To Verify the Laws of Combination (Series) of Resistances Using a Metre Bridge.

Aim

To verify the laws of combination (series) of resistances using a metre bridge.

Apparatus

A metre bridge, a Leclanche cell (battery eliminator), a galvanometer, a resistance box, a jockey, two resistance wires or two resistance coils known resistances, a set square, sand paper and connecting wires.

Theory

(*i*) The resistance (r) of a resistance wire or coil is given by $r = \frac{(100 - l)}{l} \cdot R$

where R is the resistance from the resistance box in the left gap and l is the length of the metre
bridge wire from zero end upto balance point.

(*ii*) When two resistances r_1 and r_2 are connected in series, then their combined resistance

$$R_s = r_1 + r_2$$

Circuit diagram

(i) In series

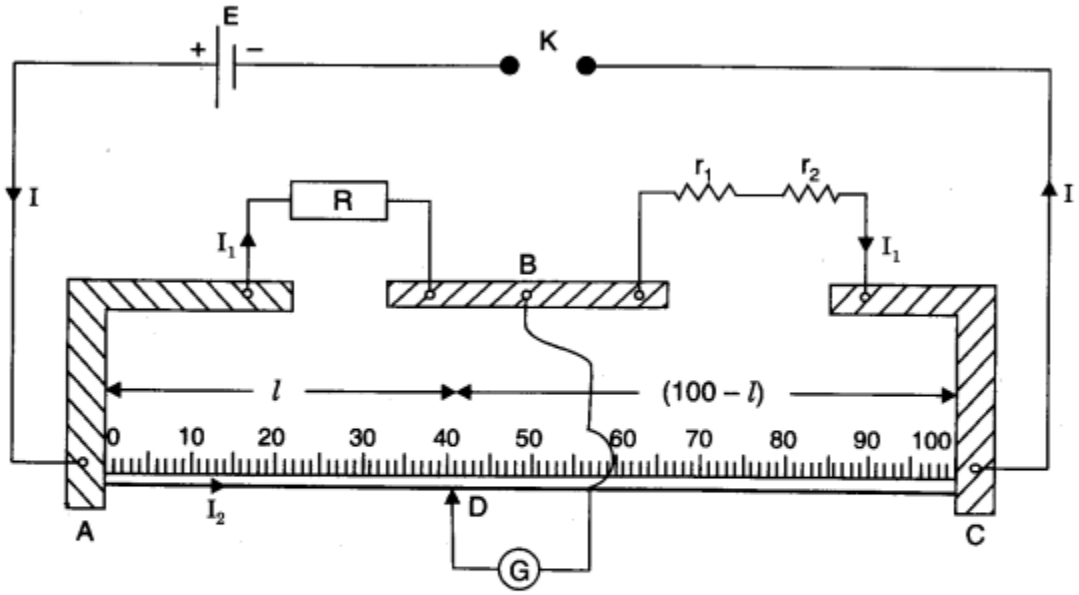

Fig. Series combination of resistances.

(ii) Resistances in series

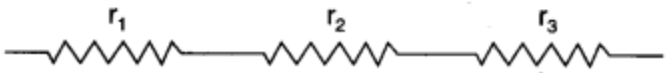

Fig. Resistances in series.

Procedure

1. Mark the two resistance coils as r_1 and r_2.
2. To find r_1 and r_2 proceed same way as in Experiment 1. (If r_1 and r_2 are not known.)
3. Connect the two coils r_1 and r_2 in series as shown in figure in the right gap of Metre Bridge and find the resistance of this combination. Take at least three sets of observations.
4. Record your observations as follows.

Observations

Table for length (1) and unknown resistance (X)

Resistance coil (1)	*Serial No. of Obs.* (2)	*Resistance from the resistance box R (ohm)* (3)	*Length AD = l (cm)* (4)	*Length DC = 100 – l (cm)* (5)	*Resistance* $r = \left(\frac{100-l}{l}\right) R$ (6)	*Mean resistance (ohm)* (7)
r_1 only	1. 2. 3.					r_1 = ...
r_2 only	1. 2. 3.					r_2 = ...
r_1 and r_2 in series	1. 2. 3.					R_s = ...

Calculations

1. Calculation for r_1 only, r_2 $r_2$only, r_1 and r_2 in series.
Same as in Experiment 1.
2. Calculation for verification of laws Experimental value of R_s = ……
Theoretical value of $R_s = r_1 + r_2$ = ……
Difference (if any) = ……

Result

Within limits of experimental error, experimental and theoretical values of Rs are same.
Hence, law of resistances in series is verified.

Precautions

1. The connections should be neat, clean and tight.
2. Thick copper wires should be used for the connections after removing the insulations near their ends by rubbing with sand paper.
3. Voltmeter and ammeter should be of proper range.
4. A low resistance rheostat should be used.
5. The key should be inserted only while taking observations to avoid heating of resistance (otherwise its resistance will increase).