first shock for thinner samples (no information is given about the thickness), and explain that it is due to relaxation processes.

4. Minshall observed, by a pin technique, decay of the first shock over a distance of 5 cm (.8 cm - 5.8 cm) (13). No estimation of transformation time is given, nor is the explanation of the decay. However, if we assume this decay to be due to the relaxation, the order of relaxation time must be about 5-10 μsec.

All of the above reports agree about the existence of the transition, but as far as the relaxation time is concerned, they make no suggestion of a particular value to be used in the calculation.

In numerical procedures we can use any relaxation time to study the effect of phase change on shock wave propagation, but we made an arbitrary choice of 1/3 μsec for most of the calculations, based on consideration of the experiments by Novikov. In the study of the decaying precursor we used three relaxation times, .1, 1/3, and 1 μsec.

4.3 Equation of State of Iron

The equation of state of the first phase is taken to be:

$$p(v_1,T) = a_1(\eta_1-1)+a_2(\eta_1-1)^2+a_3(\eta_1-1)^3+C_{v1}(T-T_0)\Gamma/v_1 \qquad (4.5)$$

where

C_{v1} = specific heat at constant volume, phase 1, assumed constant

T_0 = some temperature above which C_{v1} is constant, taken as room temperature here.

a_i = constants

Γ = Grüneisen function, assumed constant

$\eta_1 = v_o/v_1$.

This is a form of the Mie-Grüneisen equation used by Al'tshuler et al. (31).

The coefficients a_i can be determined from the polynomial fits of the Hugoniot curve (1) or from static measurements. However, for the case of iron there is no appreciable difference, below 200 Kb, between the isotherm and the Hugoniot centered at room temperature. For example, the temperature rise along the Hugoniot from 0 to 130 Kb is 20°C (28), which contributes only about 1.3 Kb to the total pressure. This difference is less than experimental error for static and shock measurements in general (29). Therefore, we can substitute the Hugoniot as a room temperature isotherm in the equation of state. These and other equation of state parameters are given in Table VI. The values of a_i listed in Table VI are determined from the least square fit of existing data below 130 Kb (32). Since errors in the experiments are larger than the thermal pressure, this will not give any inconsistency in the equation of state. When we speak of the temperature-independent equation of state, we mean the isotherm at T_o.

Fig. 4.1 shows the isotherm at T_o in terms of relative volume. Bridgman's data at room temperature, extrapolated to high pressures, are drawn for comparison. The difference at high pressures is mainly due to inaccuracies encountered in extending Bridgman's data to such high pressures. Since the