TABLE I. Experimental argon melting data.

Temperature (°K)	Pressure (kilobars)	Molar volume (cm^3/mole) Fluid	Solid	ΔV on melting (cm^3/mole)
94.73±0.02	0.451±0.007	27.30±0.02	24.34±0.02	2.96±0.02
94.74	0.459	27.31		
100.76	0.721	26.89		
108.12	1.051	26.52	24.02	2.50
110.77	1.186	26.32		
120.85	1.674	25.85	23.65	2.20
140.88	2.708	24.96	23.04	1.92
160.40	3.805	24.26	22.54	1.72
180.15	4.999	23.65	22.08	1.57
180.20	5.003	23.66	22.11	1.55
201.32	6.335	23.10	21.69	1.41

±1 bar at the lower pressures and ±4 bar at the higher pressures. Construction of this gauge had not been completed at the time the measurements on the solid–fluid phase transition in argon were made, so a Heise Bourdon-tube pressure gauge with somewhat lower sensitivity and accuracy was used in these measurements. The resulting lower accuracy in the determination of the melting pressures will soon be rectified by high-precision measurements of pressure versus temperature along the melting curve for argon and other substances, which are in progress in this laboratory.

The volume of the argon sample was determined by a method not commonly used, but which has several desirable features. In the "normal" data runs the weight of the fluid occupying the entire vessel was measured as a function of pressure and temperature. In addition to these data runs another set of runs was made spanning the same pressure and temperature range, but this time with a solid iron cylinder filling most of the internal volume of the vessel. The difference between the weights of the fluid in the vessel at a given pressure and temperature with and without the iron cylinder in place is just the weight of a volume of the fluid equal to the volume of the iron cylinder at this pressure and temperature. Since this cylinder was subjected only to *hydrostatic* pressure, the small changes in its volume with pressure and temperature could be calculated accurately from the known equation of state of iron. Such a method for volume determination eliminates the need for assumptions concerning the behavior of a pressure vessel and its closure seals when the vessel is subjected to internal pressure. This is desirable since it was shown, at least for the pressure vessel being used in the present experiment, that the internal volume did *not* behave according to the usual assumptions.[1]

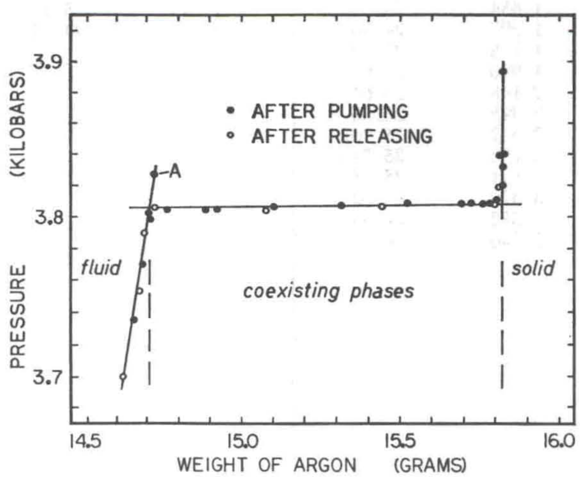

FIG. 4. Isotherm through the solid–fluid phase transition in argon. Point A indicates a pressurization into the supercooled region before the argon began freezing in the vessel.

PROCEDURE AND RESULTS

Using the apparatus and techniques described above, P–V–T data were obtained for argon (99.995% pure). These data consist of several isotherms, each of which is made up of a number of equilibrium P–V–T points. The procedure for each isotherm, after the system had been initially pressurized, was first to pump a small amount of argon into the vessel or to release a small amount from it. The system was then allowed to equilibrate before the values of the pressure in the system and the temperature and weight of the vessel were recorded. This process was then repeated to obtain a series of points along the isotherm. Immediately after all the points for a particular isotherm

TABLE II. Experimental P–V–T data for fluid argon (P is in kilobars; V is in cubic centimeters per mole).

