

in service, and caused delay, dissatisfaction, and expense to the customer.

Mechanical as well as electrical tests are made on insulators, apparatus being at hand capable of subjecting them to a mechanical tension of 10,000 pounds, and, if desired, an electrical stress of 100,000 volts or more. This mechanical apparatus is available for any tension tests up to 10,000 pounds.

Many miscellaneous tests are carried out here for which special apparatus is designed in the laboratory workshop. Also, many tests, while not determining absolute values, do nevertheless determine comparative suitability of material for the work for which it is to be used. Among miscellaneous tests performed recently may be mentioned the following:—

Determination of the relative expansion of porcelain and various metals and alloys, glass and cement.

Determination of the relative heat conductivity of various patent car floorings and sidings as compared with wood and dead air space as a heat insulator.

Tests on hot galvanizing and sherardizing as a rust-proof covering for iron and tests to determine whether or not purchases of galvanized hardware will pass the standard four-dip test.

Connected with this section is the cement testing laboratory, in which four to five samples per day of cement may be tested. Samples are tested according to the specifications of the Canadian Society of Civil Engineers, for the following: Fineness, time of setting, tensile strength, soundness and constancy of volume.

Any sample not passing test, or which gives a doubtful test, is at once given a check test, reserve cement for such contingencies being labelled and stored at the time the cement is received at the laboratory. The reserve samples are preserved until the cement has been accepted by the Commission.

**Meter and Standards Laboratory.**—By the installation of improved apparatus, the scope of the work of the meter department has been greatly increased and a large amount of electrical testing extremely varied in its nature has been accomplished. The equipment has been chosen with a view to the widely varied classes of testing which are likely to come within the sphere of this department. Where extremely close voltage regulation is not required, 25-cycle power is obtained from the supply mains of the building; while 60-cycle power of the same class can be taken from the 50-kw. motor generating set installed for use with the high-tension testing transformer. For precision work, a specially designed motor-generator set has been installed. It consists of a direct-current variable speed motor driving a small alternator. From this alternator may be obtained two or three-phase potentials at any voltage up to 360, while by changing the speed of the motor, any frequency from 22 to 66 cycles can be maintained. Direct-current is taken from the storage batteries or from the charging generator.

Where electrical power is measured for sale, the necessity arises for accurate standards of measurement,

against which may be checked the sub-standards used in calibration of station graphics and other power meters. With a view to leaving absolutely no room for conjecture as to the accuracy of measurements, a careful comparison has been made of the Commission's standard instruments with those of the Government at Ottawa, and also with the U.S. standards at Washington.

The "Hydro-Electric Meter Code" has been adopted as a basis of comparison of watt-hour meters, and a number of different types were submitted for comparison of their mechanical properties. A very close check having thus been obtained on the actual relative values of widely differing makes, a basis was established whereon to place large contracts for the instruments as required by the municipalities. The following meters have been submitted to these tests: Aron, Canadian General, Chamberlain and Hookham, Ferranti, Packard, Siemens, Sangamo, Westinghouse.

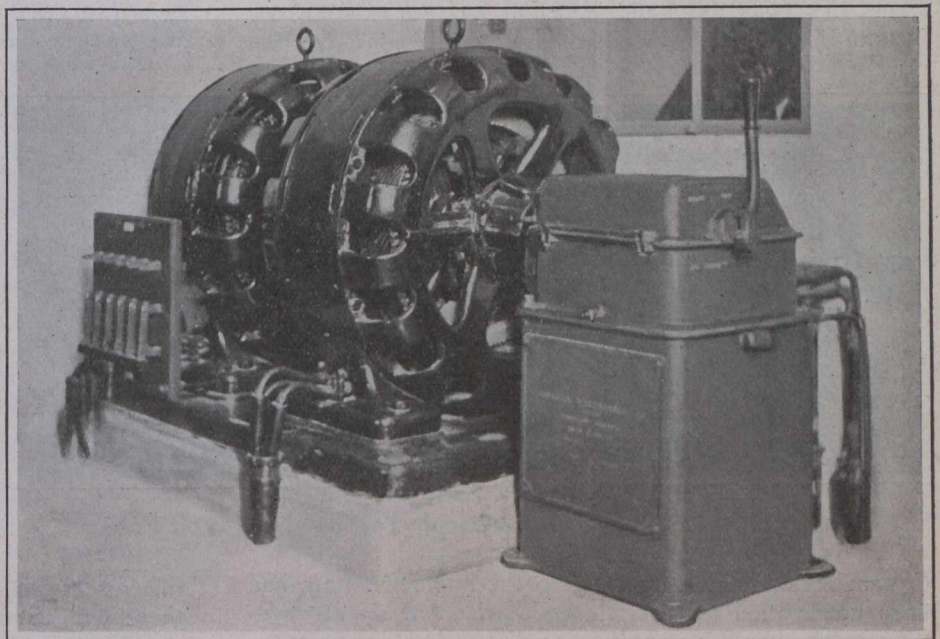


Fig. 2.—A 50-Kv.a. 60-Cycle Motor-Generator Set, H.-T. Laboratory.

The peculiar characteristics of the demands of rural customers, which now form a rapidly increasing percentage of the Commission's power load, has called for special types of metering apparatus to replace or to be used in conjunction with the ordinary watt-hour meter. Experiments have been conducted on various metering principles which might answer these requirements, and a number of types of excess and maximum demand meters now being given actual service tests to further determine their characteristics.

In the past year, the oscillograph has often proved its usefulness in investigating phenomena which would have otherwise been impossible of examination. The wave forms of currents and potentials obtained from the high-tension testing transformers were made the subject of a series of oscillograms, the object being to determine the behavior of the insulators tested, under the attack of a potential having a steep wave front as compared with its action when an approximately sinusoidal voltage is applied. This instrument has also proved invaluable in special investigations, among which may be mentioned: A series of tests to determine to what extent the triple