wave is the means by which energy and momentum are transferred, (4) the momentum and energy are transported by contact forces, (5) behind the shock front, hydrostatic conditions exist, and (6) the material acts as a fluid. The steady state condition probably does not exist within the shock front but the final state attained is not affected appreciably by structure in the shock front. Steady state is essential, however, in deriving the conservation relations and thermodynamic equilibrium is necessary for a meaningful description of the compressed material.

Consider the one- dimensional shock wave illustrated in Fig. 1 in which an observer is attached to a coordinate system moving with the shock front. The region of interest is ahead and behind the discontinuity as illustrated by lines marked A and B. In the figure, U_s is the velocity of the shock wave, U_p is the velocity each mass element receives after passing through the shock front (neglecting thermal motion), E is the specific internal energy, P is the pressure, and ρ is the density of the material behind the shock wave. The subscripted variables E_0, P_0, and ρ_0 represent the undisturbed material ahead of the shock wave. The undisturbed material with a density ρ_0 is flowing into the discontinuity with a velocity U_s and flows out with a velocity U_s-U_p and a density ρ. Hence, the mass flowing in during time δt is $\rho_0(U_s-U_{p0})\delta t$ and mass flowing out is $\rho(U_s-U_p)\delta t$. Since there are no sources or sinks, the mass must be conserved across the shock front. Then

$$\rho_0(U_s-U_{p0}) = \rho(U_s-U_p). \tag{1}$$

Equation (1) can be written in terms of specific volume V_0 and V in the form