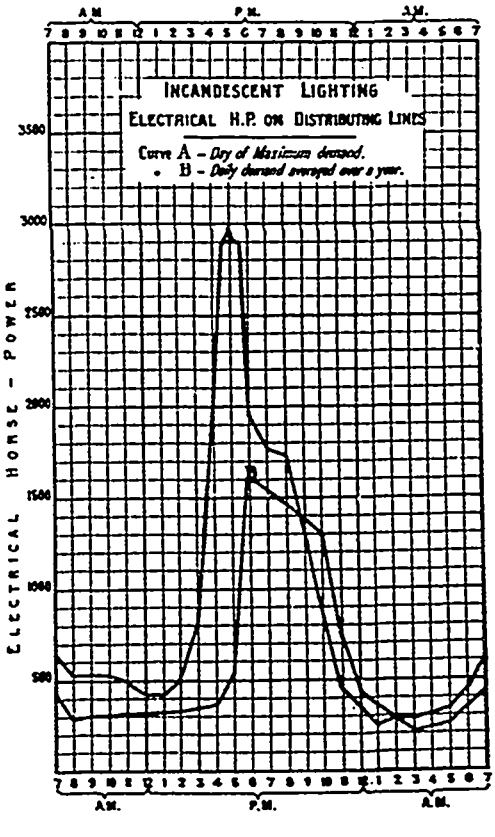
Lauffen,	Three phase.	100	20,000	300	Experimental
Portland	" "	12	6,000	5,000	
Ogden,	" "	38	16,000	3,000	
Three Rivers.	Two phase.	17	12,000	600	
Kootenay,	Three phase.		20,000	2,000	Building.
Hamilton.	Two phase.	38	20,000	3,000	"
Lachine,	Three phase.	5	4,400	20,000	
Chambly,	Two phase.	16	12,500	20,000	Building.

With one exception these are all alternating plants, and it will be noticed that Canada is well to the fore, as might be expected from the almost unlimited powers available. Montreal stands at the head of the world so far as transmitted power is concerned, and it appears probable that the two magnificent schemes at present under construction will find an ample market in the city and vicinity. Montreal's demands, covering as they do the whole field of consumption of power for street railway, incandescent and arc lighting, and motor power, offer a good example for illustrative purposes, and it has been deemed advisable to give point to the discussion to follow by reference to the demands existing in that city at the present time, without reference to future necessities, as these will no doubt be much of the same kind.

With this end in view, the following curves have been drawn, showing the demands for all classes of power at the present time for twenty-four hours.



The higher curve in each case shows the maximum demand during the year, and the lower the average load at each hour of the day for the year. From these demands the transmission scheme will be figured, but necessarily in a general way for illustrative purposes. The problem consists in laying down the power in the city to suit the demands in the most complete way as regards economy, efficiency and suitability. As these demands affect the transmission by their nature, as well as by their amount, they must be considered briefly before taking up the transmission proper.

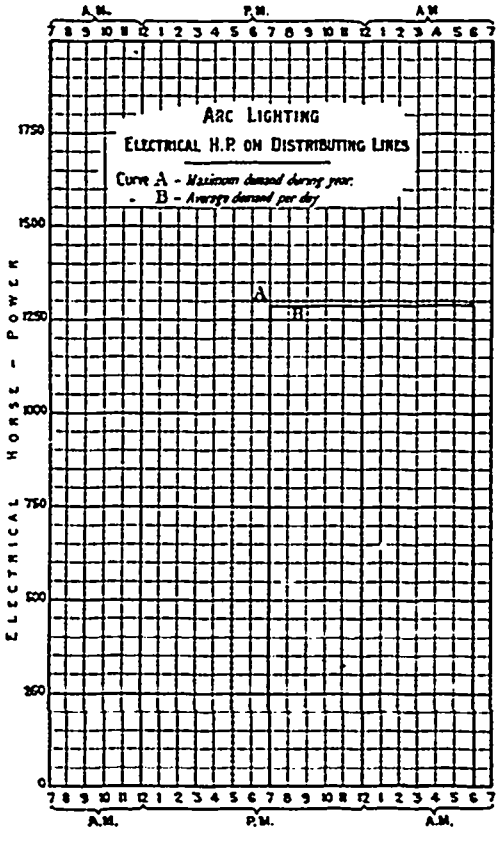
Incandescent Lighting.—The demand curves shown have been figured from the actual curves of one of the present stations in the city, with an allowance for the loads of the other operating companies; in all to cover 100,000 lights wired up. To meet this demand it will be readily granted that direct current is unsuitable, owing to the distances to be covered, and alternating currents of single, two or three phase are the only alternative, any of these being readily obtained from the transmission voltage by means of static transformers to feed the distribution at a voltage of say 2,000, which is considered safe for city work. This potential will of course be again reduced before entering customers' premises, thus involving two sets of transformers. This system will also cover interior lighting by alternating arc lamps, and perhaps a few small alternating motors.

The demand curves for the arc lighting have been figured on the supposition that there are 2,000 arc lamps on series circuits in the city, lighted from dusk to dawn, the curves in this case being elevated into straight lines. For this service several plans present themselves as below.

(1.) By rectifying the alternating transmission currents into direct through the agency of rectifiers, which are simply revolving commutators driven by small synchronous motors from the transmission line, and using this current in the present series arc lamp. This system has been in use for a short time in several European stations, with varying results. It appears to have a great future before it when it has come through the present doubtful stage.

(2.) By means of alternating arc lamps fed from the incandescent circuits. This system, while perfectly applicable for interior lighting, where each unit is treated as an incandescent lamp and ed on or off at will, is not so suitable for street lighting, as it does not lend itself to ready control from the station. Further, as the light distribution of alternating current lamps is inferior per watt of consumption to that of direct, it becomes more expensive in operation.

(3.) The series arc system as at present used, with motors instead of engines to drive the dynamos, while necessitating more apparatus than either of the others, is more simple and controllable in operation, and will be accepted for illustration. The number of units necessary to cover the 2,000 lights will be 16 if of 125 lights each, which is about as high as is available per machine. If these were coupled in pairs to 200 H. P. motors, the units would be eight, and the addition of a spare would make a total of nine, which would be ample for present demands.



Either alternating or direct current motors are suitable for general work, but, where variable speeds are necessary as for elevator purposes, the direct is at the present time the only one available. The cost of the former is also higher at the present time. The advantages of the alternating motor distribution are, less cost of circuits, greater simplicity of apparatus, and the ability of reaching outlying demands at small cost, and that it involves no special apparatus in the distributing station other than the necessary lowering transformers. As the objections to