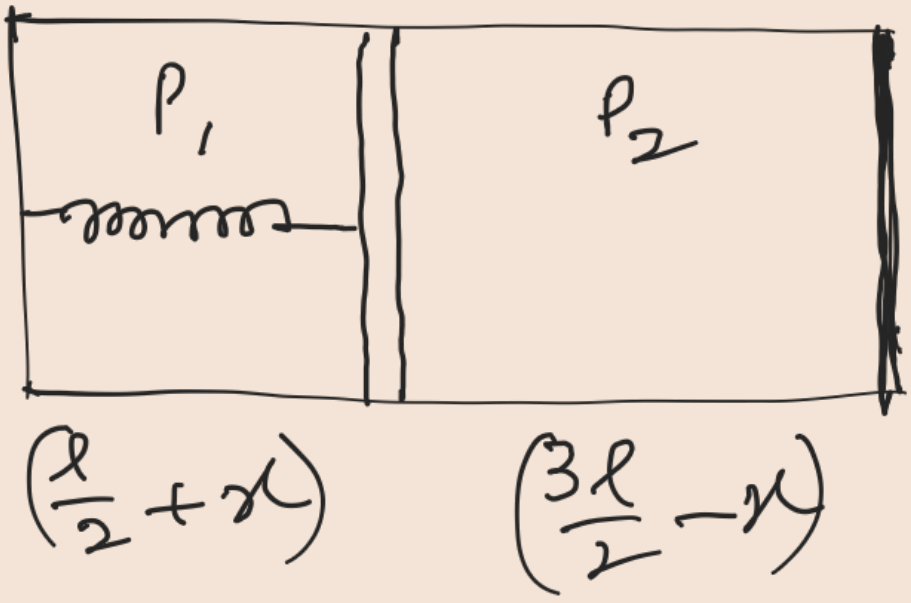


$$P_1\left(\frac{\ell}{2}+x\right) = P_2\left(\frac{3\ell}{2}-x\right).$$

$$P_2 + \frac{kx}{A} = P_1$$

After hole is made in piston, the final pressure in entire gas must be same. Also, since no external heat is supplied, the work of spring must be utilised for ΔU.

$$2n C_V (T_f - T) = \frac{1}{2} k x^2 . \quad \Delta T = \frac{k x^2}{6nR} .$$

$$k = \frac{(P_1 - P_2)A}{x} = \frac{P_1 A}{x}\left[1 - \frac{\frac{l}{2} + x}{\frac{3l}{2} - x}\right]$$

$$= \frac{P_1 A}{x} \frac{(l - 2x)2}{(3l - 2x)} . \quad \text{Also,}$$

$$P_1 \left(\frac{l}{2} + x\right) A = nRT$$

$$P_1 A = \frac{2nRT}{(l + 2x)} \quad \text{Hence,}$$

$$k = \frac{l-2x}{(3l-2x)} \times \frac{2}{x} \times \frac{2nRT}{(l+2x)}.$$

$$\Delta T = \frac{kx^2}{6\eta R}$$

$$= \frac{2x(l-2x)(2nRT)}{3\,6\eta R\,(3l-2x)(l+2x)}$$

$$= \frac{2xT}{3}\left[\frac{l-2x}{(l+2x)(3l-2x)}\right]$$