Objective:- Determination of the frequency of an unknown tuning fork by resonance air column method.

THEORY:- Let λ be the particular wavelength of the vibrating resonance air column and the minimum length of air column be l_1, then we can write –

$$\frac{\lambda}{4} = l_1 + x \qquad [x - \text{End correction}] \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

For the second resonance the length of air column be l_2, then we can write –

$$\frac{3\lambda}{4} = l_2 + x \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

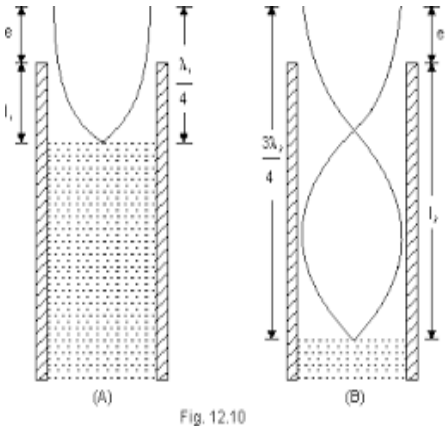

Fig. 12.10

Subtracting (1) from (2) we get,

$$\frac{\lambda}{2} = (l_2 - l_1) \quad \text{বা} \quad \lambda = 2(l_2 - l_1)$$

If the frequency of the tuning fork be **n** and $\mathbf{V_t}$ be the velocity of sound in air at room temperature **t° C ,** then,

$$\mathbf{V_t = n\lambda = 2n(l_2 - l_1)}$$

$$n = \frac{V_t}{2(l_2 - l_1)}$$

Let $\mathbf{V_0}$ be the velocity of sound in air at N.T.P, then from velocity temperature relation we have,

$$V_t = V_0(1 + 0.00183t)$$

$$\therefore n = \frac{V_0(1 + 0.00183t)}{2(l_2 - l_1)}$$

EXPERIMENTAL RESULTS:-

Room temperature = **°C**

Velocity of sound in air at N.T.P ($\mathbf{V_0}$) = m/s

No. Of Observation	Length of air column at first resonance	Average length $\mathbf{l_1}$ Cm	Length of air column at second resonance	Average length $\mathbf{l_2}$ Cm	Frequency of the unknown tuning fork $n = \frac{V_0(1 + 0.00183t)}{2(l_2 - l_1)}$
1.					
2.					
3.					

Remarks :-

1. Room temperature must have to be noted. Because velocity of sound depends on temperature. As temperature increases, velocity of sound increases.
2. To know the first resonance, tube is completely filled with water and gradually the water level is lowered.
3. The frequency of the tuning fork should be so selected, that length of the second resonating point will not exceed the length of the tube.