pressure drop, corresponding to a leak rate of 0.0108 cc (STP)/min. The leak corrections amounted to 11% of α_l and $<1\%$ of ΔV_m. The leak was located and repaired following the determinations at 1920.7 kg/cm², but another leak was observed during the measurements at 3555.6 kg/cm². Leak corrections here amounted to 52% of α_l and $<3\%$ of ΔV_m. It is estimated that the leak corrections at both pressures were known to $\pm 5\%$.

F. Purity of Nitrogen

The nitrogen was of Linde Air Products Company "spectroscopically pure" quality. Our mass spectrometer analysis showed that it contained 0.014% A, 0.005% O_2, $<0.01\%$ Ne, and $<0.1\%$ H_2. The rather poor limit set on the H_2 content results from the apparent contamination of the spectrometer; the real H_2 content was probably much less than 0.1%, for the melting point remained constant during the ΔV_m measurements even after several withdrawals of gas.

III. RESULTS

The general character of the data for the volume change on melting ΔV_m, the specific volume of the liquid V_l, and the thermal expansion coefficient of the liquid $\alpha_l \equiv (1/V_l)(\partial V_l/\partial T)_P$, on the melting curve, is shown by the curves of Figs. 2, 3, and 4. The experimental values of these properties and the derived thermal expansion coefficients of the solid α_s are given in Table I, which also includes the number of ΔV_m determinations made at each pressure and the degree of reproducibility. The accuracy of the measurements is estimated to be 0.5% for ΔV_m, 0.2% for V_l, and 2% for α_l.

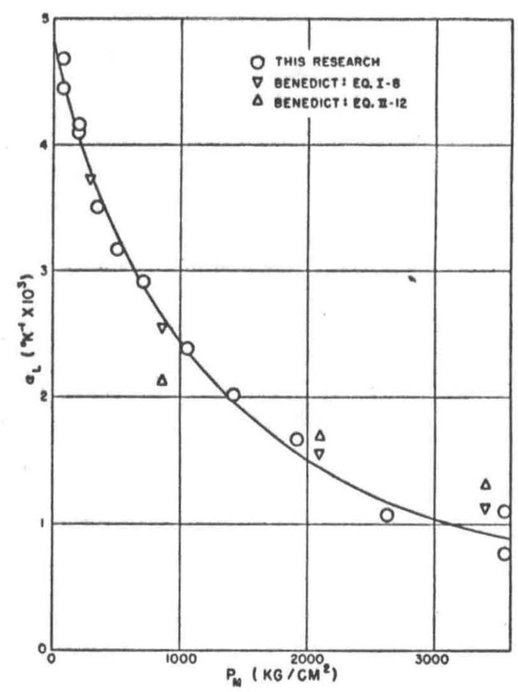

FIG. 4. The thermal expansion coefficient of liquid N_2 *vs* pressure along the melting curve.

Tammann[15] has successfully expressed ΔV_m data by an empirical equation of the form

$$\Delta V_m = A - B \log_{10}(P+C). \quad (1)$$

The data of Table I were fitted to this equation by the method of least squares, and the three constants were evaluated as $A=0.20707$ cm³/g, $B=0.048457$ cm³/g, and $C=275.98$ kg/cm² with a rms deviation in ΔV_m of 0.00043 cm³/g.

The specific volume and thermal expansion data could be represented by an equation of the type

$$x = b'(P+a')^{c'}, \quad (2)$$

where a', b', and c' are constants for the particular variable x. For the specific volume of the solid V_s, this form of equation has the attraction of possibly having theoretical significance, for its derivation from the Grüneisen equation of state and the Lindemann melting formula is similar to the derivation of the Simon melting equation,[16]

$$P = a + bT^c. \quad (3)$$

The constants of Eq. (2) for the various properties are given in Table II.

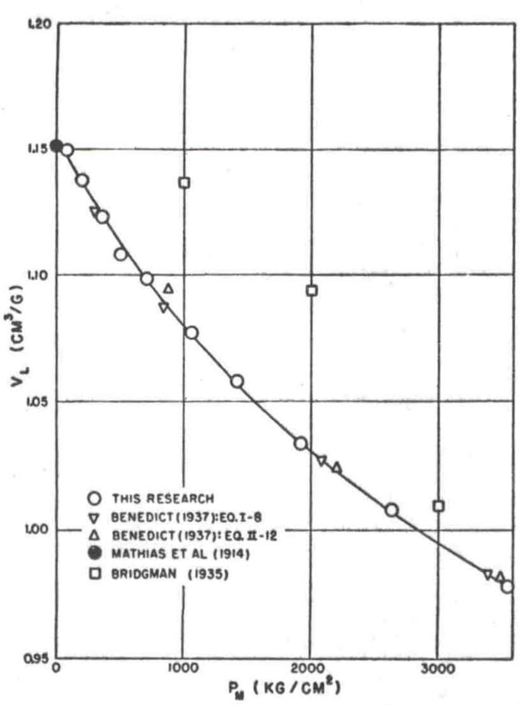

FIG. 3. The specific volume of liquid N_2 *vs* pressure along the melting curve.

[15] G. Tammann and G. Moritz, Z. anorg. u allgem. chem. 218, 60 (1934).
[16] L. Salter, Phil. Mag. 45, 369 (1954).