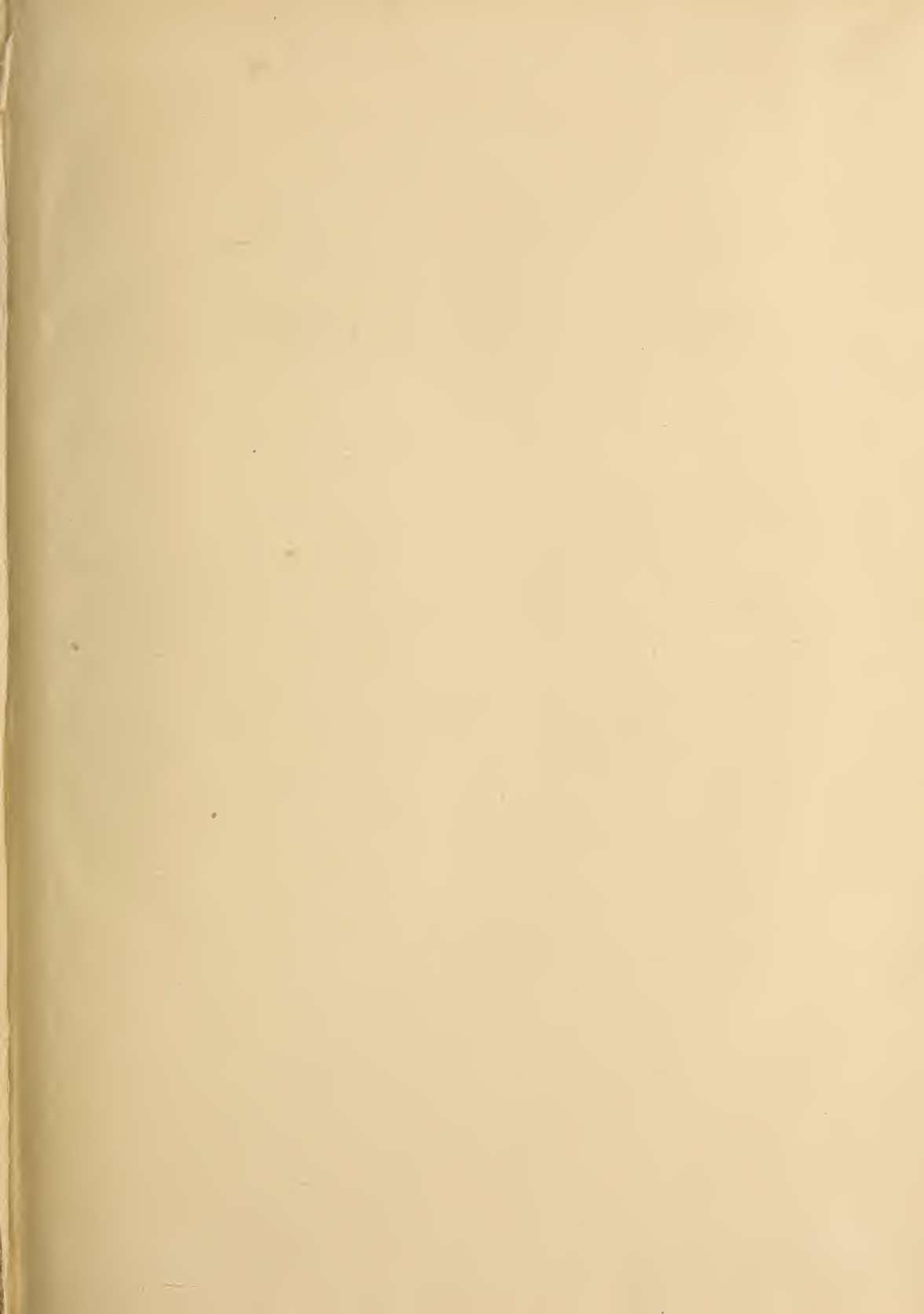


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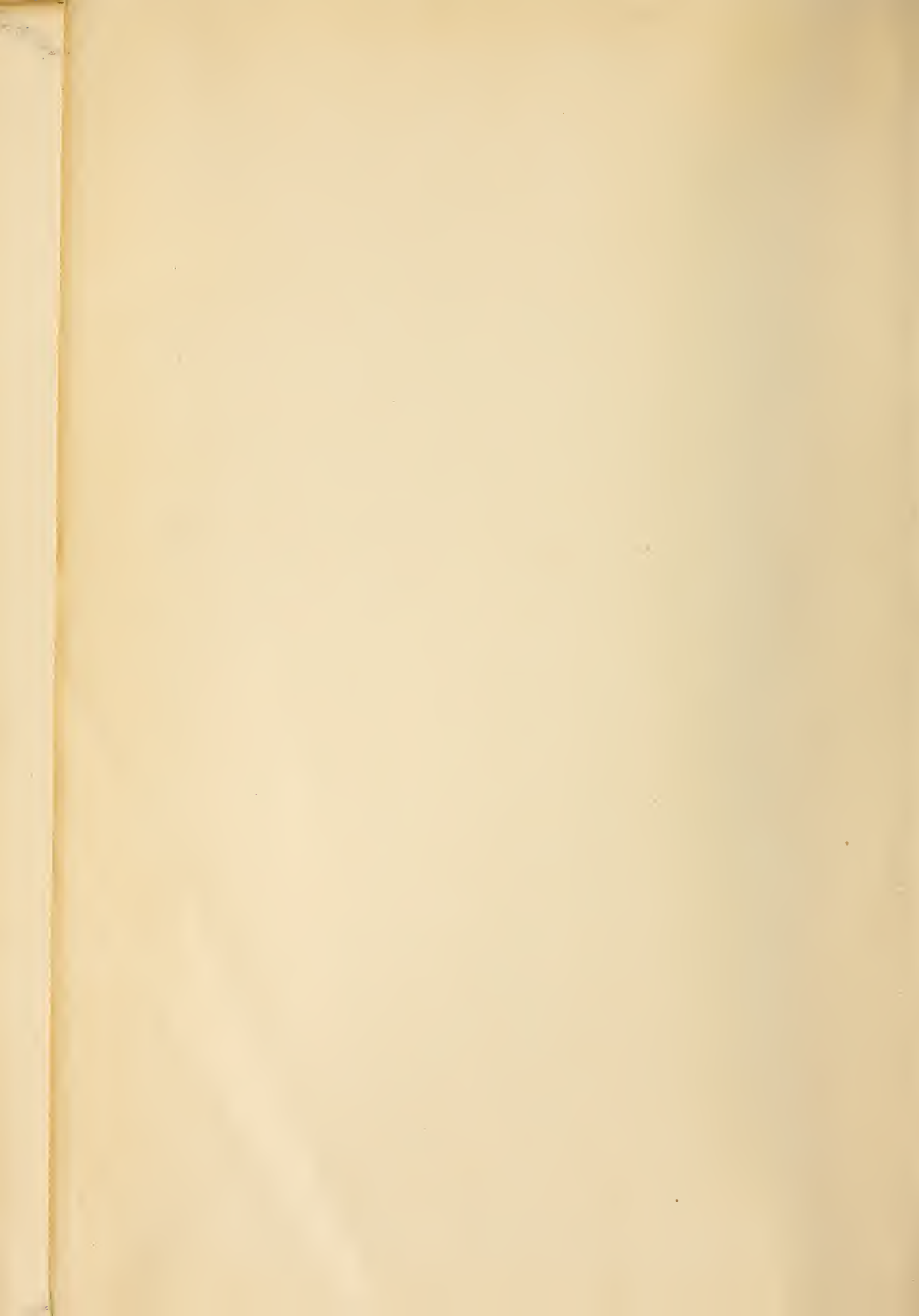
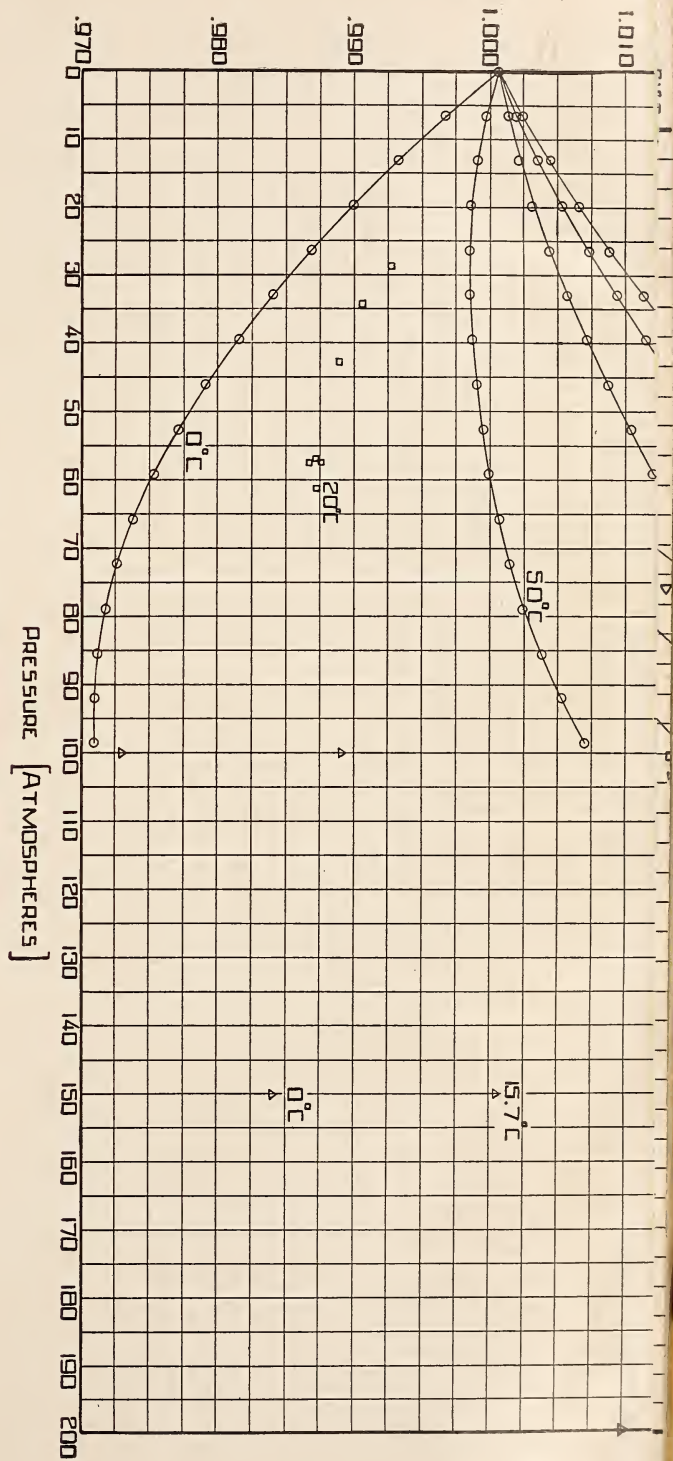




Fig. 1.—The compressibility factors for air







# DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

George K. Burgess, Director

# MISCELLANEOUS PUBLICATION OF THE BUREAU OF STANDARDS

No. 71

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## COMPRESSIBILITIES OF GASES<sup>1</sup>

Graphs for Computing the Compressibilities of Air, Argon, Helium, Hydrogen, Methane, Neon, Nitrogen, and Oxygen, and for Computing the Volumes Delivered from Cylinders Containing Argon, Helium, Hydrogen, Nitrogen, and Oxygen at High Pressures

The following graphs from Circular No. 279, The Relations Between the Temperatures, Pressures, and Densities of Gases, have been reproduced on a larger scale in order that they may be used for obtaining numerical values. The graphs showing the factors for computing the compressibilities of gases up to pressures of 200 atmospheres contain nearly all of the published data covering this range of temperature and pressure, and the curves are drawn according to what appear to be the most probable values. The graphs indicating the volume of gas delivered from a cylinder con-

taining the gas at high pressure have been computed for cylinders having a volume of 1.528 cubic feet, which is the volume of the so-called "200-foot" cylinder. For a cylinder of any other capacity the volume delivered would be proportional to the volume of the cylinder. In other words, the figure obtained from the graph should be multiplied by  $\frac{V}{1.528}$ , where  $V$  is the volume (in cubic feet) of the cylinder in question.

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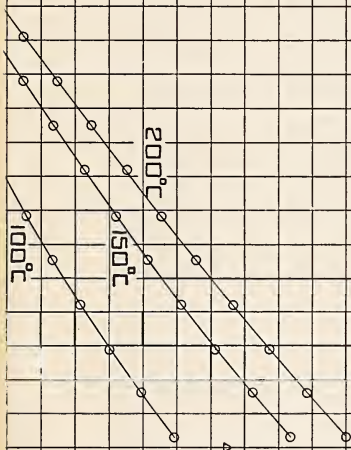
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<sup>1</sup> Prepared by S. F. Pickering, Associate Chemist.

