2.METER BRIDGE- Unknown resistance

Aim: To determine the unknown resistance of a given wire by using a meter bridge.

Apparatus: Meterbridge,Battery,UnknownResistance,ResistanceBox,Galvanometer,Pencil Jockey,Connecting wires.

Theory: Meter Bridge works on Wheatstone's network principle. When the bridge is in the balanced state(I_g=0), then

$$\frac{P}{Q}=\frac{R}{S}$$

Where P,Q,R,S are the four resistance in the various arms of the meter bridge.

Here in meter bridge circuit,

P is the known resistance.

Q is the unknown resistance($X\Omega$)

R is the resistance of the wire AJ=$lr\Omega$

S is the resistance of wire JC=$(100-l)r\Omega$

Hence unknown resistance, X=$\frac{R(100-l)}{l}$

   Where l is the balancing length when I_g=0

Procedure:
1. Set up the circuit as per the circuit diagram.
2. Pluck out a suitable value of resistance from the standard resistance box(R=2Ω,say) and move the jockey in the wire AC till the galvanometer shows null deflection.
3. Note the balancing length(AJ=l) from the scale attached.

4. Repeat the experiment from step 2-3 for various values of R=3,4,4,6.....Ω to get a few sets of readings,when X is in the right gap.

5. Use the formula X=$\frac{R(100-l)}{l}$ to find the value of X For each set of reading.

6. Find the mean X.That is the Unknown resistance of the material.

Result:

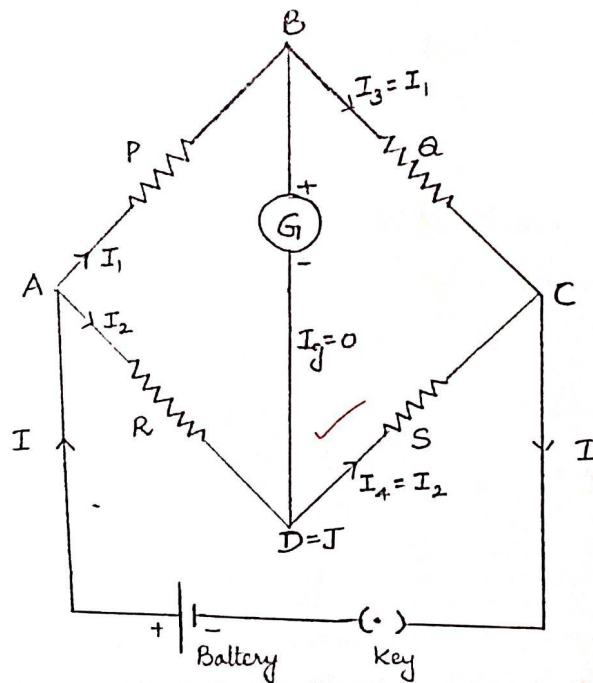The Unknown resistance of the coil=..Ω

Precaution:

1. Connections should be neat,tight and clean
2. Plugs in the resistance box should be fixed tightly.
3. The Jockey should not be pressed too hard on the bridge wire and do not rub over it.
4. Null points should be in the central region of the wire (30 cm to 70 cm).

Sources of error:

1. The instrument screws may be loose.
2. The plug may not be clean
3. Error in the measurement of balancing Length.
4. If large current is passed for a sufficiently long time, the wire AC may get heated and its resistance may change considerably during the time of experiment.
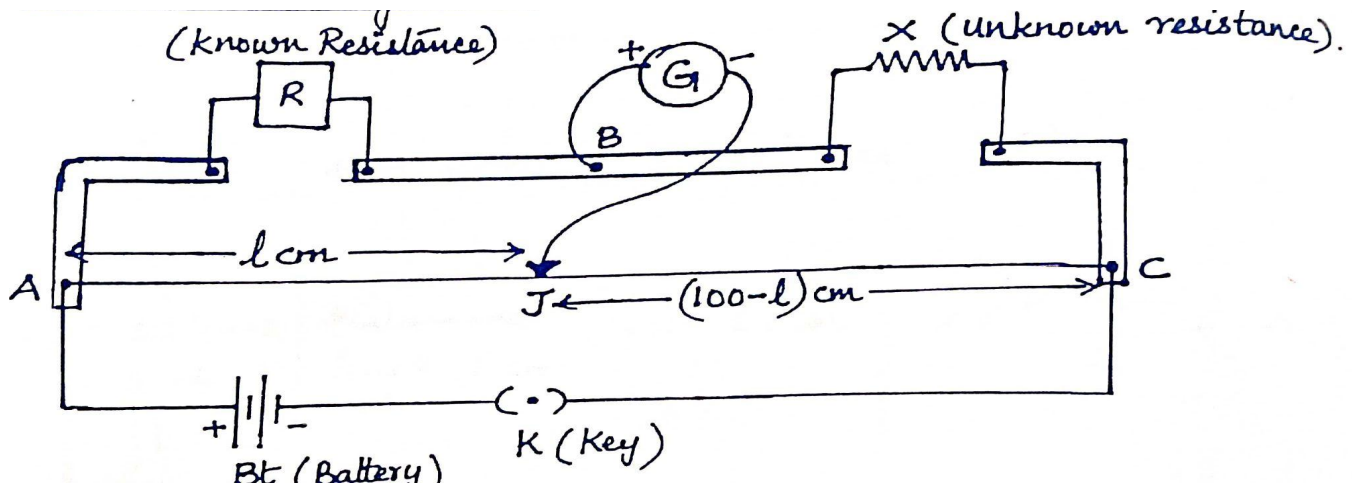
Principle of Meter Bridge : Wheatstone's Network

$$\frac{P}{Q} = \frac{R}{S}$$

$$\Rightarrow X = \frac{R(100-l)}{l}$$

Circuit Diagram:

AC=1 m long wire of bridge.

G=Galvanometer

J=Jockey

Observation

(a)To find the Unknown resistanceX

Sl.No	Resistance,R Ω	Balancing Length(l) (cm)	(100-l) (cm)	$X=\dfrac{R(100-l)}{l}$ (Ω)
1				X_1
2				X_2
3				X_3
4				X_4
5				X_5
6				X_6

Calculation

Mean value of resistance, $X = \dfrac{X_1+X_2+X_3+X_4+X_5+X_6}{6}$

$=$