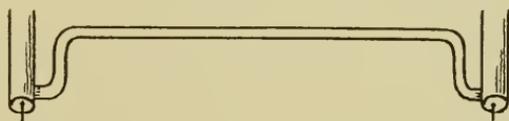


## A SIMPLE METHOD OF MEASURING ELECTROLYTIC RESISTANCE.

BY R. R. RAMSEY.

In measuring the resistance of electrolytes the back e. m. f. or polarization of the cell is always a troublesome source of error. The potential of the terminals of an electrolytic cell is never the same unless the temperature, concentration, and purity are absolutely the same at both electrodes. To avoid this error various methods have been used, such as the alternating current and telephone method.

While working with electrolytic cells it occurred to me that the ever-present and troublesome e. m. f. might be utilized in a very simple manner for resistance measurement. This method consists of placing the



*Figure 1.*

cell in series with a resistance box and mirror galvanometer and taking readings of the galvanometer deflection with several resistances in the box. From these readings the cell resistance can be determined by solving for  $R_c$  in the two equations,

$$Kd_1 = \frac{E}{R_1 + R_g + R_c}$$

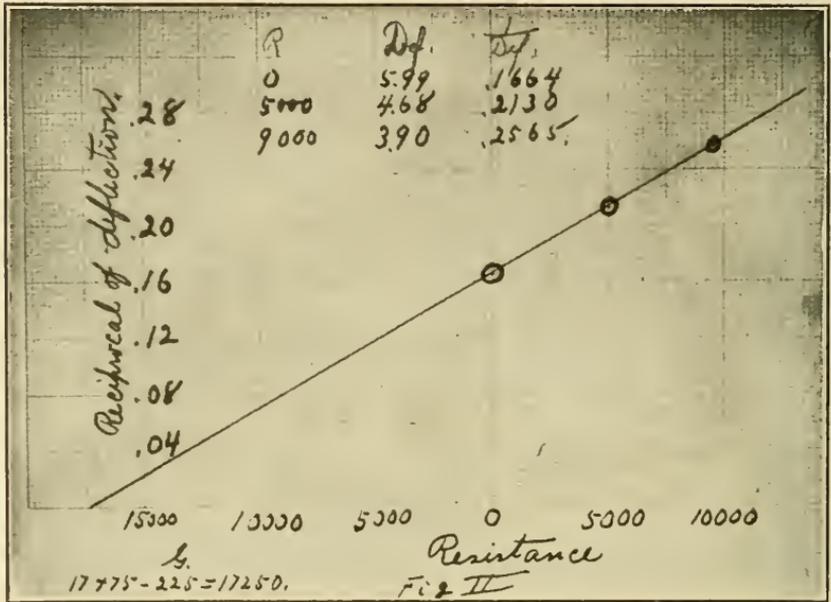
and

$$Kd_2 = \frac{E}{R_2 + R_g + R_c}$$

$R_g$ , the galvanometer resistance being known. A preferable method is to plot box resistance as a basis and the reciprocals of galvanometer deflection as ordinates. The intercept on the X axis being  $R_c + R_g$ , from which  $R_c$  can be found.

The specific resistance can be found from the resistance and the dimensions of the cell which can be determined by filling with mercury or water.

The cell was made as in Fig. I, the electrodes being made of cadmium amalgam. By placing the two ends in water baths the two ends can be kept at a constant small difference of temperature, thus keeping the e. m. f. constant. The following data and curve (Fig. II) are for a cell filled with 10 per cent. solution of cadmium sulphate.



Length of cell .....	99 cm.
Cross section .....	.277 sq. cm.
	$\frac{1}{\text{Def.}}$
Box Resistance.	Galv. Def.
0 ohms.	5.99
5000	4.68
9000	3.90
	.256

From curve  $R_e + R_g = 17470$  ohms.  
 $R_g = 225$ .

$$\text{Sp. Resistance } \rho = \frac{17470 \times .277}{99} = 48.3 \text{ ohms.}$$