FACTOR OR  $\frac{273.1}{T}$  PV

1.090  
1.080  
1.070  
1.060  
1.050  
1.040  
1.030  
1.020

AIR  
 Δ AMAGAT 1893  
 ○ HOLBORN AND SCHULTZE 1915  
 □ PENNING 1924



200.4°C

99.4°C

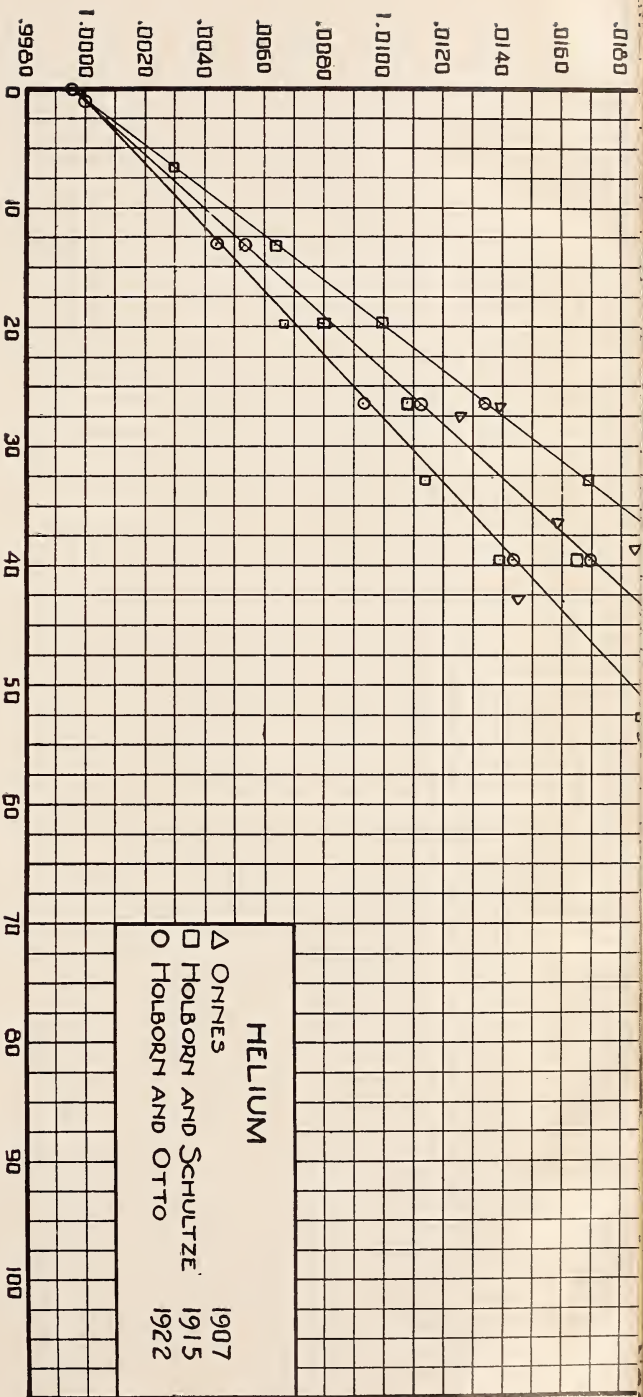
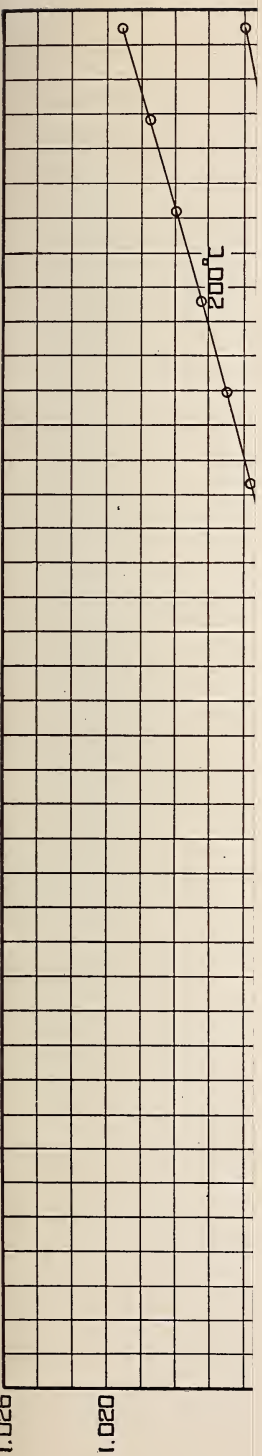


Fig. 3.—The compressibility factors for helium



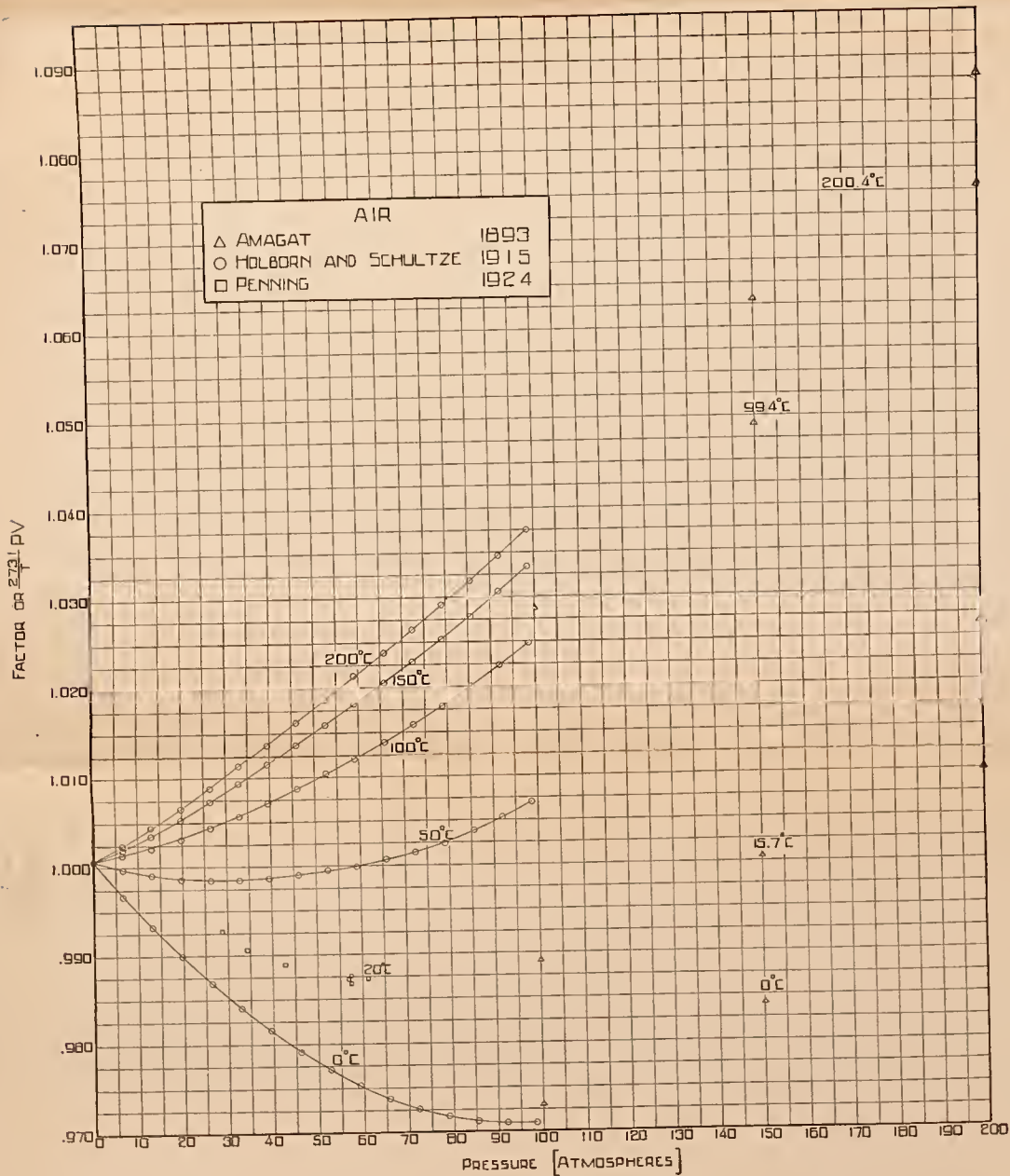


FIG. 1.—The compressibility factors for air



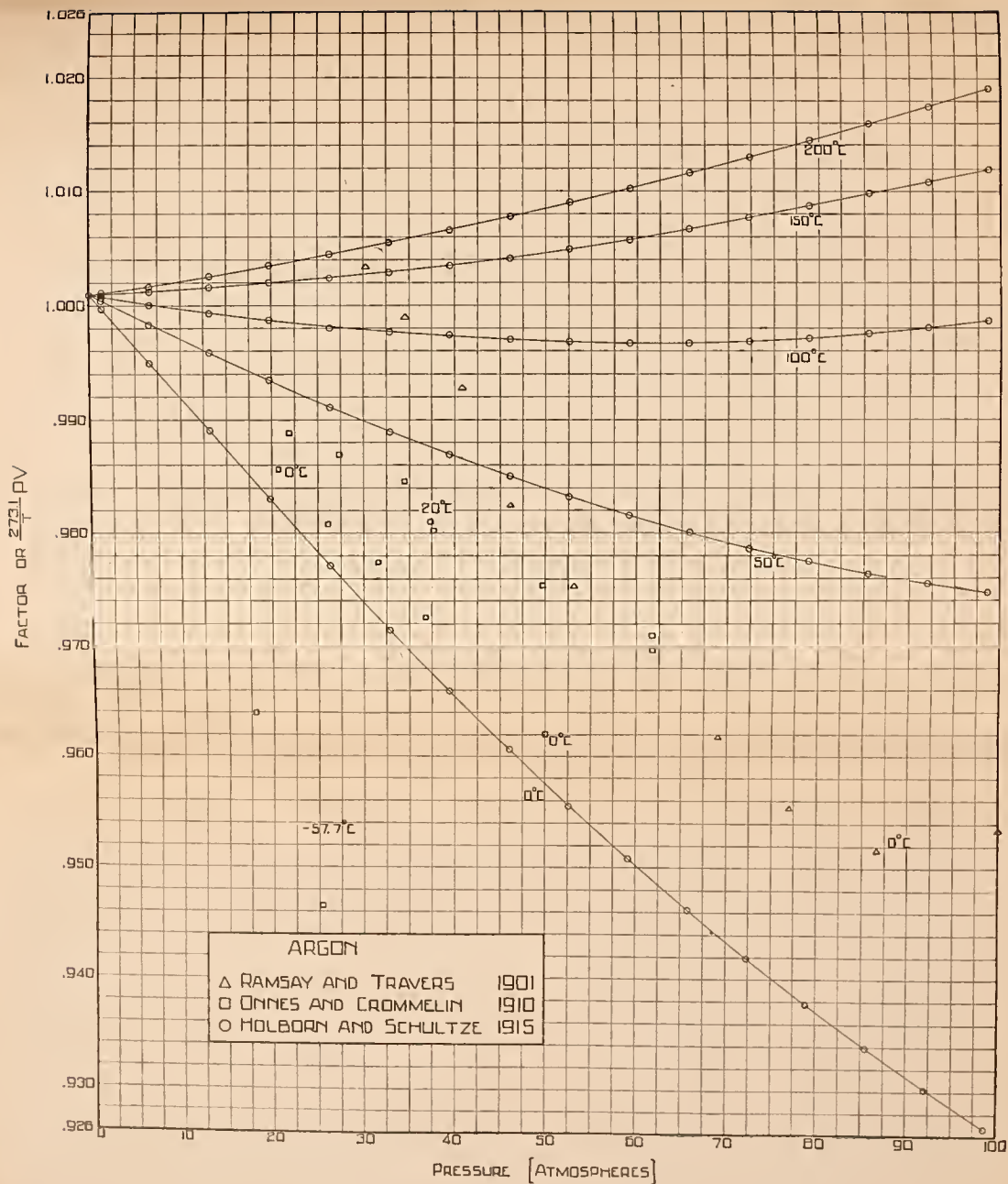
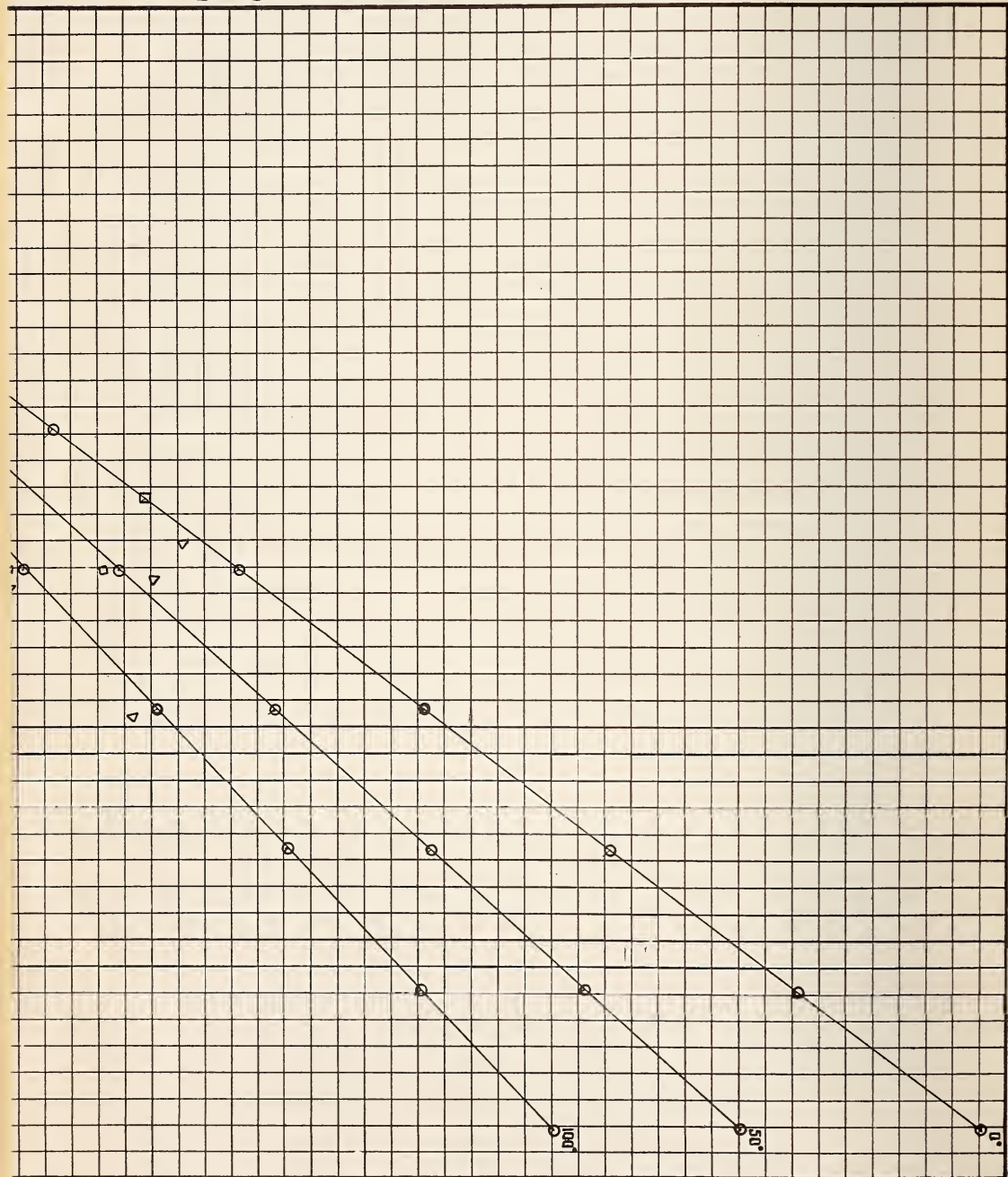


FIG. 2.—The compressibility factors for argon.

