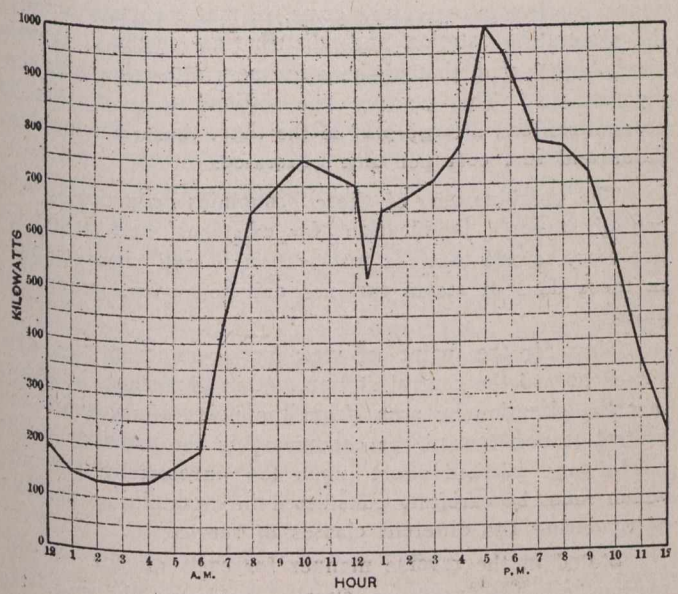
Observations made in residence districts supplied by overhead lines indicate that the sum of the maximum demands of individual consumers is from two and one-half to three times the co-incident maximum demand on the transformer, the ratio being lower where there are less than ten consumers on a transformer and higher where there are more than thirty.

In commercial districts with numerous small stores supplied by overhead lines, as illustrated in Fig. 5, the co-incident demand is much higher in proportion to the consumer's demands.




The ratio of the sum of consumers maxima to the co-incident demand in this class of lighting is found to be from 1.5 to 1.7, it being lower where there is considerable display of lighting, show-windows, etc., and higher where the shops are of such a character that not all the lighting is needed continuously.

In the block of commercial lighting shown in Fig. 5 there are fifty-five customers, twenty-six services and 1,200 lights connected. The measured demand on the transformer at 7.00 p.m. Saturday is 34 kw. while the sum of the readings of the demand meters is 55 kw. The diversity factor is therefore $\frac{55}{34} = 1.6$. The sum of the demand meter readings is 55/60 of the connected load.

In a densely populated residence block in Chicago the connected load is 2100 50-watt lamps or 105 kw. The consumers' maximum demands aggregate about 63 kw. and the co-incident maximum, as measured at the transformer, is 18 kw. There are over 175 consumers connected to the transformer. In this case the diversity factor is $\frac{63}{18} = 3.5$, and the consumers' demands are 63/105 of the connected load.

This probably represents as dense a condition as would be found anywhere in a residence district. It is due in this case to the fact that the block supplied by this transformer consists entirely of three-story apartment buildings, in which about 90 per cent. of the tenants are using electric service.

Power consumers are not often grouped so that any considerable number can be supplied from one transformer installation. They must be kept separate from lighting customers and therefore usually require a separate set of transformers for each consumer where the load is 2 h.p. or more. In large installations advantage is taken of the diversity between meters to reduce the transformer capacity installed. This cannot be done with small consumers except in the occasional situations where several power consumers are located within a radius of about 500 feet.

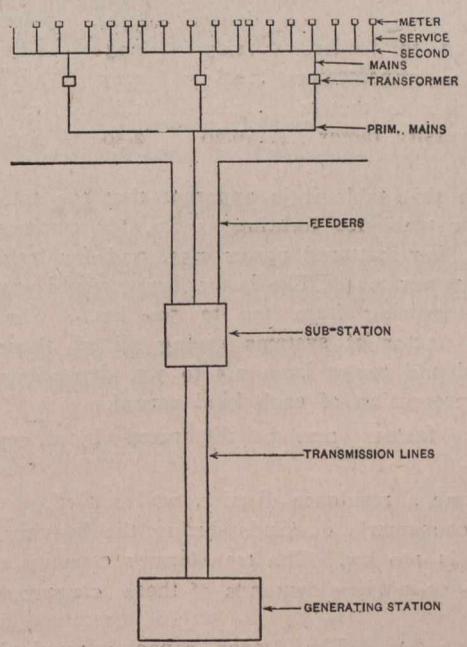
The diversity factor between meter and transformer on power customers is therefore very small and probably does not average over 1.1 for all power installations.

Advancing toward the substation, the next point at which diversity may be conveniently observed, is at the feeder switchboard. There is a considerable diversity factor between the sums of the transformer maxima and the maximum feeder load.

The factor varies with the character of the territory served and with the density of the load. In scattered residence territory where there are many one, two and three-kw. transformers, and few larger than 15 kw., the ratio of maximum feeder load to total transformer capacity is from 45 to 50 per cent. In territory where transformer units vary from 5 to 30 kw., or larger, the ratio is 55 to 60 per cent. In commercial districts with transformers from 5 to 50 kw., the ratio is from 75 to 85 per cent. or higher.

Assuming that each transformer carries its rated load at some time during the year, the diversity factor for a feeder in scattered territory is from 2 to 2.2 In denser territory the factor is 1.6 to 1.8 while in commercial districts it is 1.2 to 1.3.

On circuits carrying a scattered power load in units of 5 to 100 h.p., the ratio of maximum load to transformer capacity is from 45 to 50 per cent., which makes a diversity factor of 2 to 2.2 Where a few large power customers rang-




ing from 100 to 500 h.p. or more are on a separate feeder, the ratio is from 75 to 85 per cent., making a diversity factor of 1.2 to 1.3. These ratios shift somewhat in a growing system, the tendency being to reduce the diversity factor as the territory becomes more densely built up. They are also modified somewhat by the losses on feeders and mains which may be as much as 15 to 20 per cent.