210.16°K[a]

P	V
0.209	61.45
0.277	51.60
0.360	45.77
0.437	42.71
0.515	40.43
0.598	38.68
0.702	37.04
0.782	36.03
0.884	34.98
0.977	34.15
1.072	33.43
1.195	32.61
1.315	31.92
1.420	31.41
1.552	30.78
1.734	30.06
1.939	29.38
2.146	28.75
2.355	28.22
2.530	27.81
2.759	27.33
3.035	26.83
3.306	26.37
3.577	25.99
3.839	25.61
4.123	25.26
4.462	24.88
4.806	24.53
5.143	24.22
5.484	23.95
5.823	23.67
6.160	23.42
6.464	23.20

201.29°K

P	V
0.205	57.20
0.275	48.50
0.348	44.12
0.416	41.55
0.493	39.48
0.554	38.24
0.624	37.08
0.731	35.69
0.838	34.58
0.941	33.68
1.041	32.95
1.163	32.18
1.266	31.59
1.401	30.93
1.550	30.28
1.716	29.66
1.938	28.95
2.355	27.86
2.566	27.40
2.768	27.01
3.002	26.60
3.249	26.20
3.517	25.80
3.791	25.44
4.130	25.03
4.458	24.67
4.806	24.33
5.150	24.03
5.488	23.74
5.824	23.47
6.203	23.20

190.73°K

P	V
0.203	51.55
0.277	44.99
0.348	41.66
0.418	39.49
0.483	38.02
0.559	36.72
0.633	35.67
0.729	34.56
0.824	33.68
0.938	32.79
1.044	32.08
1.174	31.33
1.299	30.72
1.432	30.14
1.565	29.63
1.728	29.07
1.935	28.46
2.136	27.93
2.346	27.45
2.552	27.03
2.776	26.61
3.026	26.18
3.261	25.83
3.554	25.42
3.835	25.07
4.139	24.72
4.478	24.37
4.797	24.07
5.134	23.78
5.486	23.50
5.561	23.43

180.21°K

P	V
0.203	46.62
0.275	42.05
0.352	39.29
0.424	37.52
0.487	36.39
0.553	35.40
0.634	34.45
0.724	33.55
0.831	32.67
0.935	31.95
1.053	31.23
1.160	30.67
1.282	30.10
1.406	29.60
1.554	29.08
1.749	28.46
1.949	27.92
2.152	27.43
2.355	27.00
2.558	26.61
2.787	26.22
3.038	25.81
3.316	25.42
3.573	25.09
3.871	24.74
4.136	24.44
4.444	24.14
4.738	23.86
4.916	23.71

170.36°K

P	V
0.209	42.37
0.280	39.30
0.347	37.50
0.422	36.02
0.489	35.00
0.560	34.14
0.634	33.39
0.719	32.67
0.820	31.93
0.930	31.23
1.051	30.57
1.178	29.96
1.311	29.42
1.458	28.88
1.634	28.33
1.829	27.78
2.015	27.33
2.220	26.89
2.434	26.50
2.648	26.10
2.914	25.69
3.179	25.31
3.450	24.94
3.726	24.62
4.000	24.31
4.301	24.01

160.47°K

P	V
0.203	39.60
0.263	37.63
0.346	35.81
0.409	34.79
0.469	34.01
0.540	33.24
0.626	32.47
0.728	31.69
0.833	31.02
0.939	30.42
1.053	29.88
1.184	29.30
1.317	28.82
1.454	28.37
1.597	27.96
1.728	27.59
1.940	27.09
2.148	26.64
2.345	26.26
2.562	25.90
2.788	25.54
3.041	25.18
3.320	24.82
3.582	24.50
3.846	24.22

150.73°K

P	V
0.212	36.79
0.274	35.44
0.341	34.35
0.416	33.38
0.489	32.62
0.573	31.91
0.664	31.25
0.753	30.68
0.854	30.12
0.984	29.50
1.112	28.96
1.255	28.45
1.412	27.95
1.575	27.50
1.754	27.05
1.958	26.63
2.153	26.25
2.369	25.86
2.605	25.48
2.840	25.14
3.115	24.77

140.94°K

P	V
0.208	34.84
0.291	33.53
0.380	32.47
0.459	31.75
0.537	31.14
0.632	30.52
0.725	29.97
0.823	29.48
0.924	29.05
1.059	28.53
1.173	28.13
1.308	27.71
1.445	27.33
1.589	26.98
1.756	26.58
1.939	26 21
2.114	25.88
2.310	25.55
2.524	25.22
2.720	24.95