FACTOR OR  $\frac{273.1}{T} PV$

1.0560  
 .0540  
 .0520  
 1.0500  
 .0480  
 .0460  
 .0440  
 .0420  
 1.0400  
 .0380  
 .0360  
 .0340  
 .0320  
 1.0300  
 .0280  
 .0260  
 .0240  
 .0220  
 1.0200



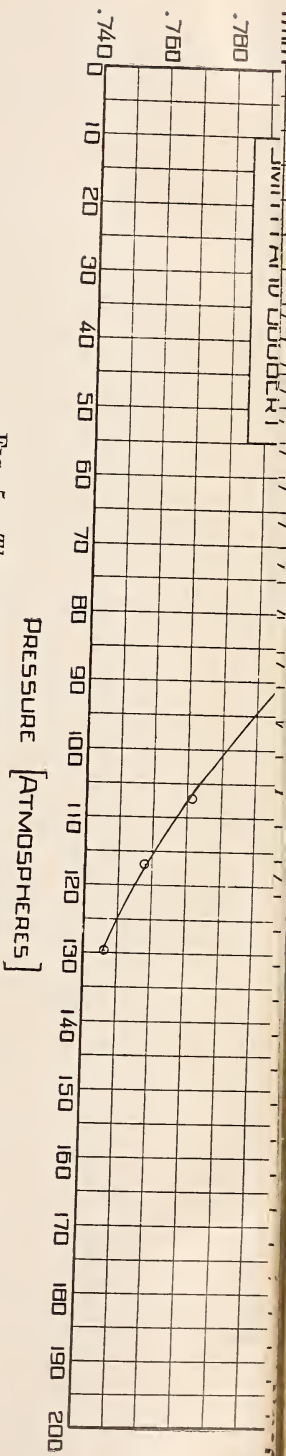
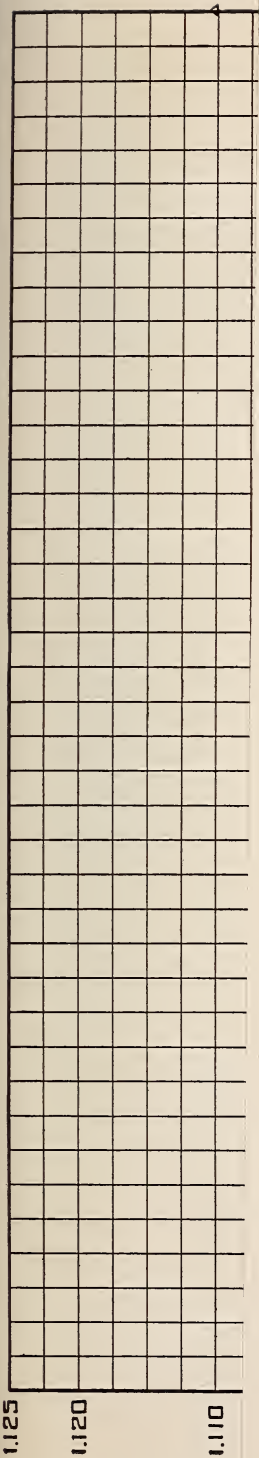


Fig. 5.—The compressibility factors for methane



0.111  
0.211  
0.5211



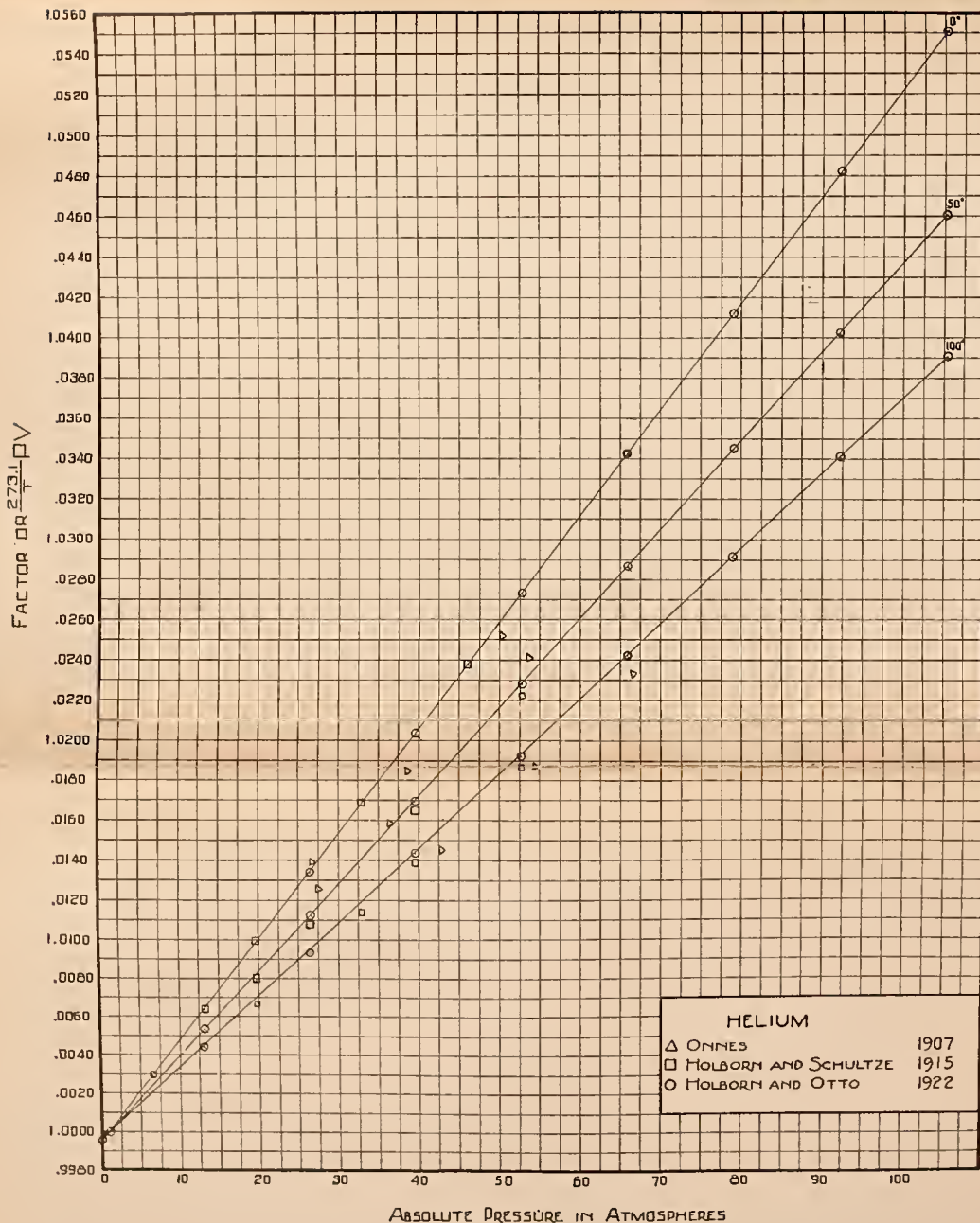


FIG. 3.—The compressibility factors for helium

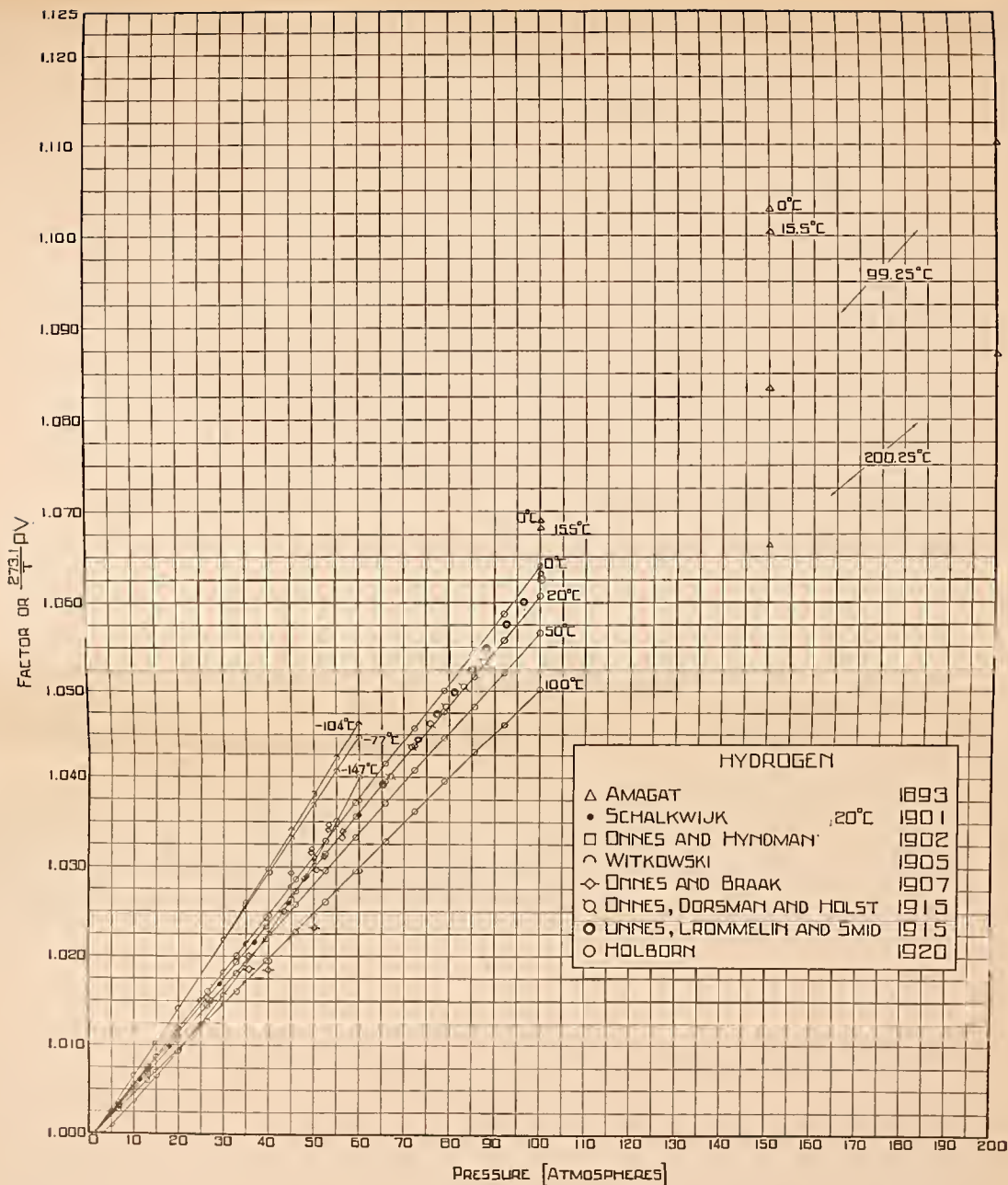
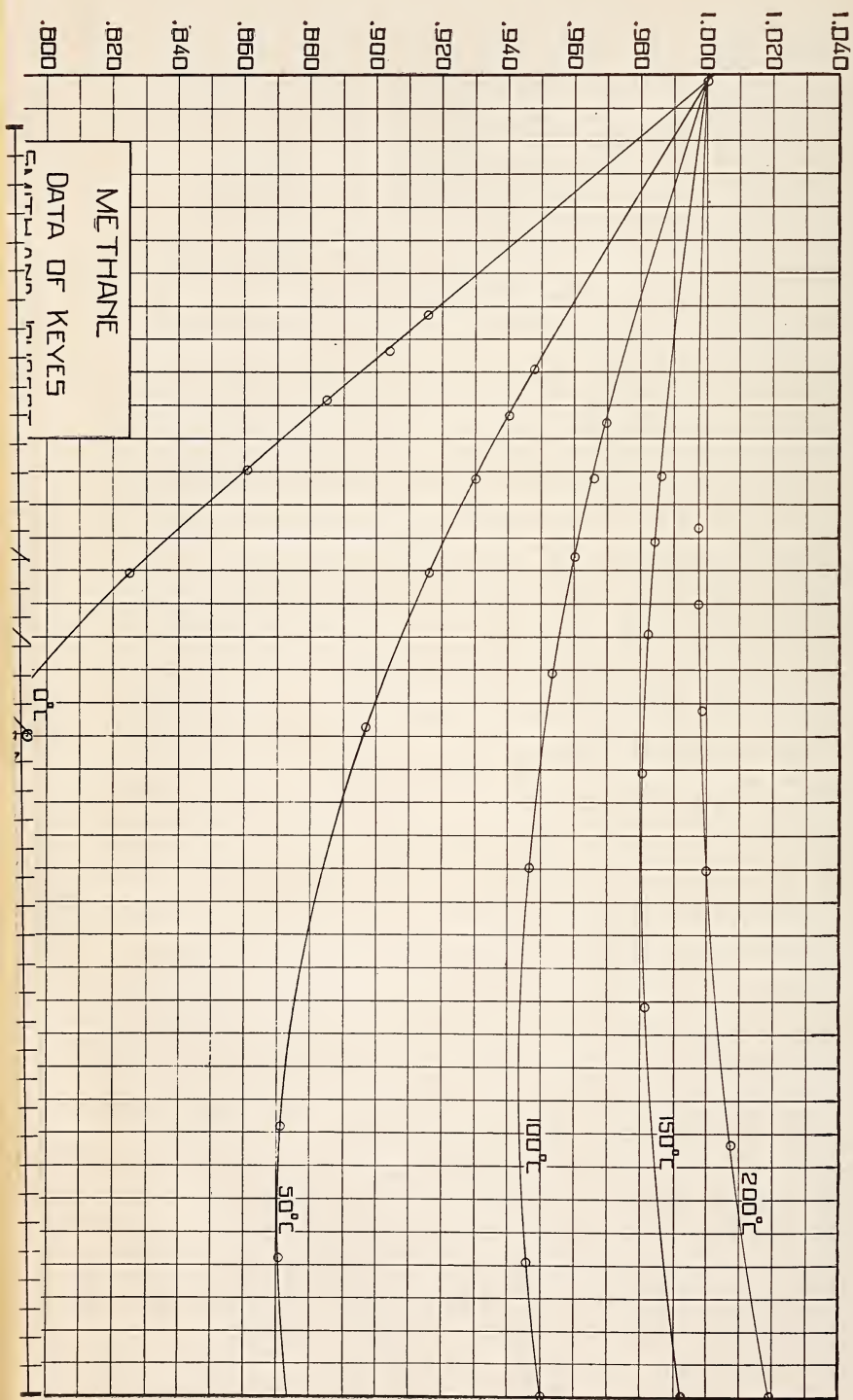


