

FIG. 23.

NO. 39.—MEASUREMENT OF THE CONSTANT OF A  
SIEMENS ELECTRO-DYNAMOMETER BY MEANS  
OF A KELVIN CURRENT BALANCE

*Preliminary.*—In the Kelvin current balance the magnetic force between coils of wire carrying the same current is measured directly by balancing it against known weights. Hence, since the force of gravity forms the controlling force of the instrument, and as the cores of the coils are non-magnetic, there is very little probability of the constants of the instrument altering once it has been standardized, unless it suffers mechanical damage. For this reason the Kelvin balance is frequently employed as a standard current-measuring instrument, its constant being determined once for all by means of a copper voltameter. In the ordinary type of balance there are six coils, four fixed and two movable, these latter being attached to the ends of a beam hung from its centre by copper filaments, in such a manner that each coil is free to move between two fixed coils. The coils are all in series, the current being conveyed to the movable coils by means of the copper filaments. The direction in which the current traverses the coils is shown in the diagram, and is such as to produce magnetic forces at each of the movable coils tending to rotate the movable beam in a counter-clockwise direction. Several sets of weights are supplied with the balance so as to enable a large range of current to be measured.

*Apparatus.*—You are supplied with a Kelvin current balance, Siemens electro-dynamometer, variable resistance, switch, and source of current.

*Method.*—(1) Connect the current balance in series with the fine coil of the Siemens dynamometer, the variable resistance, switch and battery.

(2) Place on the beam of the current balance, the particular weight and corresponding counterpoise which will be required for the magnitude of the current to be measured.

(3) Set the movable weight of the balance at zero on the scale, and if the pointers of the balance beam do not indicate



*Calibration of a Voltmeter by Potentiometer Method 57*

(B) *To calibrate the voltmeter.*

(1) Connect up as in Fig. 22. Place the switch of the ratio box at  $\frac{1}{100}$ . By sliding the contact P across its resistance

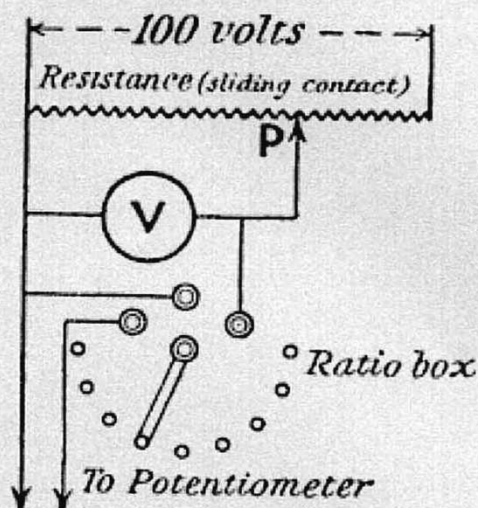


FIG. 22.

any voltage from 0 to 100 may be obtained at the voltmeter terminals, and  $\frac{1}{100}$  of it will be measured on the potentiometer. Tabulate thus:—

Type of voltmeter..... Number of voltmeter.....  
Position.....

Voltmeter reading.	Potentiometer reading.	Potentiometer reading $\times 100$ .

The potentiometer should be adjusted to read directly in volts, and it should be re-standardized frequently by the cadmium standard cell.

Take a set of rising and falling readings on the voltmeter and plot two calibration curves. If the ratio box is inaccurate show how the corrections should be made.