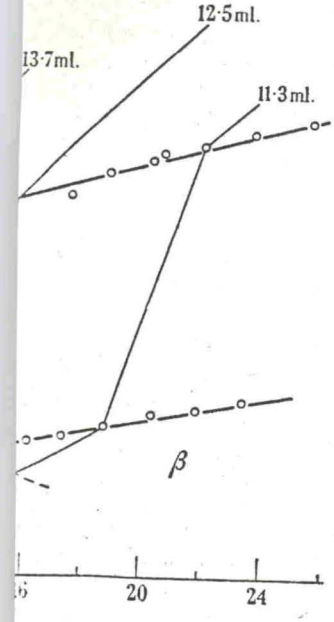
s determined after each experi-
d the associated 'dead' volume
s 'dead' volume consisted of the
and the high-pressure valve, *H*.
ature. Under the conditions of
nstituted about 7 % of the total.
ing the gauge to the valve by a
atus and measuring the helium
e.

experiments is summarized in
solid helium along the melting
solidification curve. Four lines
eness the diagram is extended
°K the entropy of the solid is
som (1936) and the entropy of
o, 1951). Extrapolation of the
eriments agreed with those due
by Keesom & Keesom (1936).
o be accurate to 3 %.



lidification. —— (fine lines),
n line in the solid.

In the course of the experiments a transition was discovered in solid helium. The transition line is indicated on the entropy diagram; further details of the transition are given below.

The significance of our results will be discussed in a later paragraph.

(ii) *Molar volumes along the melting curve*

Figure 4 shows the molar volumes of helium along the melting and solidification curves. Values below 4°K are due to Keesom & Keesom (1936) and to Swenson (1950). The transition line in solid helium is also shown in the figure.

The consistency of corresponding measurements of the melting entropy ΔS and the change of volume on melting ΔV may be tested using the Clausius-Clapeyron equation, provided that the slope of the melting curve is known. Keesom (1926) had measured the melting curve of helium below 4°K and Simon, Ruhemann & Edwards (1929*b*) from 12 to 42°K. The apparatus of the present experiments was used to establish the curve between 4 and 12°K, using the blocked capillary technique. The results showed that the melting curve could be represented, within the experimental accuracy (±3 atm, ±0·1°K), by the equation

$$\frac{p}{16{\cdot}45} = \left(\frac{T}{0{\cdot}992}\right)^{1{\cdot}554} - 1, \qquad (2)$$

where p is the pressure in atmospheres and T the absolute temperature. This is the equation originally established by Simon *et al.* (1929*b*). Using this equation

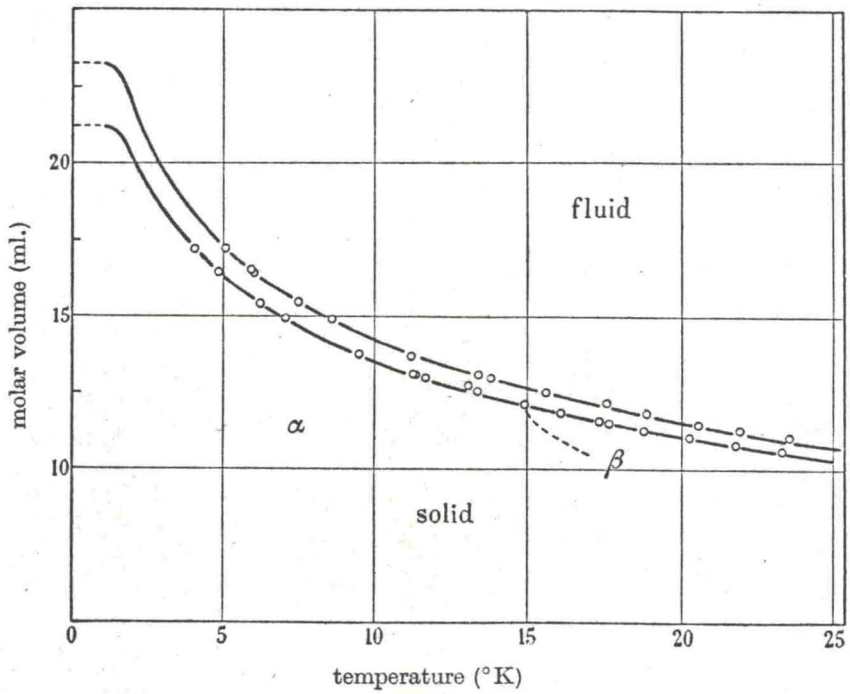


FIGURE 4. The molar volume of helium on melting and solidification. ----, transition line in the solid.