FIG. 4.—The compressibility factors for hydrogen

FACTOR OR  $\frac{273.1}{T}$  PV



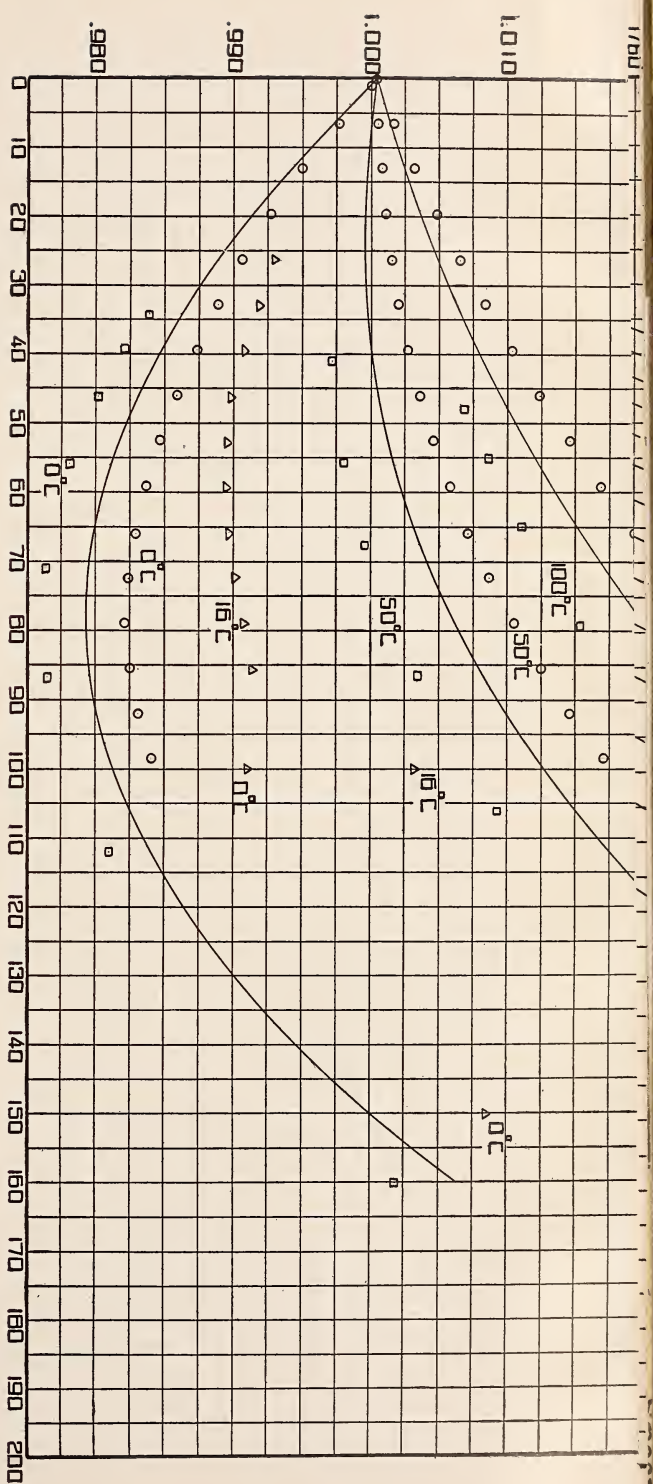
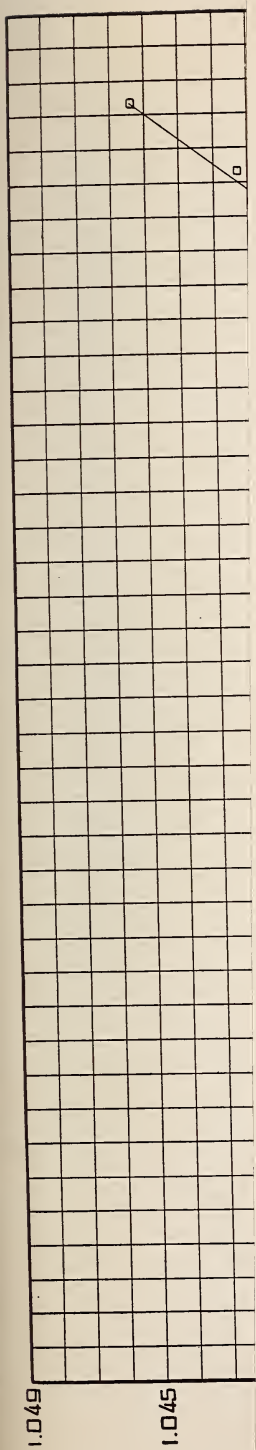


Fig. 7.—The compressibility factors for nitrogen





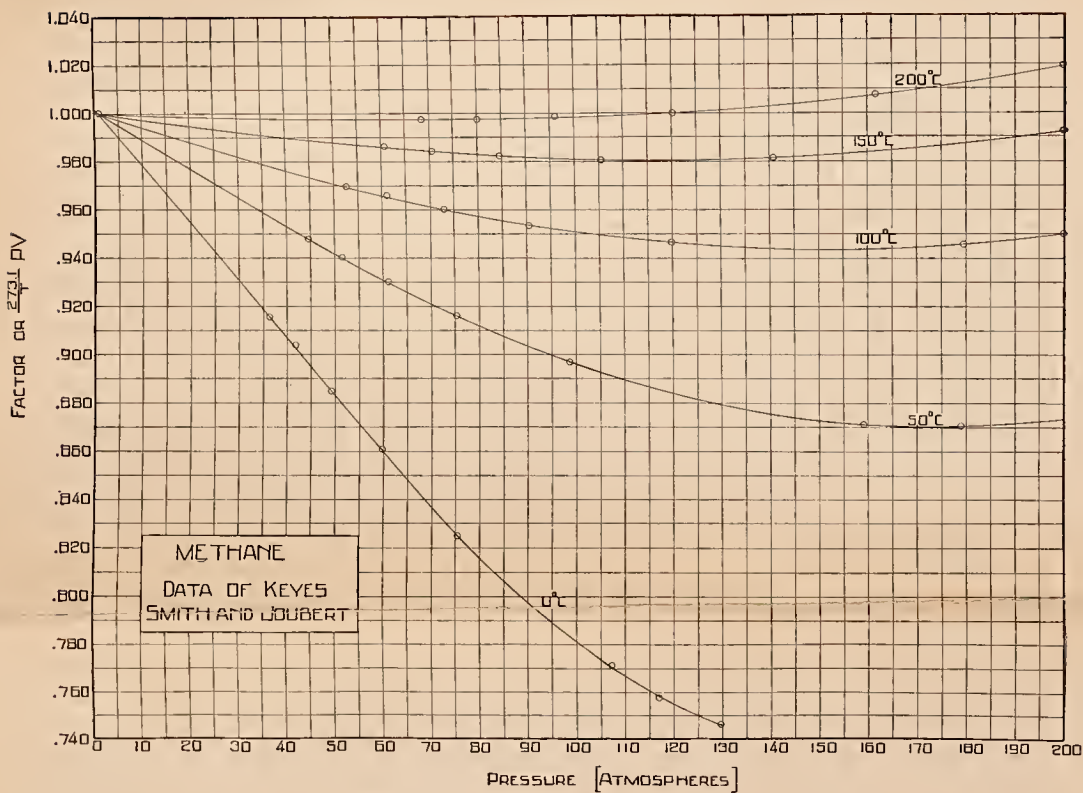


FIG. 5.—The compressibility factors for methane



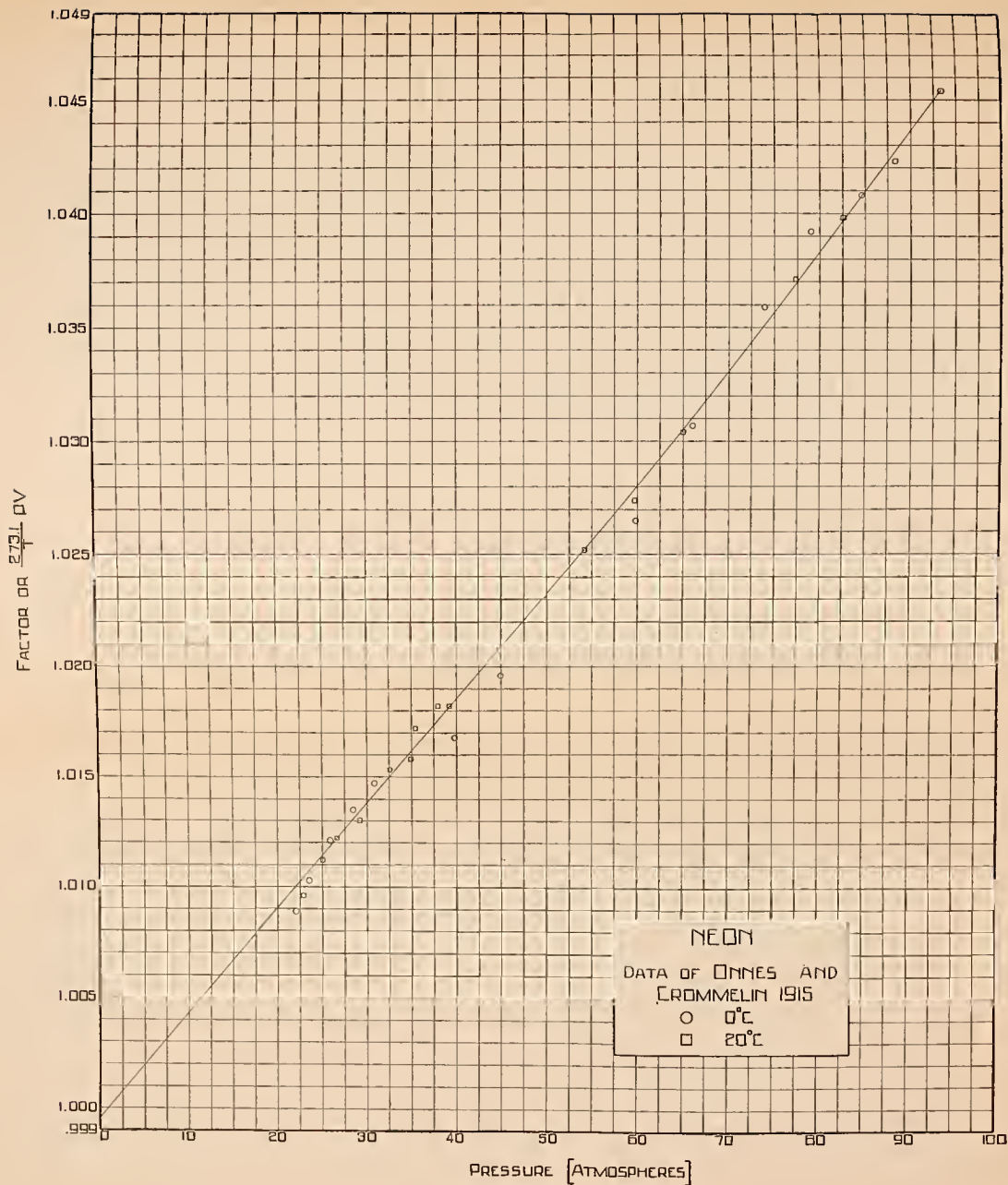
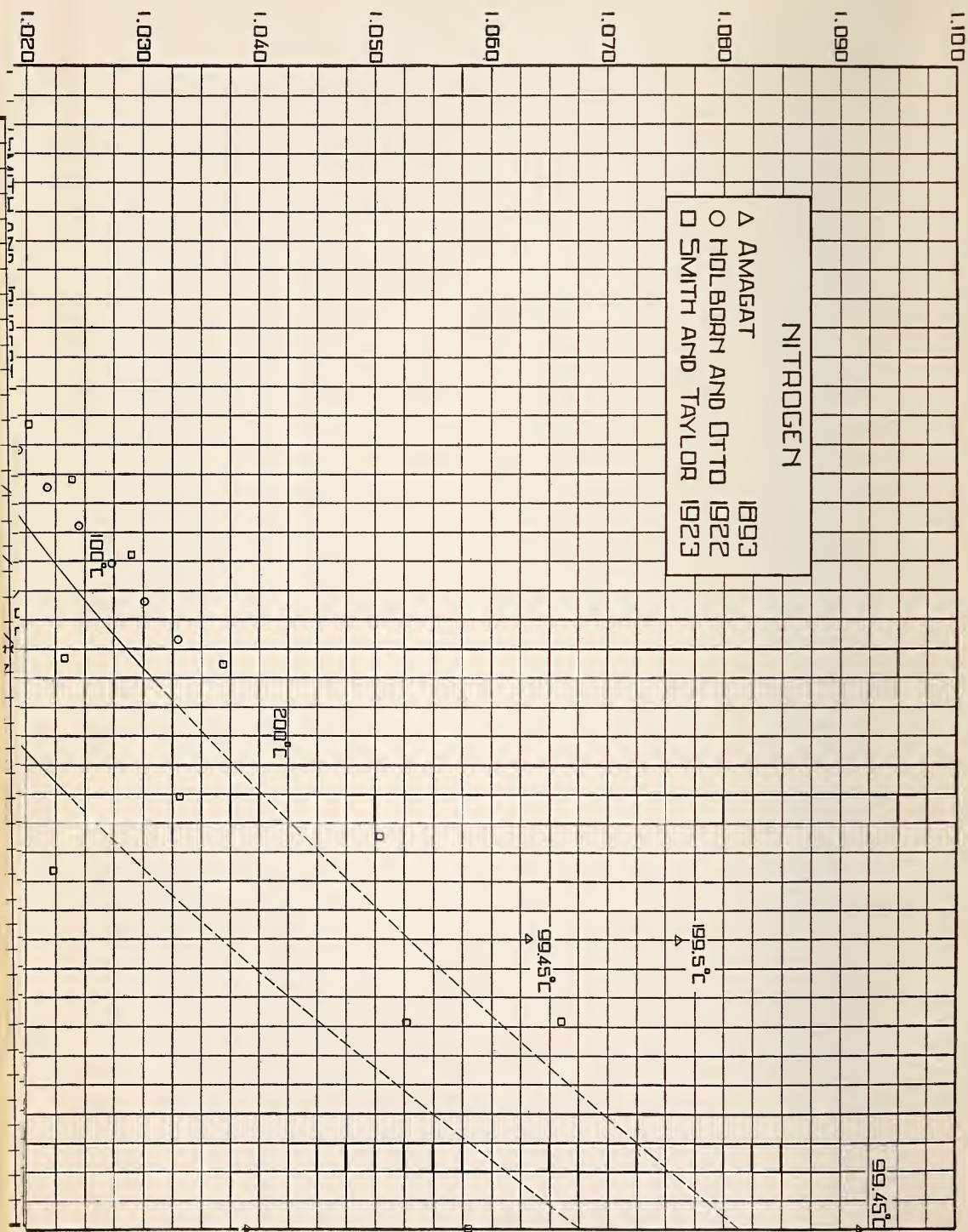


