Experiment No (7) Transformation of Galvanometer to Ammeter

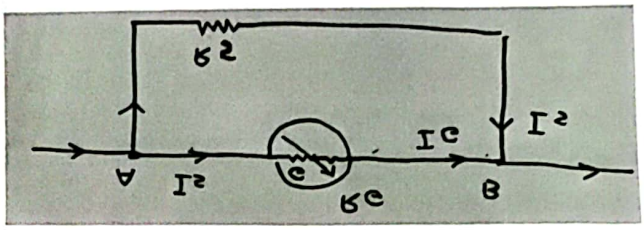
Apparatus:

1- Power Supply (D.C) 2- Resistance box 3-Rheostat
4- Galvanometer 5- Ammeter 6-Connection
wire

Method

Ammeter is a Galvanometer apparatus connect with it is coil a small resistance (current divider) parallel, which make the resistance of the apparatus much small and according to the Ohms law. The potential difference across the each side very small, and can be neglected.

Therefore the passes current represent the total current for the circuit and connected rerialy, let (I) is the mainly current in the circuit, (R_G) is the resistance of the Galvanometer coils, (R_S) is the resistance of the divider, (I_G) represent the passes current through the resistance divider. Therefore, the mainly current (I) divided in to both (I_S) as shown in Fig (1).



As we show in the figure (1), the resistance (R_S) and (R_G) are connected parallel with each other, therefore the potential difference even each side of (R_G) is the same on the (R_S). Side and equal to (V_{AB})

$$V_{AB} = I_G R_G = I_S R_S \qquad (1)$$ But

$$I = I_G + I_S \qquad (2)$$

$$I_S = I - I_G \qquad (2)$$

From the equation (1) and equation (2)

$$R_S = \frac{I_G R_G}{I_S} = \frac{I_G R_G}{I - I_G} \qquad (3)$$

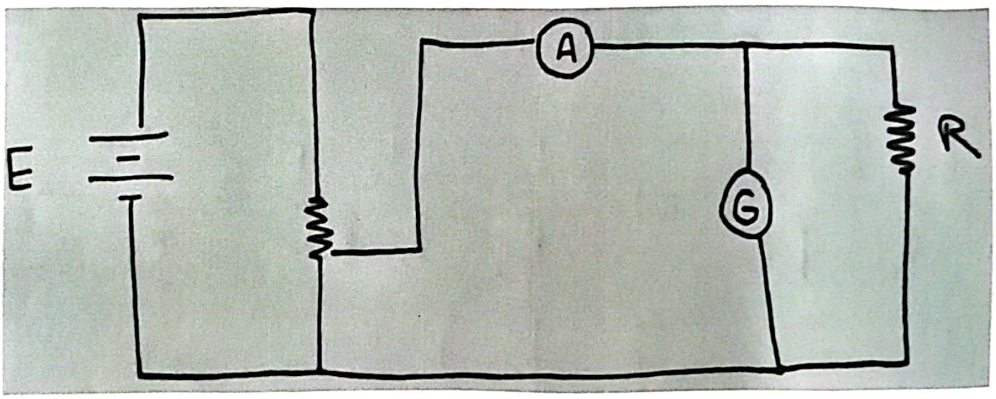
One can write the equation (3) as:

$$\frac{1}{R_S} = \frac{I - I_G}{I_G R_G} = \frac{I}{I_G R_G} - \frac{I_G}{I_G R_G} = \frac{I}{I_G R_G} - \frac{1}{R_G} \qquad (4)$$

$$\frac{1}{R_S} = \frac{I}{I_G R_G} - \frac{1}{R_G} \qquad (5)$$

Experimental Details:

1- Connect the electrical circuit as shown in figure (2).



2- Change the R_S value and record the current value (I) from the Ammeter when the signal pointer and Galvanometer deflect completely, and we can control this by using the rheostat.

3- Repeat the point to for difference value of each (R_S) and (I_S) also when the Galvanometer signal deflect completely.

4- Record the measurements as shown in this table

$$I_S = I - I_G \qquad (2)$$

From the equation (1) and equation (2)

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One can write the equation (3) as:

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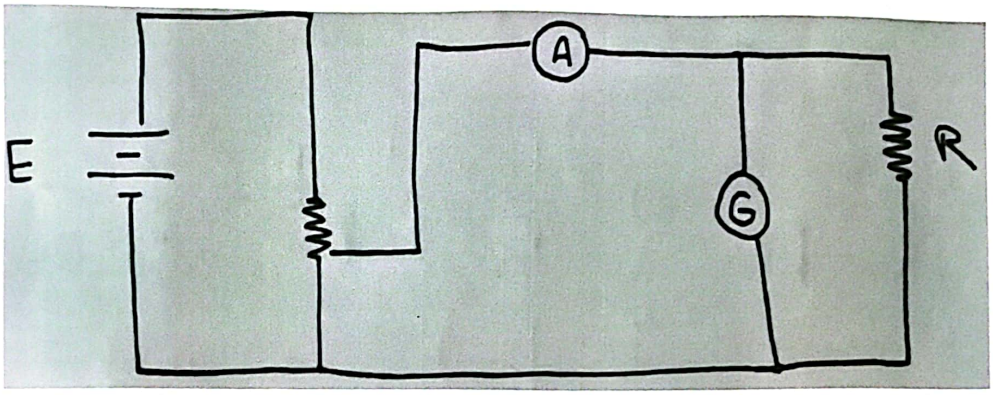

