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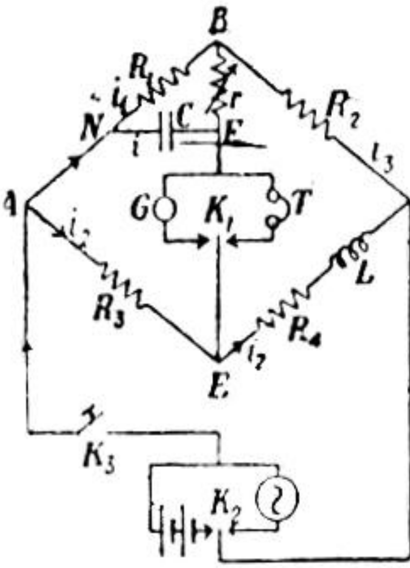
Anderson's bridge — It is a modification of Maxwell's bridge. The advantage of using this method is that only variable resistance are required together with a standard fixed capacitor. Also this method is independent of the frequency of a.c.

In this method balance of the bridge is first obtained for steady current by connecting K_1 to G, and K_2 to battery and then for a.c. by connecting K_1 to phones and K_2 to the source of a.c.. r is a variable resistance placed in the condenser branch. By adjusting r, the current in C may be controlled, but changes in r will not affect the balance for steady currents. The balance with steady current is obtained once for all, and the balance for a.c. is obtained by adjusting r.



Anderson bridge
method of measuring L

When the bridge is balanced, the instantaneous current in the different arms are shown in the diagram, and the relevant equations are given below :—

$$i_3 = i_1 + i \qquad \text{(Kirchoff's first law)} \qquad ...(1)$$

For the mesh BNF

$$R_1 i_1 - \frac{1}{C}\int i\,dt - ri = 0$$

$$R_1 i_1 = \frac{1}{C}\int i\,dt + ri \qquad ...(2)$$

For the mesh $ANFE$

$$\frac{1}{C}\int i\,dt = R_3 i_2 \qquad ...(3)$$

For the mesh *EFBD*

$$ri+R_2i_3=R_4i_2+L\frac{di_2}{dt} \quad \ldots(4)$$

From (1) and (2) we get

$$i_3=i_1+I=\frac{1}{R_1C}\int idt+\frac{ri}{R_1}+i \quad \ldots(5)$$

Substituting the value of i_3 from (5); $i_2\left(=\frac{1}{R_3C}\int idt\right)$ from (3) or $\frac{di_2}{dt}=\frac{1}{R_3C}$ from (3), and $i_1\left(=\frac{1}{R_1C}\int idt+\frac{r}{R_1}\cdot i\right)$ from (2) in equation (4), we get

$$ri+\frac{R_2}{R_1C}\int idt+\frac{R_2r}{R_1}i+R_2i=\frac{R_4}{R_3C}\int idt+\frac{L}{R_3C}i \quad \ldots(6)$$

But from the balance for steady current, we have

$$\frac{R_1}{R_2}=\frac{R_3}{R_4}, \text{ or } \frac{R_3}{R_1}=\frac{R_4}{R_3} \quad \ldots(7)$$

Substituting the value of $\frac{R_2}{R_1}$ in (6) the integration terms vanish, and we get

$$ri+\frac{R_2ri}{R_1}+R_2i=\frac{L}{R_3C}i$$

$$\therefore \quad \frac{L}{C}=R_3r+\frac{R_2R_3r}{R_1}+R_2R_3$$

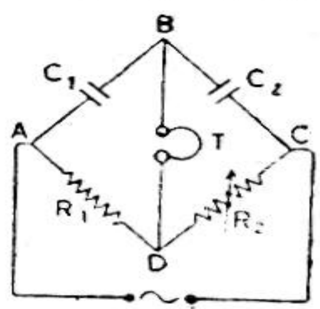
But from (7) we have

$$\frac{R_2R_3}{R_1}=R_4$$

$$\therefore \quad L=C[(R_3+R_4)r+R_2R_3]$$

Measurement of capacity. de Sauty method.

A simple A.C. bridge. It is a Wheatstone bridge arrangement with an a.c. source of frequency about 1000 c.p.s. A condenser C_1 of known value, C_2 of unknown value, non-inductive resistances R_1 and R_2 are connected as shown in the diagram. A headphone is used instead of a galvanometer. Keeping R_1 fixed, R_2 is varied till the sound in the phones is minimum when a balance is obtained. In this condition



$$\frac{\text{Reactance of } C_1}{\text{Reactance of } C_2}=\frac{R_1}{R_2}$$

$$\therefore \quad \frac{1/2\pi fC_1}{1/2\pi fC_2}=\frac{R_1}{R_2} \text{ or } \frac{C_2}{C_1}=\frac{R_1}{R_2}$$

$$\therefore \quad C_2=C_1\cdot\frac{R_1}{R_2}$$

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