FIG. 6.—The compressibility factors for neon

FACTOR OR  $\frac{273.1}{T}$  PV

NITROGEN

▲ AMAGAT 1893  
 ○ HOLBORN AND ORTIO 1922  
 □ SMITH AND TAYLOR 1923



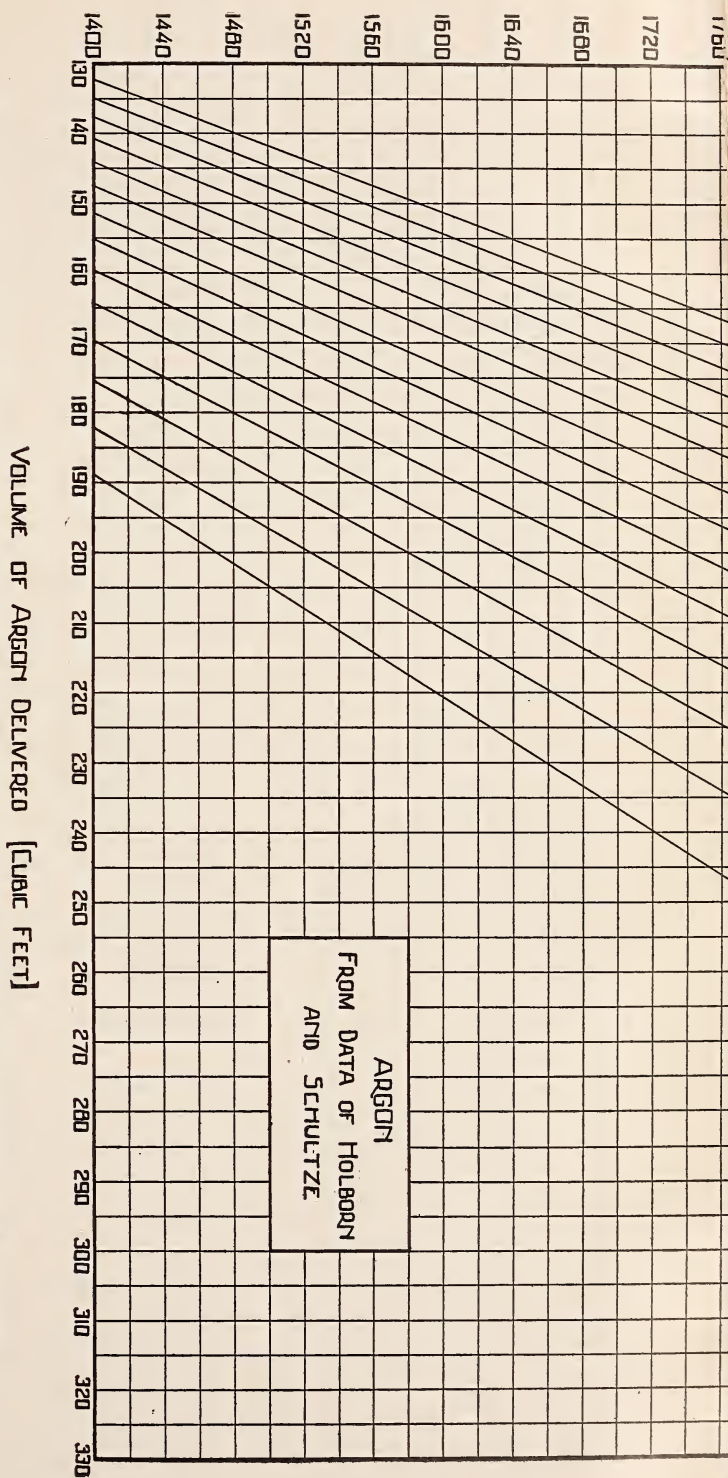
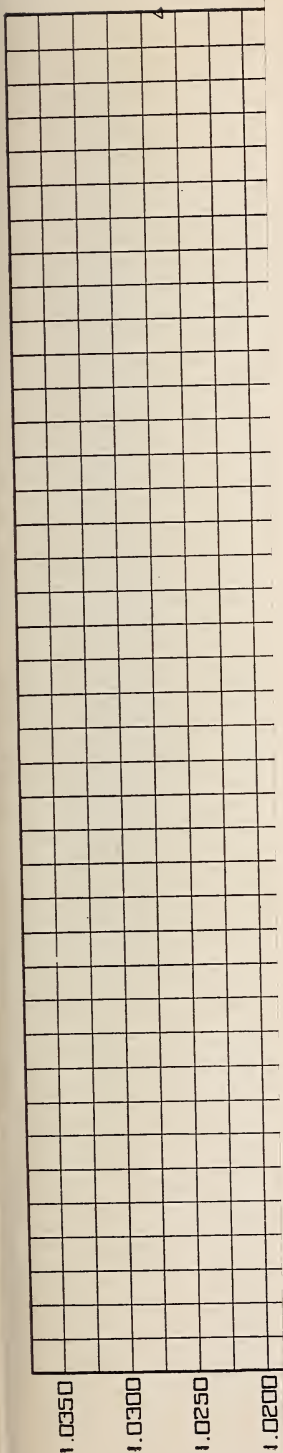


