I. INTRODUCTION

Numerical methods for the integration of the equations of finite amplitude wave propagation have reached such a stage of development that the principal limitation on predictions of wave effects is more apt to be uncertainty in the constitutive relations of the material than inability to perform the integrations. The complete constitutive relations for a real solid may at present be regarded as unknowable. Practically useful relations can be obtained from a succession of approximations, to each of which is attached some uncertainty. For high amplitude compressive waves the predominant relation is the hydrostatic one between pressure, volume and temperature. To this may be added the effects of finite shear strength, which makes the pressure tensor anisotropic, strain-rate effects which cause deviations from equilibrium, and partition of internal energy among thermal, surface, and inhomogeneous effects.

In the present work the primary emphasis is on the effects of phase transitions on compressive wave forms, particularly when the rate of transition is too slow to exactly follow the changes in pressure, temperature, and density associated with the compressive wave which initiates the transition. In order to study these effects it has been necessary to develop computer programs for integration of the flow equations for the appropriate constitutive relations. In the course of this development other useful results on equations of state have been produced, and these are described in the following sections.