



MAIN STEEL PIPE WITH GATE HOUSE IN THE DISTANCE.

volts to the distributing system. This lessens the voltage on any particular coil, and in case of a burn out the other will carry the load for a time. The regulation from no load to full load is about 1 per cent. and the average efficiencies of the entire transformer equipment is 97.8 per cent. under full load, 97.9 under half load, and 97 under quarter load. The transformers are divided into two sets of eight transformers each, with a relay of two which can be cut in or out without stopping the service. The current from the secondaries is carried to the bus bars of the distributing switchboard, whence it is furnished to the city for lighting and power.

The generators are the S. K. C. inductor type of two-phase machines, running at 286 revolutions per minute. Each generator has a capacity, at 5,700 effective volts, of 100 amperes. They are the largest inductor machines ever built, and it is claimed they are the first practical machines ever constructed for such a high initial electromotive-force. The armature is stationary, consisting of two sets of laminated iron rings, connected by steel rods four inches in diameter. On the inner surface of each laminated armature ring are fifty-six grooves for receiving the armature coils. The weight of this portion of the machine is 42,580 pounds. The field or exciting coil is circular, 94 inches in diameter, and wound on two copper bobbins, each 4½ inches wide, with a copper strip four inches wide and .026 inch thick. It is insulated between the layers with a special oilcloth which is practically indestructible at temperatures under 150° C. Every turn of the winding being practically in contact with the moving air, there is no possibility of overheating in any portion of the coil. The copper bobbin, absorbing all discharges, prevents any excessive rise of electromotive-force on the coil, which might be caused by opening the field circuit under full charge. There are, in all, 56 armature coils, 28 for each phase. The coils are small and were wound in a lathe. Each coil was tested with 15,000 volts, and the insulation of the completed arma-

ture with 12,000 volts. The inductor, the only moving part of the machine, is a steel casting 43 inches long and 84 inches in diameter, on the periphery of which are two sets of polar projections of iron laminæ, 14 at each end. Weight of inductor, including shaft, 28,470 pounds; weight of completed machine, 100,000 pounds.

In order to obtain an electromotive-force following the sine law, the pole faces of the generators, made by the Stanley Company are so shaped that their curvature may be described by a formula, which is contained in the U. S. patents issued to the company. A novel feature in these generators is that the entire distributing system is arranged to run in parallel, and to do this the generators must be kept in phase. A defect in any wire, such as a ground or leak, affects all the wires of every line, so that if a second ground occurs the generators between the two grounded points are all short circuited. But to get over this difficulty, the mains from the different machines are kept separate, and the secondaries of the step-down transformers are



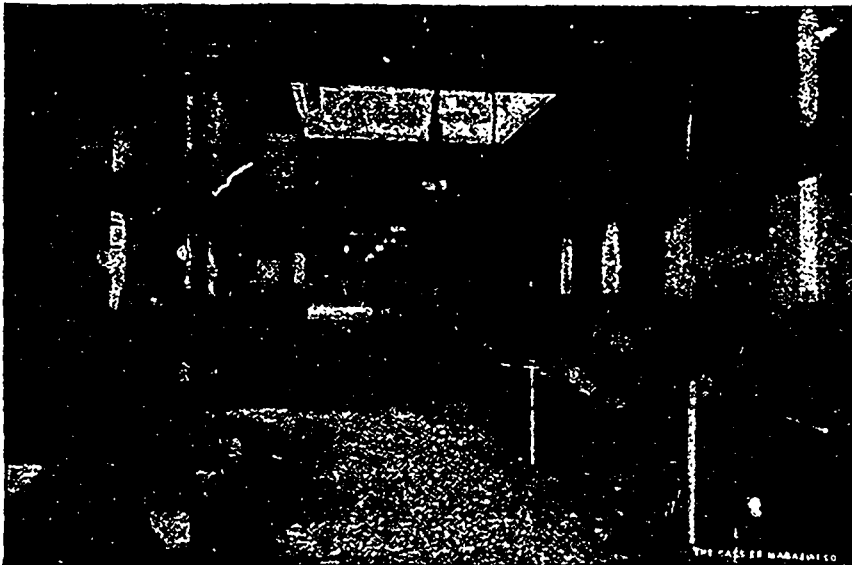
ALONG THE PIPE LINE.

connected in parallel with the supply mains. The generators are kept in phase by a distinct synchronizing winding. By these means the load can be shifted from one generator to the other by varying the quantity of water on the turbines.

The exciters are two slow-speed direct-current machines of 12 k. w. capacity, each sufficient to excite the fields of the three alternators. The shop tests of these dynamos showed the following efficiencies: Full load, 95.1 per cent.; half load, 92.3 per cent.; quarter load, 87 per cent. Rise of temperature after 24 hours run with full load: field coil, 12° C.; armature iron, 20° C.; inductor iron, 7° C.; armature coils, 26° C.; bearings, 21° C. Regulation from no load to full load, 3½ per cent.

The switchboards shown in the engravings need no special comment.

As to the commercial efficiency obtained in this plant, it is interesting to note that, with the generator working at full load, for every 100 k. w. of energy delivered



THE DYNAMO ROOM.