

## II. THEORY OF SHOCK WAVES

### A. Introduction

A shock front is characterized by a very rapid change in mechanical properties and thermodynamic state of a material produced by a violent disturbance. This disturbance in the present investigation is derived from the detonation of high explosives. The theory presented in succeeding sections is confined to the propagation of a single shock wave in materials for which the sound speed increases with pressure beyond some initial linear portion; that is the compressibility of the medium decreases as the pressure increases. Most materials possess this property, including the four liquids studied in this investigation.

The formation of a shock front can be pictured qualitatively by the following model. A piston is accelerated into a medium and this motion is considered divided into a large number of small successive movements. The initial motion causes a small disturbance to propagate into the medium at the sound speed. The material is compressed behind this disturbance resulting in an increase in the sound speed. The next disturbance will then propagate at a slightly higher sonic velocity than the previous one. The faster wave tends to overtake and unite with the slower wave. After many of these disturbances have been generated and propagated in the compressed medium, they collect at a single discontinuity forming a shock front. This front travels at a velocity between the sound speed of the undisturbed