FIG. 9.—Volume of argon (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet





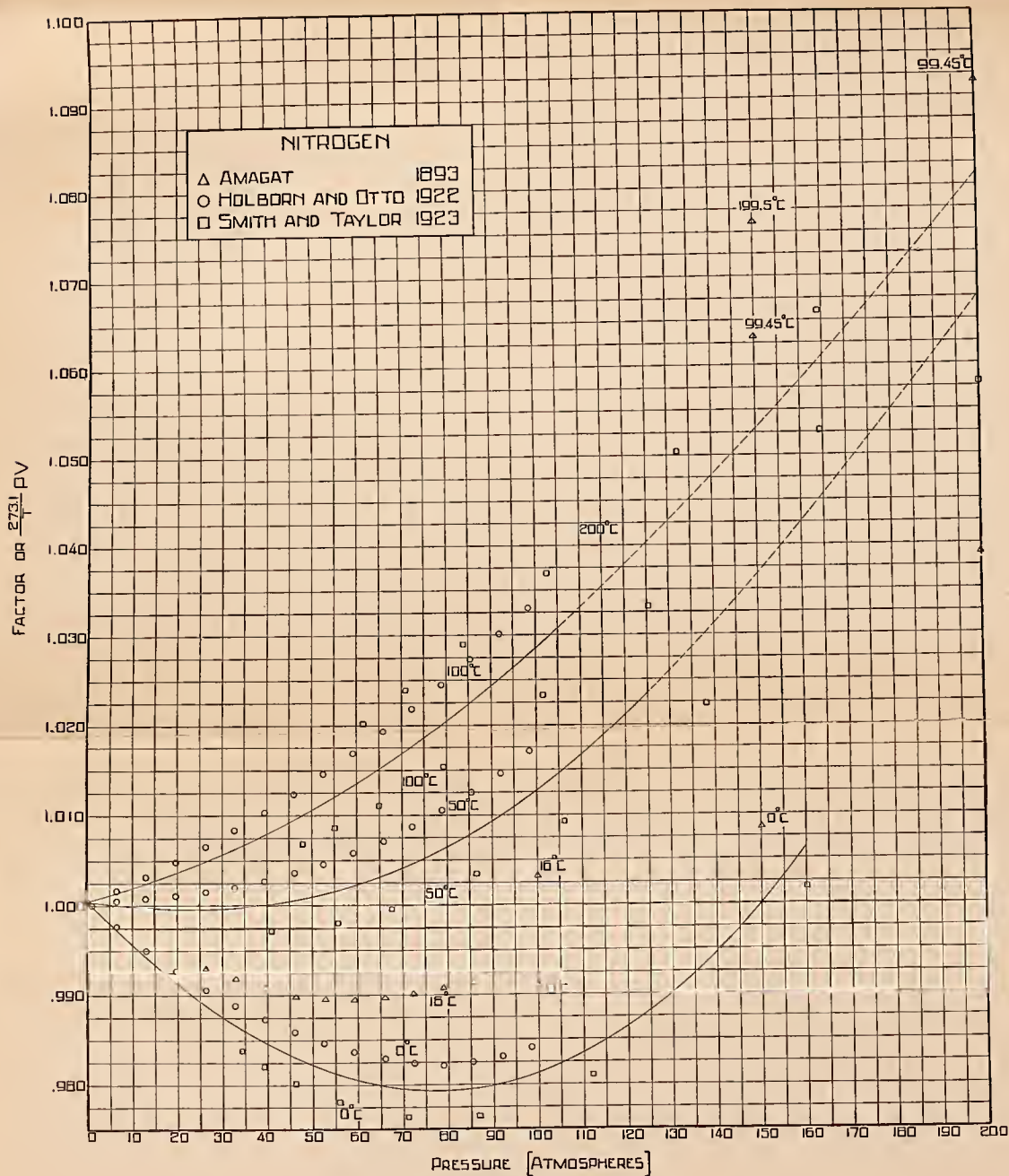


FIG. 7.—The compressibility factors for nitrogen

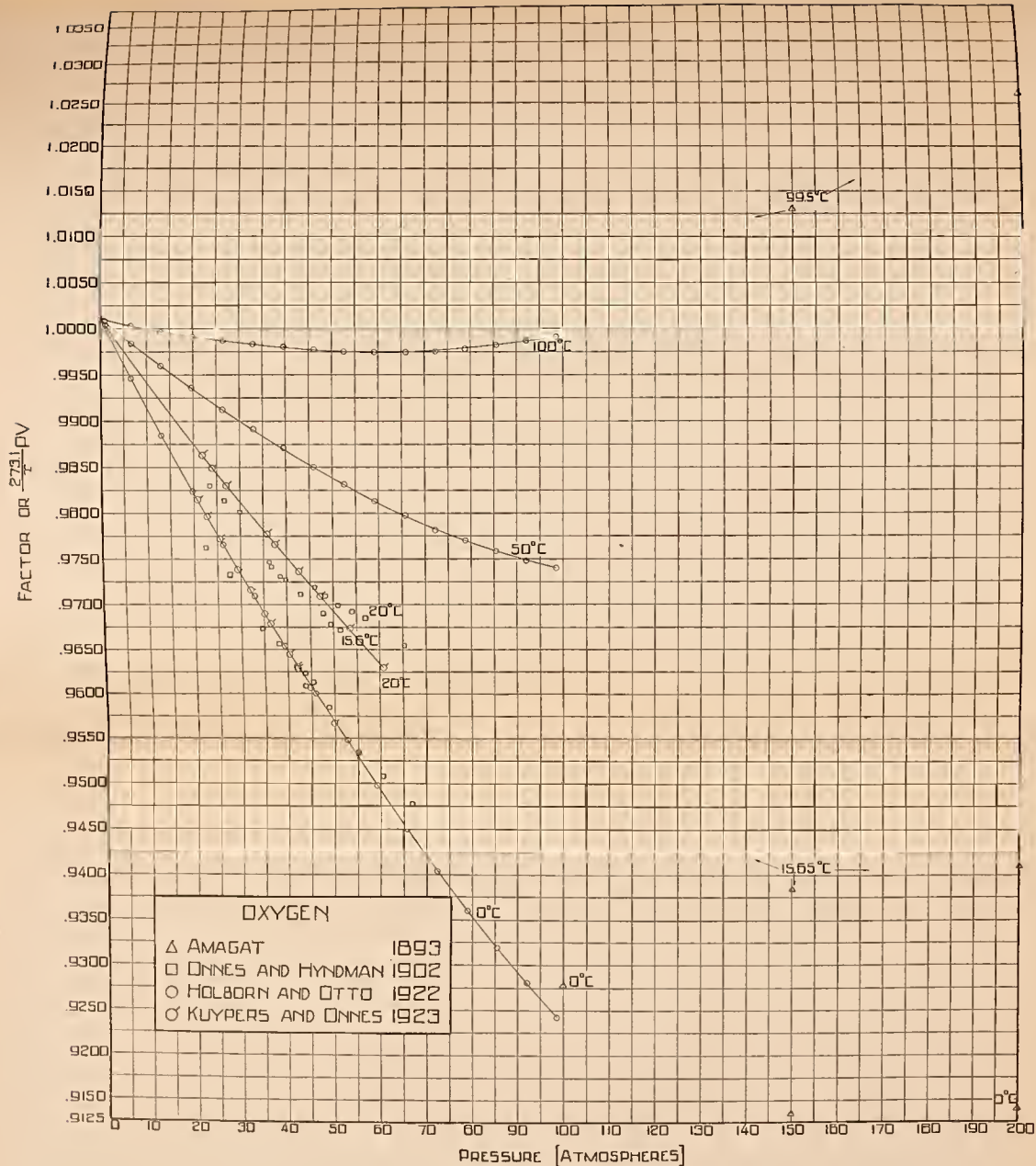
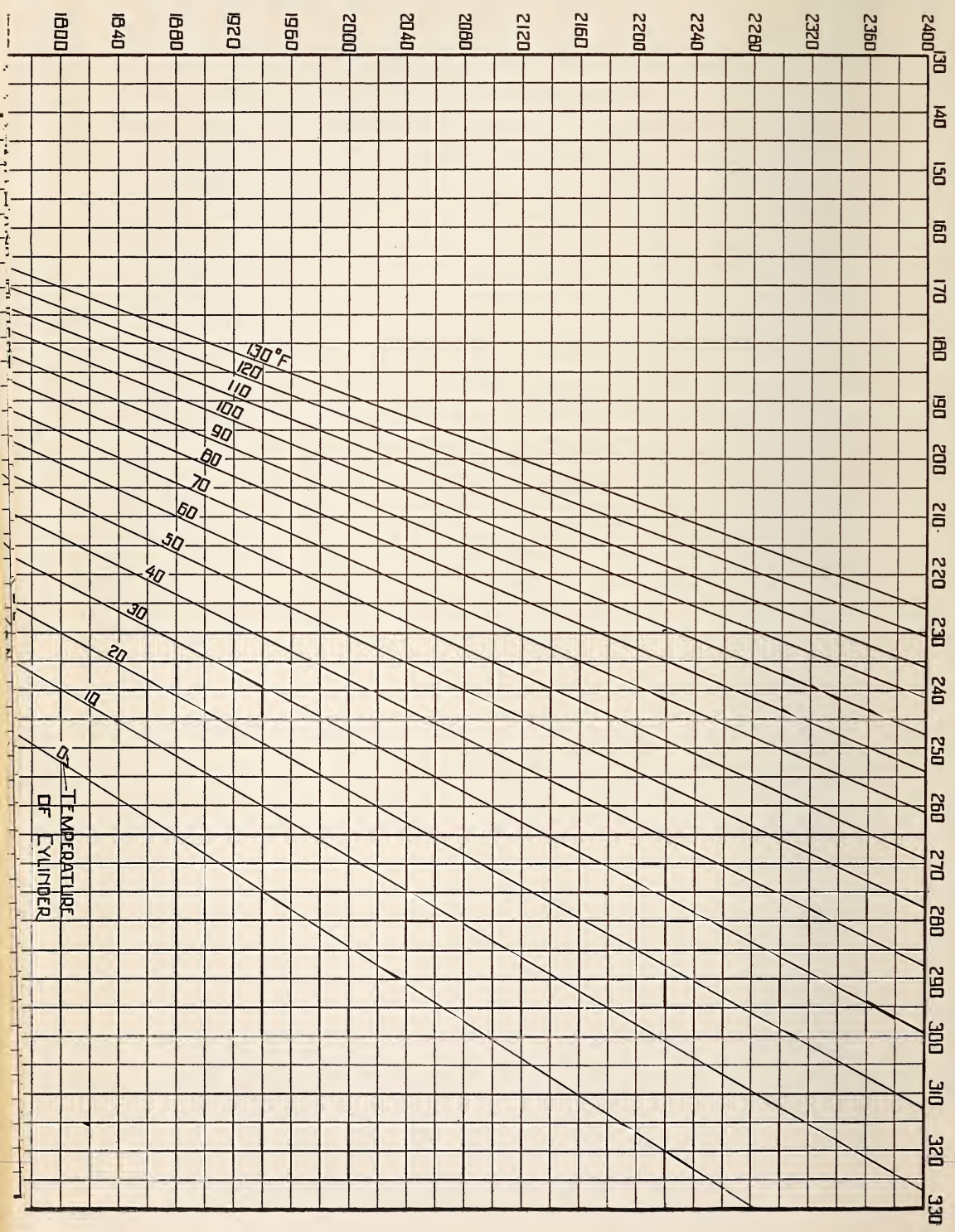


FIG. 8.--The compressibility factors for oxygen

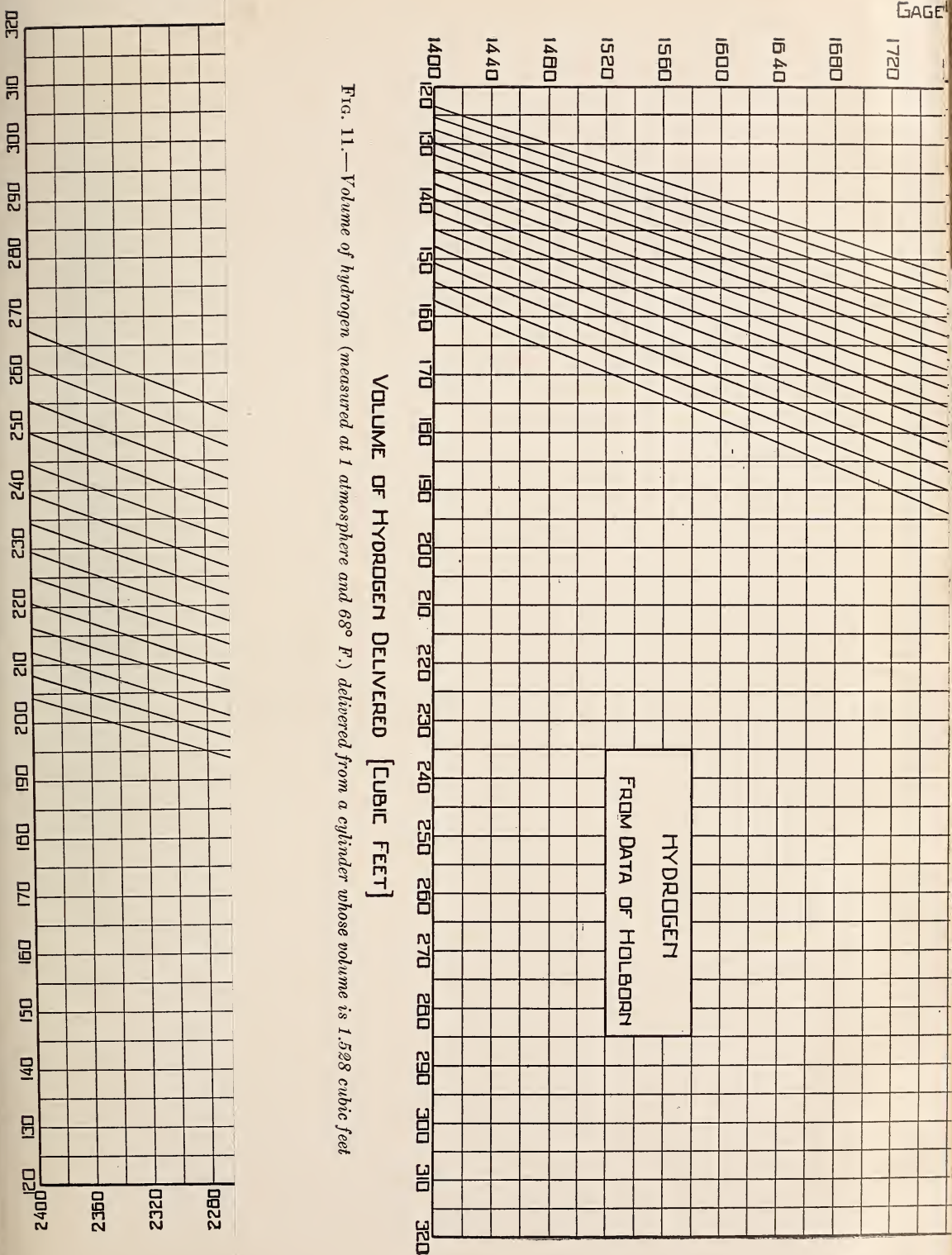


SSURE [POUNDS PER SQUARE INCH]



# VOLUME OF HYDROGEN DELIVERED [CUBIC FEET]

Fig. 11.—Volume of hydrogen (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet



