TABLE II. Sound velocity and ratio of specific heats in argon.

Temperature (°K)	Pressure (atm)	V_0(exptl.) (m/sec)	V_0(Gyorog) (m/sec)	γ
273.15	1.00	308.14	308.06	1.6715
	10.00	308.42	308.48	1.7030
	30.00	310.02	309.95	1.7822
	50.00	312.29	312.23	1.8647
	70.00	315.33	315.42	1.9485
294.26	1.00	319.90	319.88	1.6714
	10.00	320.49	320.53	1.6978
	30.00	322.64	322.67	1.7628
	50.00	325.65	325.48	1.8325
	70.00	328.95	329.04	1.8985

R, T, M are the gas constant, absolute temperature, and molecular weight, respectively; B^*, C^*, D^* are the generalized virial coefficients (Refs. 1 and 5); and ρ^*, T^* are the reduced density and reduced temperature. Equation (1) is the form of the generalized virial equation given by Hovi[7] (but the fourth virial coefficient and its derivatives were added to Hovi's equation by the author).

The ratio of the heat capacities γ as a function of pressure and temperatures was calculated from

$$\gamma=\frac{V_0^2}{(R/M)T(1+2B^*\rho^*+3C^*\rho^{*2}+4D^*\rho^{*3})}. \quad (2)$$

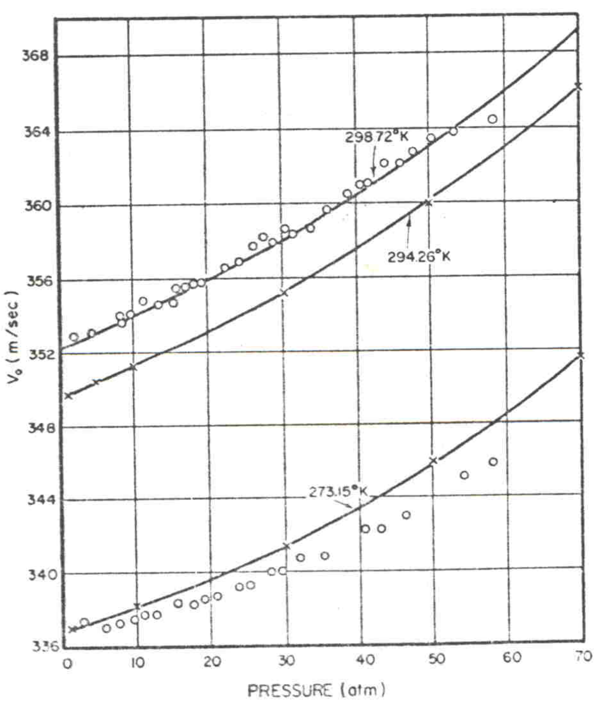

FIG. 1. Sound velocity in nitrogen as a function of pressure. (×, present data; ——, Gyorog's equation; ○, van Itterbeek's data[2].)

[7] V. Hovi and R. Nasanen, Ann. Acad. Sci. Fennicae Ser. AVI, No. 35 (1959).

RESULTS AND CONCLUSIONS

The free-gas sonic velocities and the specific-heat ratios are listed in Tables I and II. The data of this paper, the calculated values from Gyorog's equation, and van Itterbeek's data are compared in Figs. 1 and 2. Note that the agreement between the present data (×) and the values calculated by Gyorog's equation (solid line) is excellent in all cases. However, van Itterbeek's data for nitrogen at the ice point are lower than those of the present paper. The deviation increases from about 0.5 m/sec at low pressures to about 2.3 m/sec at high pressures.

Also presented in Fig. 1 is a comparison between velocity values for N_2 calculated at 298.72°K by Gyorog's equation and those of van Itterbeek[2] at the same temperature. Here it is seen that the van Itterbeek data agree with the predicted values except for his highest test pressure.

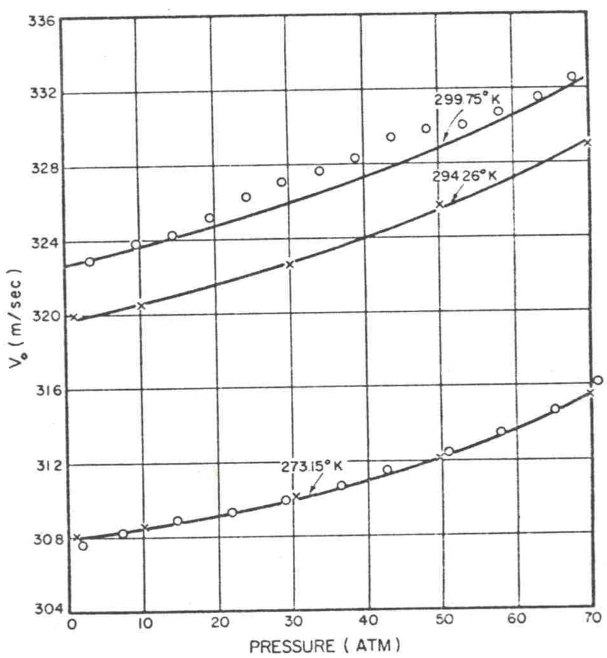

FIG. 2. Sound velocity in argon as a function of pressure. (×, present data; ——, Gyorog's equation; ○, van Itterbeek's data[3].)

In Fig. 2, the data of this paper for argon at the ice point are in very good agreement with those of van Itterbeek.[3] But comparison between the calculated values for argon at 299.75°K and those of van Itterbeek at the same temperature shows some deviation from the predicted curve in the pressure range of 20 to 50 atm. The author's data at 294.26°K, however, agree with the calculated values.

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