material and the compressed material behind the shock.

The discontinuity or shock front under actual conditions acquires a very large but finite slope due to the presence of viscosity and heat conduction. In most situations, treating the shock front as a discontinuity seems to be adequate in terms of present experimental techniques.

The basic properties of the state of the medium across a shock front will be presented briefly. A more detailed treatment can be found in references 19 and 20. First, the entropy of the material increases across the shock front and the increase is third order in the shock strength (that is $P-P_0$, V_0-V, or $\rho-\rho_0$). The pressure, density, and energy increase very abruptly in going to the compressed state and these changes differ from isentropic changes by third order in the shock strength. Shocks are compressive, meaning the pressure and density increase as the materials are compressed. Lastly, the shock wave velocity is supersonic with respect to the unshocked material and subsonic with respect to the material behind the shock front. The shock process is assumed to be adiabatic since the time scale is much too short to allow appreciable heat transfer.

B. Conservation Relations for a Shock Wave

The derivation of the Rankine-Hugoniot equations or the conservation relations[21, 22, 23] is begun by considering a plane uniform shock front traveling into a medium which behaves in a manner described in Section A. The assumptions in the derivation are (1) steady state conditions exist behind the shock front; that is, no physical quantities vary with time, (2) the compressed material is in thermodynamic equilibrium behind the shock front, (3) the pressure