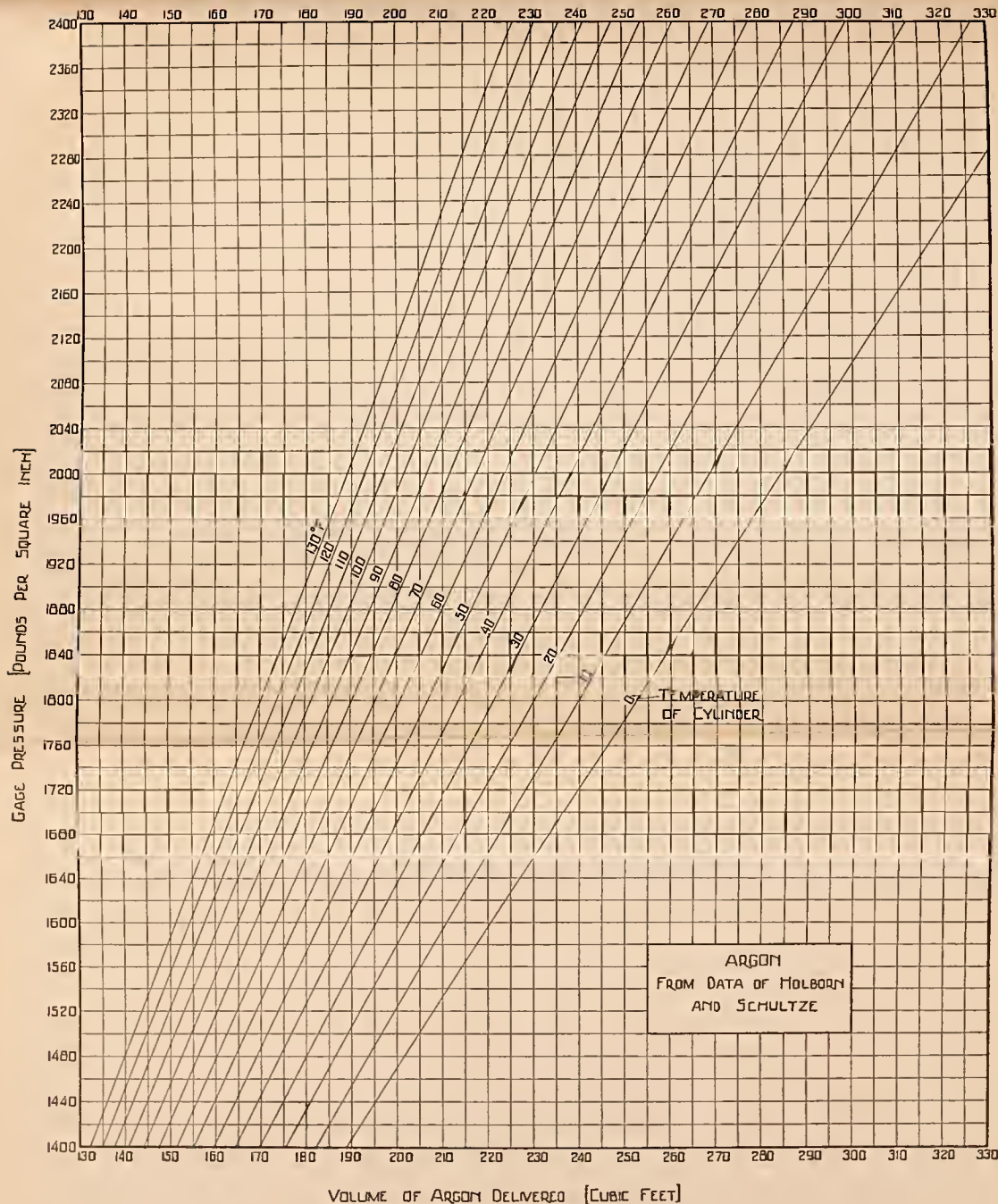


FIG. 9.—Volume of argon (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet



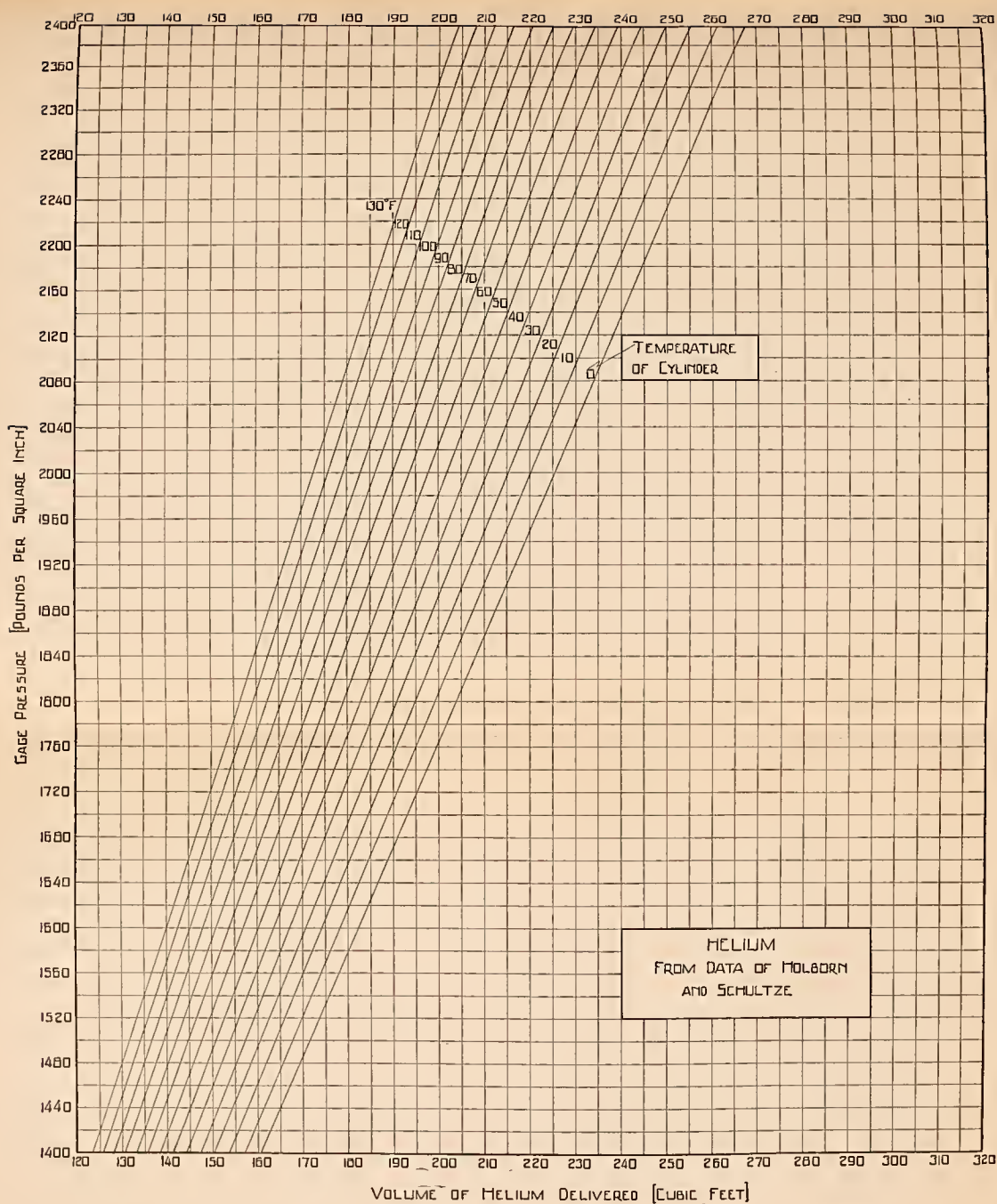
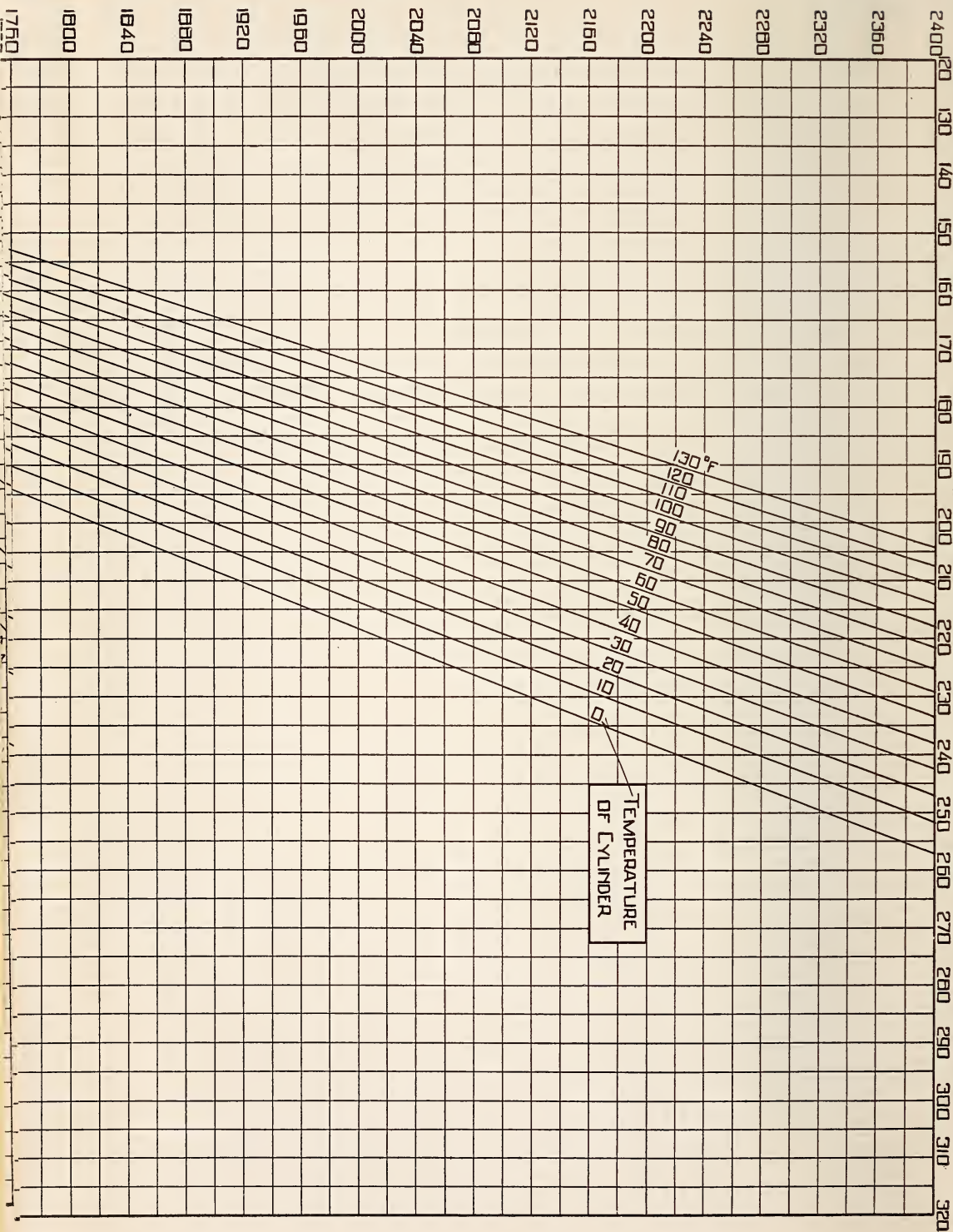


FIG. 10.—Volume of helium (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet

PRESSURE (POUNDS PER SQUARE INCH)





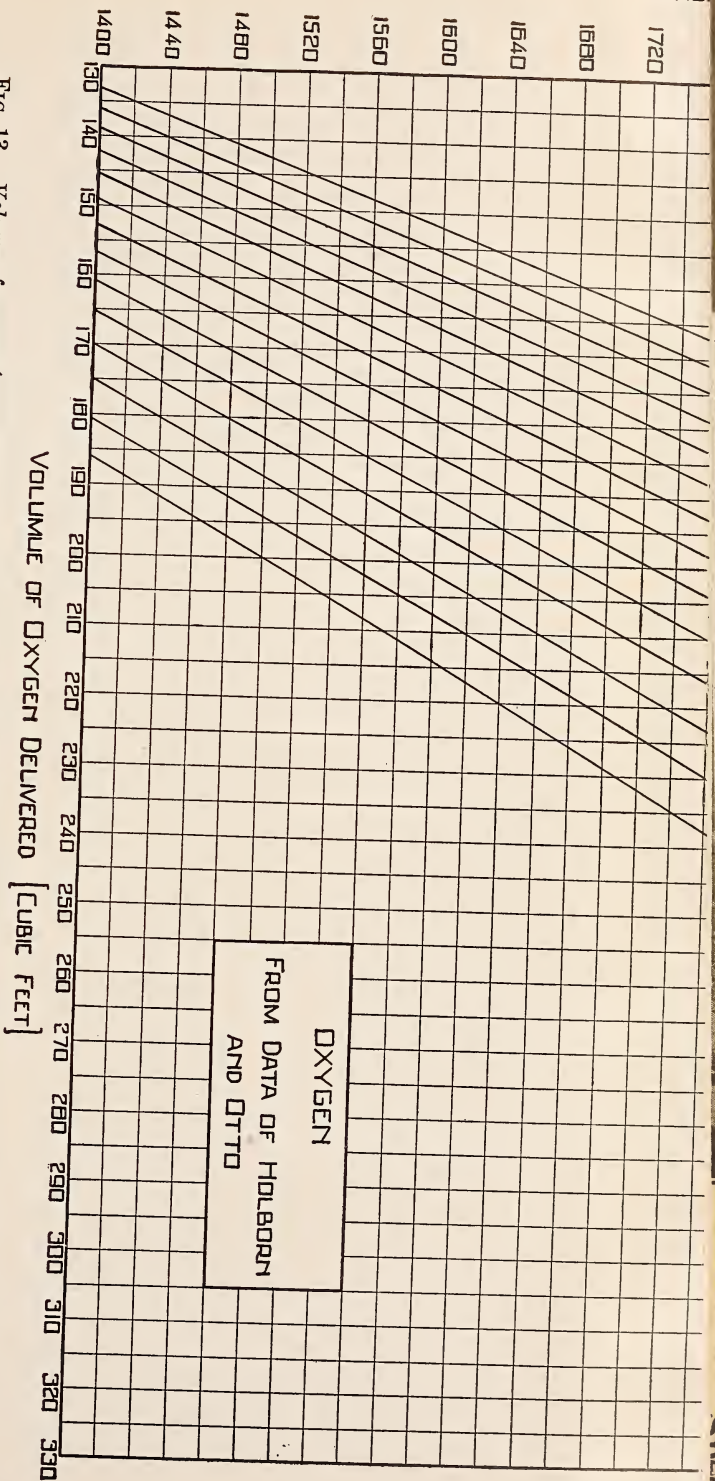
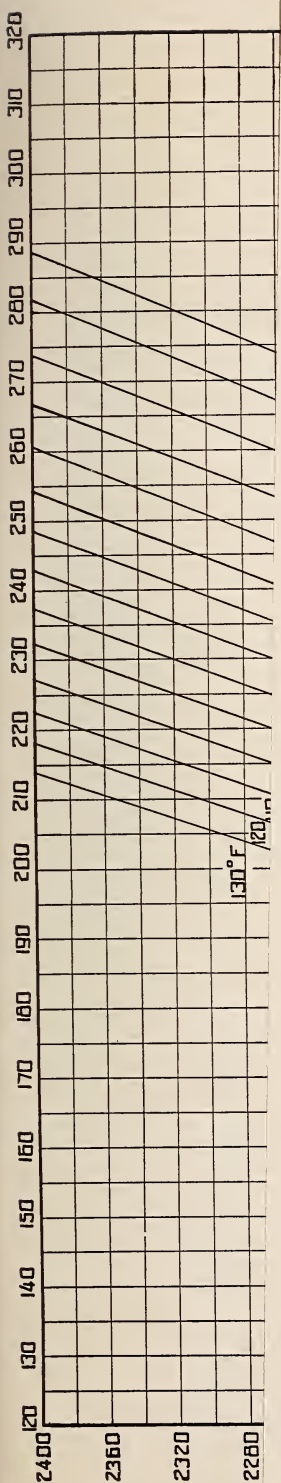


Fig. 13.—Volume of oxygen (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet



