error resulting from this approximation has not yet been evaluated. It should be small since ΔT is small. From this assumption we relate changes in temperature to changes in specific volume as follows:

$$dE = (\partial E/\partial T)_v dT + (\partial E/\partial v)_T dv$$

Substituting into this relation from Eq. (3.21), we find in the mixed phase region:

$$(\partial E/\partial T)_v dT = -(p+q)dv - (\partial E/\partial v)_T dv.$$

Defining $(\partial E/\partial T)_v$ as $C_{v,m}$ and using the following identity,

$$T(\partial p/\partial T)_v = p + (\partial E/\partial T)_v ,$$

this becomes

$$dT = -(T(\partial p/\partial T)_v + q)dv/C_{v,m} . \qquad (4.4)$$

The calculation of $C_{v,m}$ in the coexistence region is given in Appendix I. It should be noted that in the coexistence region $(\partial p/\partial T)_v$ is equal to dp/dT because of the assumed dependence of p and T.

Our assumption of internal energy dependence $(E(v,T))$ is certainly true for a single phase, so the form of Eq. (4.4) is valid, and if we know the values of C_v and $(\partial p/\partial T)_v$ in either a single phase or a mixed phase, the temperature calculation is only a matter of substituting different values of these parameters, depending on the phase region.

4.2 Review of Experimental Information

There are three main static experiments on the equation of state (12,10,29) and the isothermal p-v relations are in close agreement, within the range of experimental errors, with shock wave measurements of the Hugoniot at low pressures. We use the equations of state determined from shock experiments.

There are four major measurements on shock wave propagation in iron. The one by Bancroft et al. (28), is on the Hugoniot pressure-volume relations above the transition pressure and it reveals a discrepancy in the magnitude of the gradient dp/dT compared with the static value (7). The other three are concerned with transient effects and the thickness of the second shock:

1. Bancroft et al. observed the two-wave structure and determined the pressure-volume relation in the second shock by jump conditions.
2. Smith measured the thickness (.02 mm) of the second shock front in recovery experiments by hardness methods and concluded that the duration of the transition zone is in the order of .001 μsec (30).
3. Novikov et al. observed the two-wave structure in iron by a capacitance method (14). They concluded, from the rise time of the second shock, that the duration of the transition region is .2 - .3 μsec. This duration is not exactly equal to the relaxation time τ, but as it is essentially governed by the relaxation of the phase transition, it should be of the same order of magnitude. They also observed a pressure drop behind the