H. Some Thermodynamic Calculations

The results of some thermodynamic calculations made with the computer program described briefly in Section C of this chapter are presented to illustrate the type of information obtained. Benzene was chosen as representative of the behavior for all the liquids with respect to isotherms and isentropes. Fig. 25 is a graph of an isotherm and an isentrope centered at 125 kbar on the Hugoniot, an isentrope centered at zero pressure, and the Hugoniot curve. No calculations were made above the transition pressure because of the lack of knowledge of the high pressure phase. As illustrated, the pressure on the isotherm is slightly less than the pressure on the isentrope for a given volume when to the left of the Hugoniot. The reverse is the case when to the right of the Hugoniot. The two isocurves are very close together and also are not separated much from the Hugoniot curve.

Some other calculated results at the transition point are listed in Table IX. The values for the sound speed and temperature seem reasonable except the temperature calculated for liquid nitrogen using the $C_p(T)$ data in Table IV is seemingly too high. A temperature of 700°K is calculated when using the classical specific heat value of 5/2R for a diatomic molecule (R is the universal gas constant) which is probably much too low. An inadequate model for the equation of state along with insufficient initial data is blamed for the uncertainty.

One of the listed values is the best fit gamma (Γ_f). It represents a value for the Gruneisen gamma which best fits the