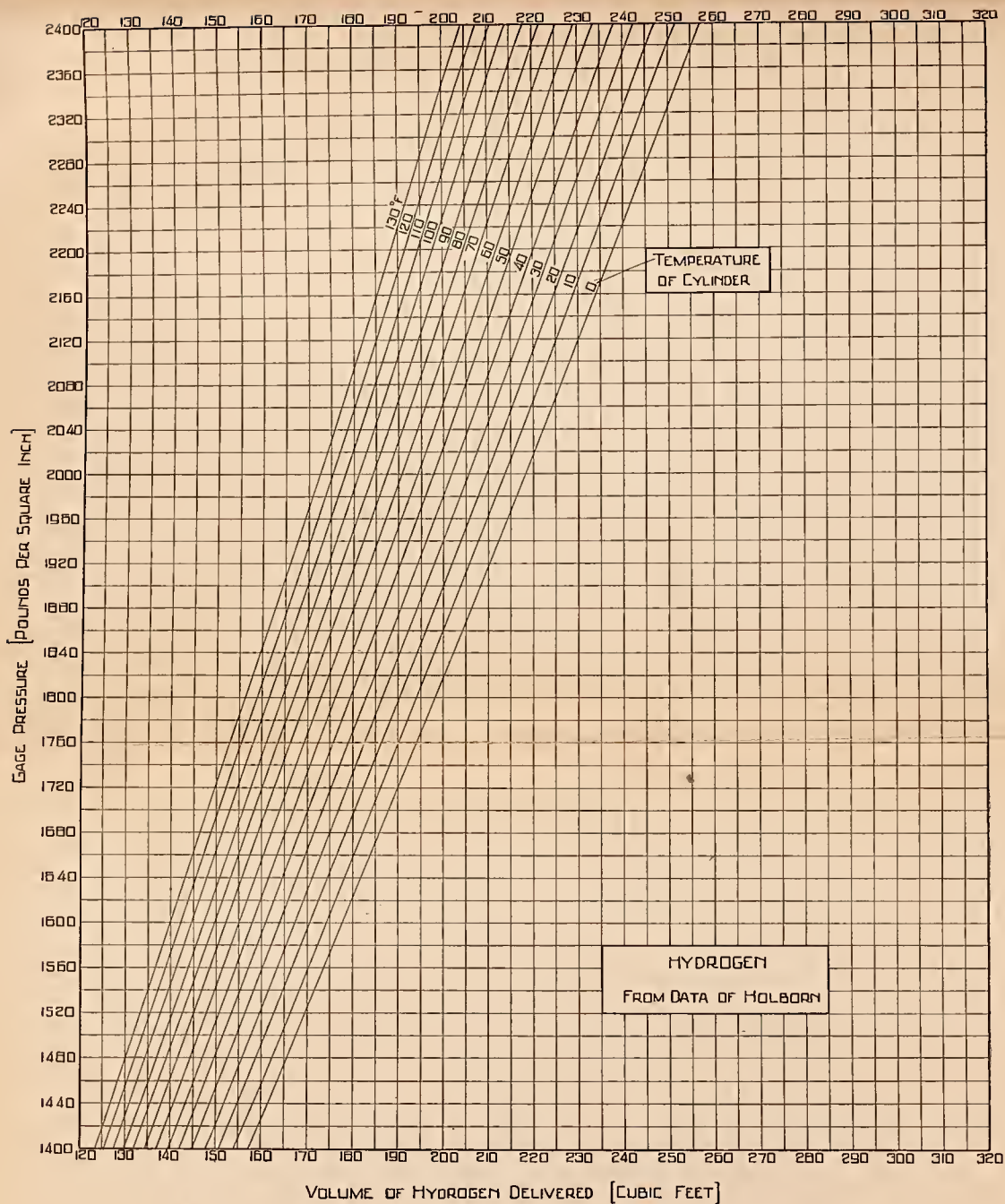


FIG. 11.—Volume of hydrogen (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet

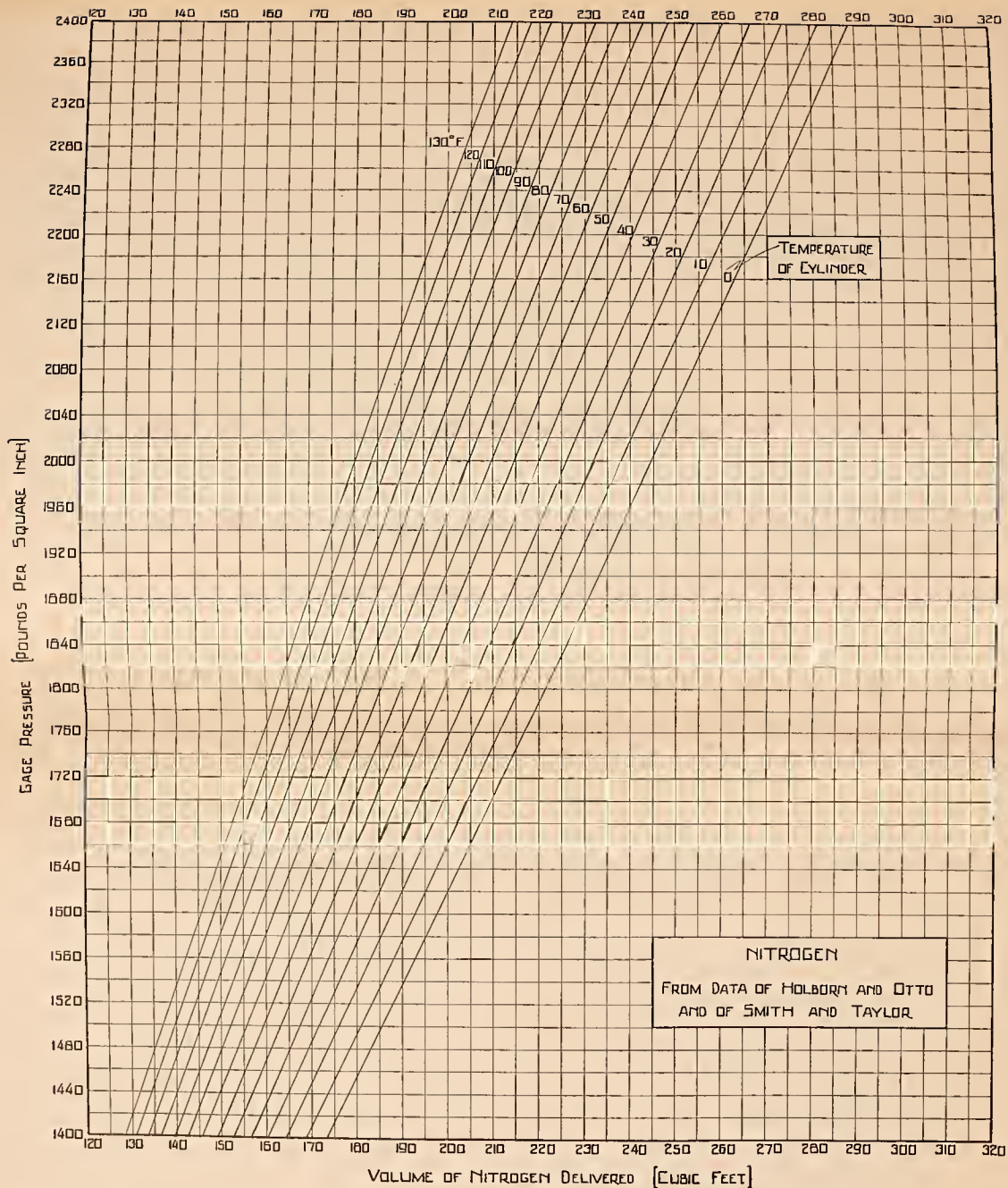
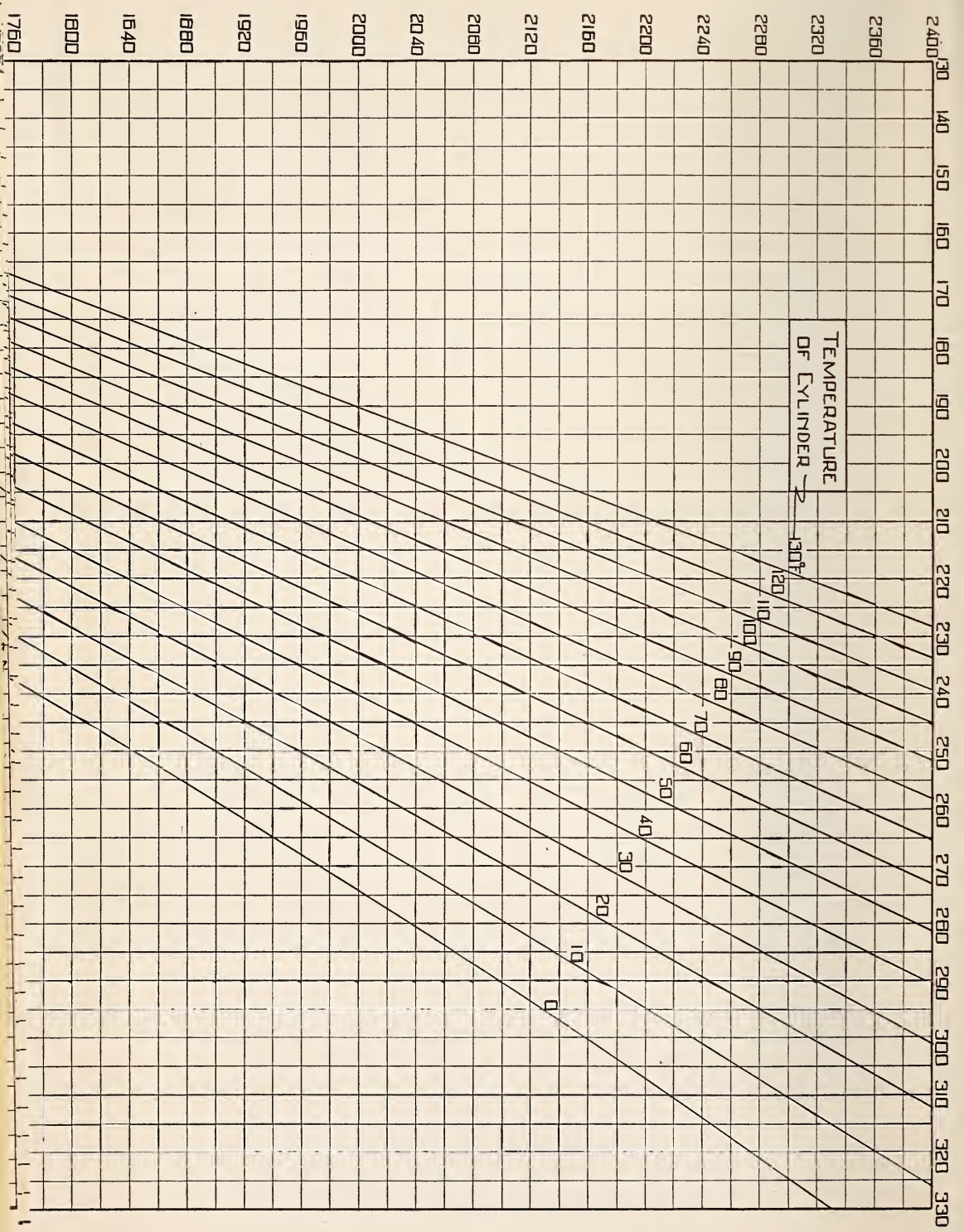


FIG. 12.—Volume of nitrogen (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet



PRESSURE [POUNDS PER SQUARE INCH]







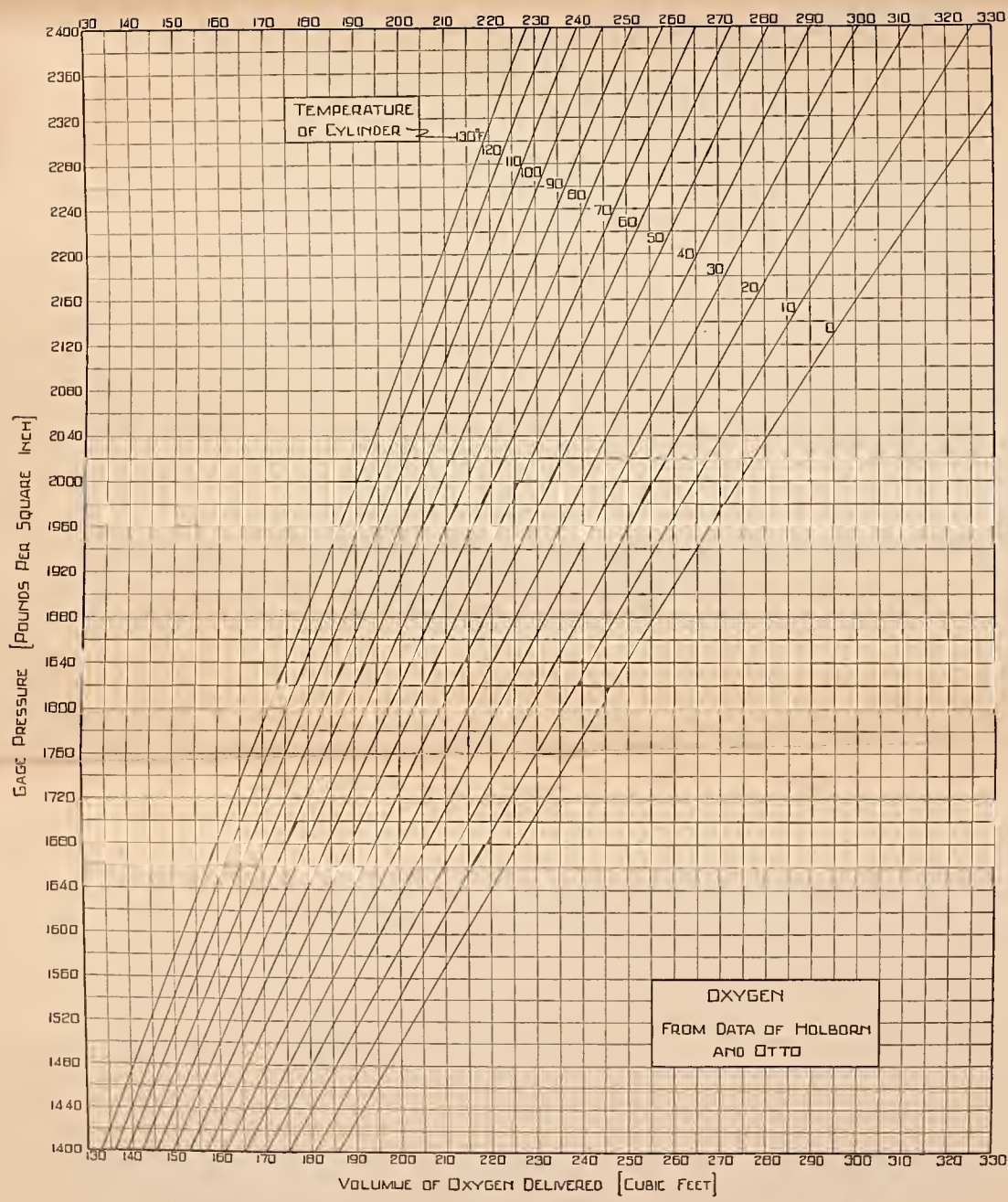


FIG. 13.—Volume of oxygen (measured at 1 atmosphere and 68° F.) delivered from a cylinder whose volume is 1.528 cubic feet

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