

A NEW FORM OF DIRECT CURRENT AMMETER AND VOLTMETER.

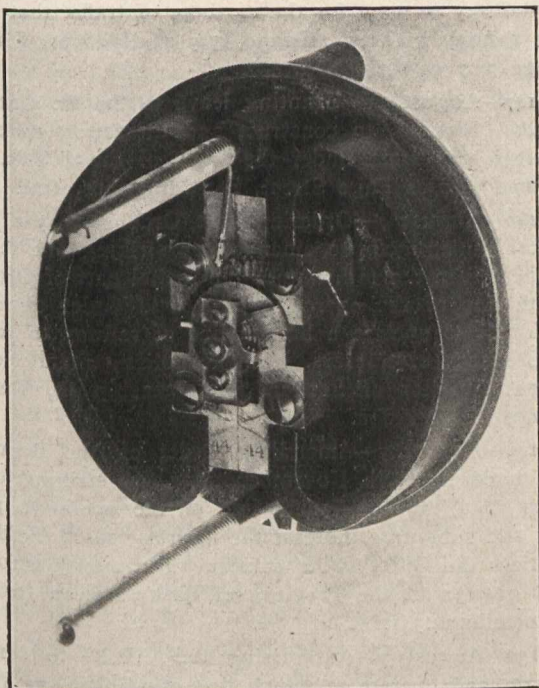
P. MacCahan.

There exists a considerable demand for a line of small size D.C. switchboard ammeters and voltmeters, of the very highest grade and accuracy, yet so constructed as to be low in price.

Heretofore all low price instruments, especially those of small size, have been built on the "moving iron" principle, the cost of the permanent magnet type construction having been considered prohibitive for this class of service.

However, it is universally conceded that for direct current service, the permanent magnet moving coil construction is highly superior to the moving iron type, being more accurate, naturally aperiodic, or "dead beat," more free from external field and temperature effects, taking less energy, and also showing polarity. The energy taken is much lower than in moving iron instruments, allowing operation of ammeters from shunts; moreover, there are none of the residual errors which are present to a certain extent, in all moving iron instruments, without exception.

Recent improvements in factory methods and in design features by the Westinghouse Electric and Manufacturing Company have rendered possible the production of a small



sized switchboard instrument of the permanent magnet type, at a price as low as that of the best moving iron instruments previously available. The result has been the instruments herein described, which possess unique features and advantages not previously obtained with any type of construction. These instruments are made as ammeters and voltmeters, and are mounted in neat black Electro-se cases, 5" in diameter, rear connected, with circular bevelled glass front-plates.

The use of a case made from insulating material instead of metal gives a degree of insulation not usually found in small instruments. Owing to the peculiar self-shielding form of the permanent magnets, an iron case is not necessary for shielding against the effects of external fields.

The meters are supported by means of brass studs projecting from the rear of the case, serving at the same time as terminals.

The voltmeters are made self-contained including resistance, in any capacity as high as 300 volts, and the ammeters are operated from external shunts, the shunts of the capacities up to and including 75 amperes being mounted directly on the meter studs.

The scale divisions are uniform, and the total length is almost the same as that found in the usual 7" diameter meters.

From a technical point of view, the most interesting feature of these instruments is the "single air gap" type of construction, which differs considerably from the original D'Arsonval Bipolar Magnet with two cylindrical air gaps in series.

The principal advantages of the single air gap construction in permanent magnet meters were described in the *Electrical World* of February 15, 1908, and briefly are as follows:

1. The possibility of removing the moving element from the magnetic structure without interfering with the magnets or removing their pole pieces.
2. The coil balancing the weight of the pointer.
3. Single air gap means that larger air gap clearances may be used without making the total magnetic reluctance of the air gap too high.

The removability of the permanent magnets is really of the greatest importance to the user who desires to do his own repair work on the premises.

Figure No. 2 shows an internal view of the meter mechanism with the case removed.

Figure No. 1 shows the process of removing the permanent magnets when repairs become necessary.

The principal applications for this class of instrument will be for small panels, such as for rectifier outfits, battery charging, small isolated plants, small marine plants, or even on regular large switchboard work where a small sized instrument is desirable.

The low price is due to the economic disposition of the material used, the light weight, and the fact that there are no hand operations used in manufacture, aside from the assembly. The parts are all machine made in large quantities, with a highly organized and accurate tool equipment, the assembler merely attaching these parts together without further fitting.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

Copies of these orders may be secured from the *Canadian Engineer* for a small fee.

5115—July 28—Directing the G.T.R. to provide, construct and maintain at its own expense such works and appliances as necessary for the safety of the public at the level highway crossing of the railway of the G.T.R. at Reid Street, Peterborough, Ont.

5116—July 30—Directing the T.H. & B. Railway and the C.P.R. to refund to the Plymouth Cordage Company the difference between 15½ and 22c. per 100 pounds on two carloads of binder twine, for export, shipped from Welland to Montreal, and to pay interest at the rate of 5 per cent. per annum from the date of the said excess in the charges as paid, until the amount of the overcharge is refunded.

5117—July 30—Authorizing certain agents other than officials of railway companies, acting jointly for two or more companies to act for the several companies by power of attorney, for the filing of certain tariffs of freight or passenger tolls.

5118—July 31—Authorizing the Department of Public Works, Province of Saskatchewan, to construct a highway cross the right of way of the Souris Branch of the C.P.R. on the extension, southerly, of Main Street, Oxbow, Sask.

5119—March 12—Dismissing the application of Frank A. Cutting, Boston, Mass., in connection with alleged discrimination in favor of Quebec and Ontario, against the Province of New Brunswick by the C.P.R. in refusing to carry tan bark from its stations in New Brunswick destined to New England points, at the same rates as it charges for lumber, and allowing the same rates on tan bark from points in Ontario and Quebec as are charged on lumber.

5120—August 1—Authorizing the James Bay Railway Company to place its line of tracks across the line or tracks of the C.P.R. near Wahnapiatae, Ont.

5121—July 31—Authorizing the Norfolk Gas Co., Limited, to lay gas pipe or main and an outer or larger pipe