# Wheatstone Bridge

. In the year 1843 AD, the English physicist Charles Wheatstone (1802 – 1875) made an electrical circuit to measure the amount of unknown resistance. This circuit was distinguished by its high accuracy in finding the amount of resistance. It relied on finding the value of the unknown resistance in proportion to the values of known resistors.

## .The purpose:

It is to find the amount of unknown resistance.

## .Used equipments:

Voltage source (battery), known resistance, wire of unknown resistance, meter bridge, galvanometer, wires.

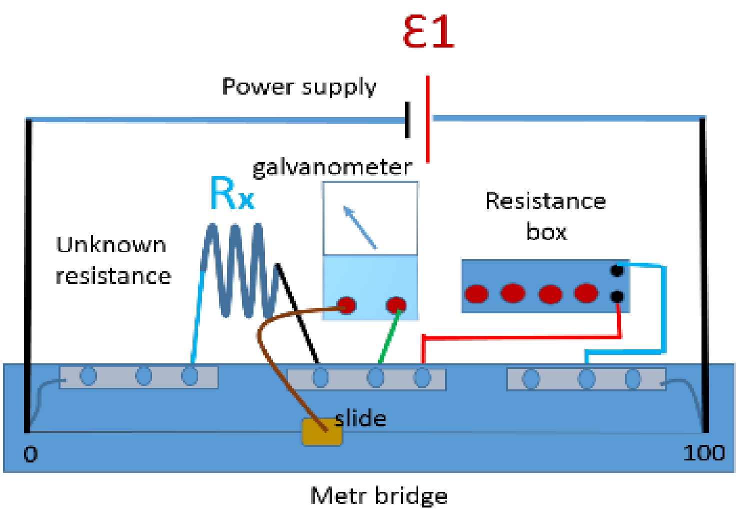


Figure (1)

Dr. Ameen Alwan B.Sc. Mohammed Jamal

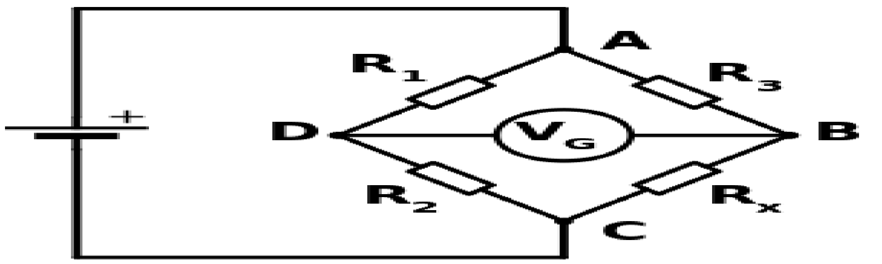


Figure (2)

## .*Experiment theory:*

When an electrical circuit is connected as in Figure (2) and a current passes through the circuit, the current will be divided into two parts. $I_1$ passes through resistors 3R and R4 and $I_2$ passes through resistors R1 and R2.

If the potential of point B Is equal to the potential of point D, which is what we call the state of equilibrium, then the potential difference of two points AB is equal to the potential difference of two points AD and the potential difference of two points CB is equal to the potential difference of two points CD.

$$V_{AB} = V_{AD} \quad \text{.........(1)}$$

$$V_{CB} = V_{CD} \quad \text{.......... (2)}$$

Therefore, we can compensate for the resistances and currents, and this is:

$$R_3 I_1 = R_2 I_2 \quad \text{......... (3)}$$

$$R_x I_1 = R_1 I_2 \quad \text{.......... (4)}$$

By dividing the two equations, we find that:

$$R_x = R_3 * R_1/R_2 \quad \text{........... (5)}$$

*Dr. Ameen Alwan* *B.Sc. Mohammed Jamal*

**If R1 and R2 are resistors from the same wire, their resistance is equal:**

$$R1 = \rho 1 * L1/A1 \text{ ........ } (6)$$

$$R2 = \rho 2 * L2/A2 \text{ ......... } (7)$$

**Since, as we mentioned, they are from the same wire, they have the same specific resistance p and have the same cross-sectional area A, by dividing (6) by (7)**

**Equation becomes as follows**

$$R_x = R * L1/L2 \text{ .......... } (8)$$

$$R1/R2 = R3/R4$$

| R | $L_1$ | $L_2=L- L1$ | $R_x=R*L1/L2$ |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

*Dr. Ameen Alwan* *B.Sc. Mohammed Jamal*