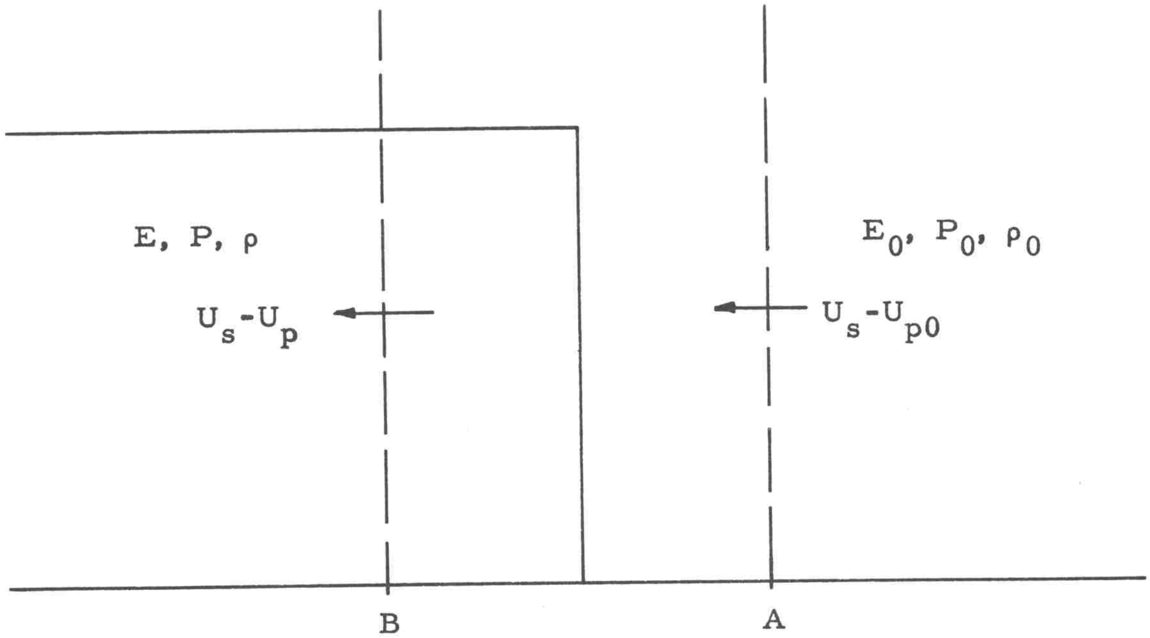

Fig. 1. Diagram of a one-dimensional shock wave.

$$V/V_0 = (U_s - U_p)/(U_s - U_{p0}) \tag{2}$$

where

$$V = 1/\rho \text{ and } V_0 = 1/\rho_0.$$

The mass flowing into the shock front has momentum $\rho_0(U_s-U_{p0})\delta t(U_s-U_{p0})$ and flows out with momentum $\rho(U_s-U_p)\delta t(U_s-U_p)$. The change in momentum per unit time is the difference between these two quantities and must equal the net force exerted per unit area across the shock front. This net force per unit area normal to the shock front is the pressure difference $P-P_0$. Hence,

$$P-P_0 = \rho_0(U_s-U_{p0})^2 - \rho(U_s-U_p)^2 \tag{3}$$

where P_0 is pressure ahead of the shock front and P is the pressure behind. Replacing ρ from Eq. (1), the conservation of momentum statement becomes in a more familiar and usable form

$$P-P_0 = \rho_0(U_s-U_{p0})(U_p-U_{p0}). \tag{4}$$