it is very difficult to attribute the discrepancies for iron and quartz to experimental errors in determining the slope of the Hugoniot at the phase boundary. Conceivable reasons for the discrepancies are:

1. Inaccuracies in thermodynamic data (α_1 and C_{p1}) at high pressures. Values used in the preceding table are those at atmospheric pressures.

2. The experimental Hugoniot curve in the coexistence region is not at equilibrium. There may be some non-equilibrium rate-dependent effects influencing the measurements.

In order to explain the discrepancies of Table II, either of the coefficients α_1 or C_{p1} must exhibit a two- to four-fold difference between its value at high pressure and that at atmospheric pressure. Information for estimating such differences is not generally available. Measurements by Bridgman below 20 kb show changes of not more than 20 per cent (12). It seems unlikely that changes of the required magnitude will occur at these higher pressures.

If there exist rate dependent effects in phase transition, we should be able to observe other dynamic evidence in wave propagation. For example, if the phase transition exhibits a relaxation process, then we expect a decay of the first shock wave with travel distance. This arises because the delay in transition allows a mass in the first phase to momentarily support a higher pressure than its transition pressure; i.e., the mass exists in the extended metastable region (Fig. 3.1). This is similar to stress relaxation of an elastic precursor.
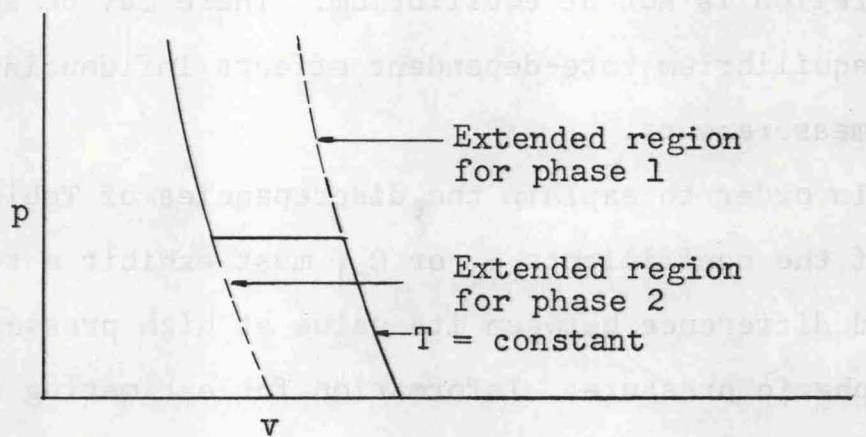
Fig. 3.1.--Extended Metastable Region