If C be the balanced point, then

$$V_{AC} = E_1$$

From principle of potentiometer,

$$V_{AC} \propto l_1$$

Thus, $E_1 \propto l_1$

or, $E_1 = kl_1$ …….. (1)

Step 2: **When K_1 is open and K_2 is close**:

If C' be the balanced point, then

$$V_{AC'} = E_2$$

From principle of potentiometer,

$$V_{AC'} \propto l_2$$

Thus, $E_2 \propto l_2$

or, $E_2 = kl_2$ …….. (2)

From equation (1) and (2),

$$\boxed{\frac{E_1}{E_2} = \frac{l_1}{l_2}}$$

By knowing values of l_1 *and* l_2 the ratio $\frac{E_1}{E_2}$ can be calculated.

Working formula:

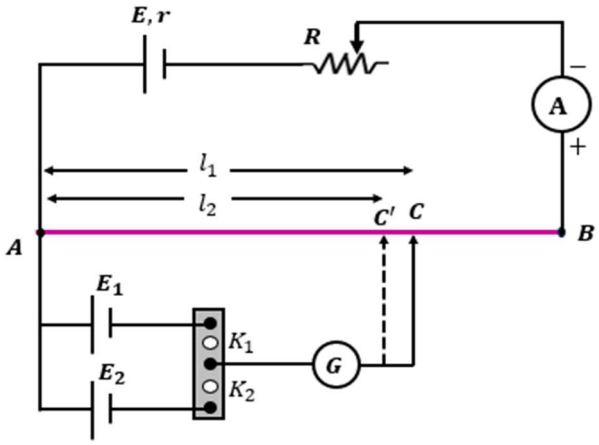
- ✓ For the comparison of emf of two cells:

  If, l_1 is balanced length for cell E_1

  l_2 is balanced length for cell E_2

  Then, $\boxed{\frac{E_1}{E_2} = \frac{l_1}{l_2}}$

PROCEDURE:



1. Electric connection is made as shown in the figure. Connect all positive terminals to one terminals of potentiometer wire representing zero of the scale.
2. Close key K_1 and adjust the rheostat so that the galvanometer deflects towards left and right when tapped at the extreme ends of the potentiometer wire.
   Slide the jockey over potentiometer wire (starting from zero end) until you obtain zero deflection in the galvanometer. Note the corresponding balanced length (l_1).
3. Open the key K_1 and close the key K_2. Maintain the same position of rheostat as in step 2 and slide the jockey over the wire and obtain zero deflection in the galvanometer. Note the corresponding balanced length (l_2).
4. Repeat steps 2 and 3 by adjusting rheostat at different positions.
   [***Note that the ammeter reading (current through wire) should be maintained constant for one set of experiment (in finding a set of l_1 and l_2). The current can be maintained constant by adjusting the rheostat***.]
5. Use appropriate formula and obtain the ratio of emf of two cells.