caused by insertion of the inlet capillary; (2) the contraction with decrease in temperature; and (3) the expansion with increase in pressure. Dead volumes in the system were measured by simple gas expansion.

E. CORRECTIONS

The various corrections discussed earlier (*15*) were applied to the present measurements. For dead-volume calculations, present data on He^3 and He^4 gas densities at room temperature were used at pressures up to 200 kg/cm^2. From 200 to 1000 kg/cm^2 the He^4 gas densities of Wiebe *et al.* (*22*) at room temperature were used. Above 1000 kg/cm^2 an extrapolation of their data was made using as a guide the results of Bridgman (*23*) on impure He^4.

Following each ΔV_m determination, when the cell valve was reopened to the free piston gauge, movement of the piston indicated that either too little or too much gas had been bled into the metering system. The amount of excess or deficient gas was calculated from observation of the piston travel.

Compressibility of the gas at room temperature in the inlet capillary was calculated (*22*) and subtracted from the observed compressibilities in order to arrive at the true compressibility of fluid in the cell. This correction was calculable to <1 percent error and in magnitude was about 10 percent of the measured ΔV.

To effect freezing and melting, finite subcooling and superheating, respectively, were required (*15*). Corrections for these were made using the measured ΔT's the measured α_f, and α_s estimated as 0.75 α_f. The ΔT used in freezing amounted to 0.03–1.2° for He^4 and 0.05–1.0° for He^3; the ΔT used in melting was 0.04–0.40° for He^4 and 0.04–0.21° for He^3. Small ΔT's were usually satisfactory with the thin-walled cell, although large ΔT's were occasionally used.

III. RESULTS

For both helium isotopes, experimental measurements of the volume change on melting, ΔV_m, are shown graphically as a function of melting pressure up to 3500 kg/cm^2 in Fig. 1. The data below 250 kg/cm^2 are shown in more detail in Fig. 2. Values of the thermal expansion coefficient of the fluid,

$$\alpha_f = 1/V_f(\partial V_f/\partial T)_P ,$$

along the melting curve are plotted in Fig. 3. For He^3 a more detailed plot of α_f at low pressures and a plot of the fluid compressibility coefficient,

$$\beta_f = -1/V_f(\partial V_f/\partial P)_T ,$$

along the melting curve are shown in Fig. 4. The error in each of α_f and β_f is estimated to be ±5 percent. Figure 5 gives the locus of points in the pressure-temperature diagram for He^3 where the thermal expansion coefficient of the