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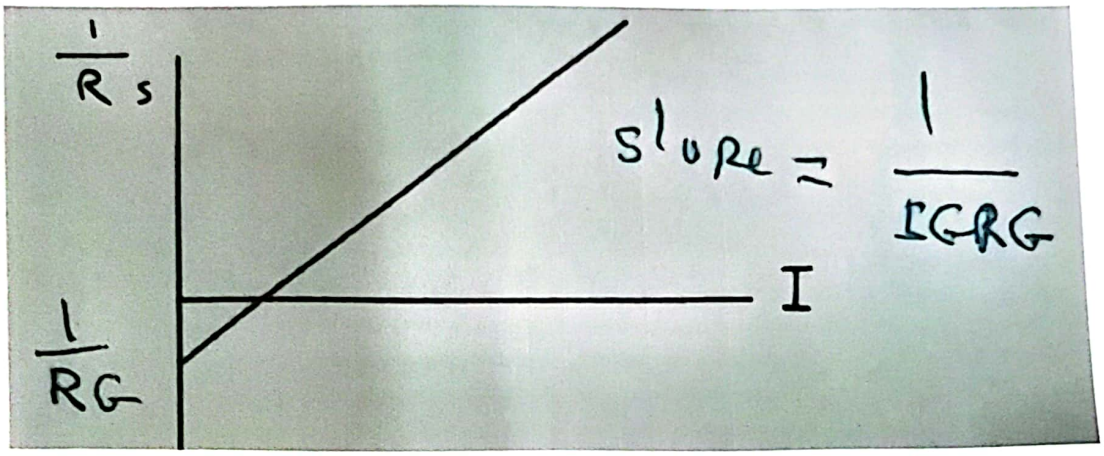
3- Repeat the point to for difference value of each (R_S) and (I_S) also when the Galvanometer signal deflect completely.

4- Record the measurements as shown in this table

$I \times 10^{-3}(A)$	$R_S(\Omega)$	$\frac{1}{R_S}(\Omega^{-1})$

3-Draw a curve between the $\frac{1}{R_S}$ on the Y axis and (I) on the X axis as shown in figure (3)



Figure(3): the inverse resistance against of the current.

From this equation $$\frac{1}{R_S} = \frac{1}{I_G R_G} I - \frac{1}{R_G}$$

The slope of the straight line represents the value of $\frac{1}{I_G R_G}$, and the negative cut of the Y- axis represents the value of $\frac{1}{R_G}$, and by using the value of the R_G and I_G one can calculate the value of the R_S and this from the equation (3)

5- For active value of (R_S) change the rheostat and record the difference

6- value from the Ammeter and the Galvanometer, by using this table:

$I(A)$	$I_G(A)$

7- Plotted the curve between (I) from the Ammeter and I_G from the Galvanometer as shown in figure (4).

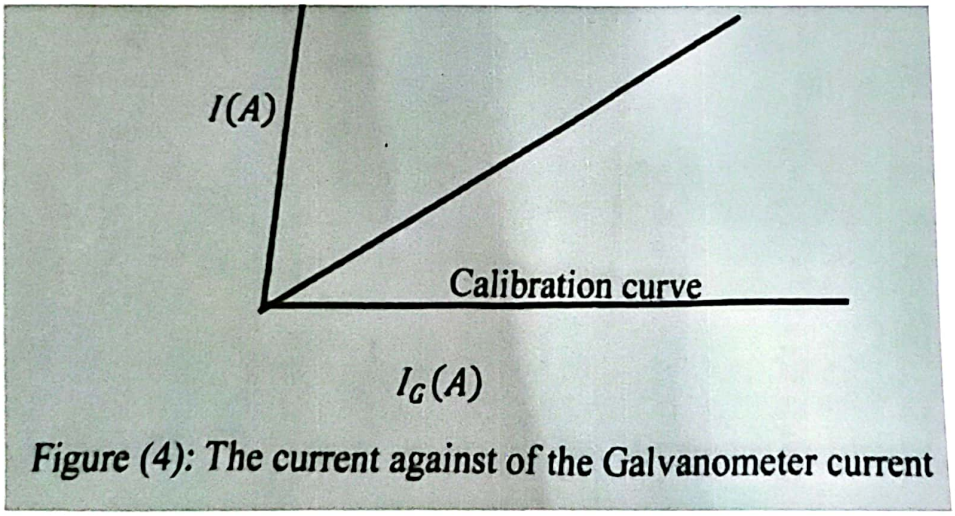


Figure (4): The current against of the Galvanometer current

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