desired. It is, of course, impossible to make hard and fast rules which will apply in every case, as the installation of devices of this nature is regulated very largely by local conditions, both operating and those imposed by contracts. It is, however, possible to make more or less accurate subdivisions under a classification, and the tabulation below will serve to indicate a generally accepted basis in use at the present time:

(a) Loads up to 0.1 kilowatt.
(b) 0.1 kilowatt to 2.5 kilowatts.
(c) 2.5 kilowatts to 50 kilowatts.
(d) 50 kilowatts to 100 kilowatts.
(e) From 100 kilowatts up.

Classification with Respect to Information Required.

(a) Applications requiring accurate limitations of demand.

(b) Applications which require indication of watt or kilowatt demand, without indicating time of day at which demand occurs.

(c) Applications requiring a permanent record of all of the demands of the month, together with the time of day at which each demand occurs.

(d) Applications which require the information as listed in class "c," but which require, on account of the large size of the installation, great accuracy of reading and permanency of record.

The two subdivisions "c" and "d" cover the problems connected with off-peak rate systems; contracts calling for the average of the three highest demands of the month, and similar special conditions.

There are available at the present time demand meters which fulfill the conditions set out in the previous tabulation. They may be roughly classified as follows:

(1) Demand limiters.

(2) Indicating demand meters giving integration over definite time interval. Lagged and logarithmic values of demand.

(3) Curve-drawing demand meters, including those giving instantaneous values and values integrated over definite time interval.

(4) Printing demand meters.

Importance of the Time Interval.

In the application of demand meters one of the most troublesome and much discussed points has been the time interval over which the integrations are to be made. It would be obviously unfair to penalize a customer for an instantaneous overload, such as is caused by short-circuited conditions or other accidental reasons. If the time interval is made excessive, then during the interval large demands may be made upon the central-station equipment, which would influence either the regulation of the line, or the capacity of the equipment necessary to serve such demands. The problem has been to arrive at some happy medium which would be equitable to both the central-station and the customer. A general statement of the ideal condition is found in the following:

The time interval should be so proportioned that only those demands which have an effect upon central-station operation or equipment are recognized and should be measured in proportion to their effect upon such operation or equipment.

This problem was first fully discussed by Louis A. Ferguson, of the Commonwealth Edison Company, of Chicago, in "Effect of Width of Maximum Demand on Rate-Making." Since that time many very careful investigations have been made upon actual service installations of many kinds, in order to determine the effect of various time intervals upon the value of demand obtained.

Effect of Time Intervals on Value of Demand.

A compilation and analysis of the results of tests made by different central-station companies under varying conditions will be illuminating in connection with the application of demand meters. While average variations will not necessarily indicate the actual differences to be found upon any specific customer by variations of the time interval, yet it is probable that the values given will roughly indicate the effect of such variations upon the revenue of the central station, which will be affected by all classes of customers.

Kilowatt Demand in Percentage of 30-Minute Demand. —Demand Interval—				Connected Load in Percentage of 30-Minute Demand.
5	15	30	60	
108.4	104.4	100	97.3	209

It is of interest to analyze the data further with relation to the general classification of customers, in order to determine roughly those classes for which the variation is greater than the average, and those for which the variation is less than the average.

Class of Customer.	Kilowatt Demand in Percentage of 30-Minute Demand. —Demand Interval— 5	15	30	60	Connected Load in Percentage of 30-Minute Demand.
Light manufacture	108	103.8	100	98	193
Heavy manufacture	106.2	104	100	97	178
Automobile manufacture	108	103	100	99.2	211
Foundry	110.7	108	100	97	292
Wood working	107	102.3	100	94.5	199
Grain elevator	110.5	105.5	100	98	194

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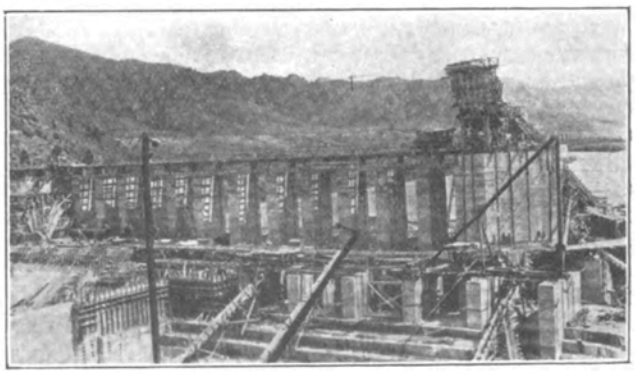
PROGRESS ON HOLTER DAM CONSTRUCTION.

Montana Power Company's 40,000-Kilowatt Project Nearing Completion.

The accompanying illustration shows the progress which has been made in the construction of the new Holter dam of the Montana Power Company on the Missouri River. This project, which is designed to



Construction View of Holter Dam of Montana Power Company on Missouri River.

ultimately develop 40,000 kilowatts, was undertaken originally to supply energy for the additional electrification of the Chicago, Milwaukee & St. Paul Railroad. Because of the postponement of this work, however, efforts are being made to interest manufacturers of carbide, carborundum and other similar materials where cheap electrical energy is a necessity.

The dam is one of a chain which the Montana Power Company has built along the Missouri River and cost in the neighborhood of $4,000,000. The lake erected by the holding back of the water has a maximum head of 109 feet. The dam is 1350 feet long.