From the relationship between ϕ and V, one can derive the quantity

$$\gamma = -\frac{\mathrm{d}\ln\phi}{\mathrm{d}\ln V}.$$

For values of the volume greater than 13 ml. γ is approximately constant and equal to 2·4. At lower volumes γ begins to diminish slowly, but this may be within the limits of accuracy.

TABLE 4. C_v, S AND $(U-U_0)/T$ AS A FUNCTION OF T/ϕ

(All in cal/°C per mole)

T/ϕ	C_v	S	$(U-U_0)/T$
0·04	0·02	0·008	0·010
0·06	0·08	0·023	0·017
0·08	0·19	0·060	0·043
0·10	0·38	0·121	0·091
0·12	0·64	0·213	0·158
0·14	0·96	0·333	0·248
0·16	1·33	0·483	0·359
0·18	1·73	0·662	0·491
0·20	2·21	0·870	0·645

(ii) *The isochores*

It is now possible to calculate the isochores by integrating the relationship

$$\left(\frac{\delta p}{\delta T}\right)_V = \gamma\frac{C_v}{V}, \tag{3}$$

which is valid if C_v is a function only of T/ϕ, and ϕ depends only on volume. The integration constants were determined from the p, V, T values on the melting curve. The isochores at eight densities are shown in figure 9, together with the equilibrium line between the two solid modifications.

(iii) *The isotherms and compressibilities*

As may be seen from figure 9 the isochores may be extrapolated to 0° K with considerable accuracy, and in this way the p, V relationship at absolute zero can be derived. Figure 10 shows this relationship. From this in turn the compressibility at 0° K as a function of volume may be found and is shown in table 5. Isotherms and compressibilities at other temperatures may also be obtained.

TABLE 5. THE COMPRESSIBILITY OF SOLID HELIUM AT 0° K

volume (ml.)	pressure (atm)	$10^5\beta$ (atm^{-1})	volume (ml.)	pressure (atm)	$10^5\beta$ (atm^{-1})
10·5	2170	10	15·0	295	54
11·0	1660	12	16·0	200	76
12·0	1070	17	17·0	136	103
13·0	695	26	18·0	88	140
14·0	460	38	19·0	50	190