solutely by loading the disk with weights, it is more convenient to check it against a McLeod gage using air in the apparatus. The calibration curve is shown in Fig. 2. The curve is nearly linear but there are several effects which might cause a slight curvature.

For use at higher temperatures a furnace is placed around the tube in the neighborhood of D. For some purposes it may be desirable to interchange the connections to pressure and vacuum and invert the disk D and its seat.

The "zero point" of the apparatus will change somewhat with temperature but it can always be checked against a vacuum. The manometer is, of course, not suitable for use where the escape of gas from the apparatus must be avoided.

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[CONTRIBUTION FROM THE FIXED NITROGEN RESEARCH LABORATORY OF THE UNITED STATES BUREAU OF SOILS]

THE COMPRESSIBILITY ISOTHERMS OF HYDROGEN, NITROGEN AND MIXTURES OF THESE GASES AT 0° AND PRESSURES TO 1000 ATMOSPHERES. A CORRECTION

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RECEIVED JUNE 17, 1927 PUBLISHED AUGUST 5, 1927

A gage of the dead-weight type was used in the determination of the pressures recorded in a recent publication[1] concerning the compressibility of hydrogen, nitrogen and their mixtures.

An accurate calibration of the gage, made possible through recent acquisition of new equipment, shows that it was correct to within 0.1% at pressures to 100 atmospheres. At pressures of 200 atmospheres and above, an unsuspected error has been introduced, through the use of an incorrect ratio for the multiplying power of a lever attached to the gage only at these higher pressures. The maximum error in published results is 0.62% at 200 atmospheres, and becomes less at higher pressures.

The corrected results follow. The table number refers to the corresponding table in the original paper.

At pressures to 100 atmospheres the corrected results agree with those of Holborn and Verschoyle to within a maximum difference of 0.26% in the case of pure hydrogen and within 0.11% in the case of pure nitrogen. At 200 atmospheres the agreement with Amagat's results is almost exact. The maximum deviation from Amagat's results above 200 atmospheres is 0.34%. Corrected results for the three gas mixtures agree with those of Verschoyle at pressures to 100 atmospheres to within 0.10%. At 200 atmospheres the later results are larger by a maximum of 0.4%.

[1] Bartlett, THIS JOURNAL, **49**, 687 (1927).

CORRECTED COMPRESSIBILITY FACTORS, pv/p_0v_0, FOR HYDROGEN, NITROGEN, AND FOR MIXTURES OF HYDROGEN AND NITROGEN AT 0.0°

At 0° and 1 atm., $p_0v_0 = 1$

Press. atm.	TABLE III Hydrogen Bartlett	Nitrogen Bartlett	TABLE V 25:75 $H_2:N_2$ Bartlett	50:50 $H_2:N_2$ Bartlett	75:25 $H_2:N_2$ Bartlett
50	1.0337	0.9846	1.0036	1.0185	1.0266
100	1.0665	0.9846	1.0185	1.0426	1.0575
200	1.1383	1.0392	1.0784	1.1107	1.1283
300	1.2099	1.1380	1.1668	1.1938	1.2036
400	1.2827	1.2589	1.2712	1.2877	1.2896
600	1.4267	1.5253	1.5026	1.4849	1.4602
800	1.5723	1.8021	1.7400	1.6897	1.6335
1000	1.7148	2.0694	1.9707	1.8948	1.8053

TABLE IV

CORRECTED, OBSERVED (o) AND CALCULATED (c) COMPRESSIBILITY FACTORS (pv/p_0v_0) AND OBSERVED DENSITY (d) FOR HYDROGEN, NITROGEN AND THEIR MIXTURES

At 0° and 1 atm., $p_0v_0 = 1$ Density expressed in g. per liter

Press. atm.	H_2, % / N_2 %	100 / 0	88.5 / 11.5	75.4 / 24.6	55.1 / 44.9	45.9 / 54.1	34.1 / 65.9	26.0 / 74.0	13.7 / 86.3	6.1 / 93.9	0 / 100
1	o	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	c	....	....	....	....	....	....	....	....	....	....
	d	0.0898	0.2233	0.3754	0.6110	0.7179	0.8548	0.9489	1.0917	1.1799	1.2507
50	o	1.0337	1.0318	1.0270	1.0199	1.0174	1.0101	1.0051	0.9958	0.9905	0.9846
	c	1.0336	1.0316	1.0276	1.0195	1.0161	1.0099	1.0048	0.9959	0.9896	0.9840
	d	4.3436	10.820	18.276	29.953	35.281	42.312	42.204	54.815	59.560	63.513
100	o	1.0665	1.0621	1.0580	1.0459	1.0398	1.0280	1.0201	1.0042	0.9948	0.9846
	c	1.0681	1.0638	1.0585	1.0466	1.0396	1.0290	1.0207	1.0061	0.9956	0.9867
	d	8.4200	21.024	35.482	58.418	69.042	83.151	93.020	108.71	118.60	127.03
200	o	1.1383	1.1295[a]	1.1286	1.1162	1.1053	1.0928	1.0801	1.0619	1.0505	1.0392
	c	1.1390	1.1336	1.1280	1.1135	1.1045	1.0911	1.0804	1.0621	1.0495	1.0388
	d	15.777	39.539	66.524	109.47	129.90	156.44	175.70	205.61	224.63	240.70
300	o	1.2099	1.2072	1.2037	1.1990	1.1870	1.1760	1.1682	1.1546	1.1456	1.1380
	c	1.2137	1.2074	1.2059	1.1951	1.1879	1.1770	1.1684	1.1543	1.1448	1.1369
	d	22.266	55.492	93.561	152.87	181.44	218.06	243.68	283.65	308.98	329.71
400	o	1.2827	1.2842	1.2892	1.2898	1.2845	1.2755	1.2720	1.2659	1.2645	1.2589
	c	1.2839	1.2853	1.2869	1.2869	1.2822	1.2761	1.2719	1.2656	1.2616	1.2585
	d	28.003	69.553	116.47	189.49	223.56	268.07	298.40	344.96	373.24	397.39
600	o	1.4267	1.4422	1.4597	1.4810	1.4855	1.4951	1.5029	1.5149	1.5228	1.5253
	c	1.4281	1.4420	1.4585	1.4829	1.4890	1.4976	1.5042	1.5153	1.5227	1.5291
	d	37.765	92.899	154.31	247.53	289.96	343.04	378.82	432.38	464.89	491.98
800	o	1.5723	1.5975	1.6325	1.6804	1.6925	1.7198	1.7365	1.7671	1.7831	1.8021
	c	1.5723	1.5987	1.6301	1.6789	1.6958	1.7191	1.7365	1.7650	1.7838	1.7997
	d	45.691	111.82	183.96	290.88	339.33	397.62	437.16	494.23	529.37	555.21
1000	o	1.7148	1.7551	1.8037	1.8776	1.9039	1.9386	1.9667	2.0193	2.0436	2.0694
	c	1.7165	1.7554	1.8017	1.8749	1.9026	1.9406	1.9688	2.0147	2.0449	2.0703
	d	52.367	127.23	208.12	325.41	377.06	440.93	482.48	540.63	577.36	604.37

[a] This result appears to be about 0.5% low. No adequate explanation can be given. It was the average result of five independent, closely checking experiments.

The magnitude of the corrections precludes the necessity of resubmitting graphical representation of the results shown in Figs. 1 to 3. Corrected values for the constants in the equations of state follow.

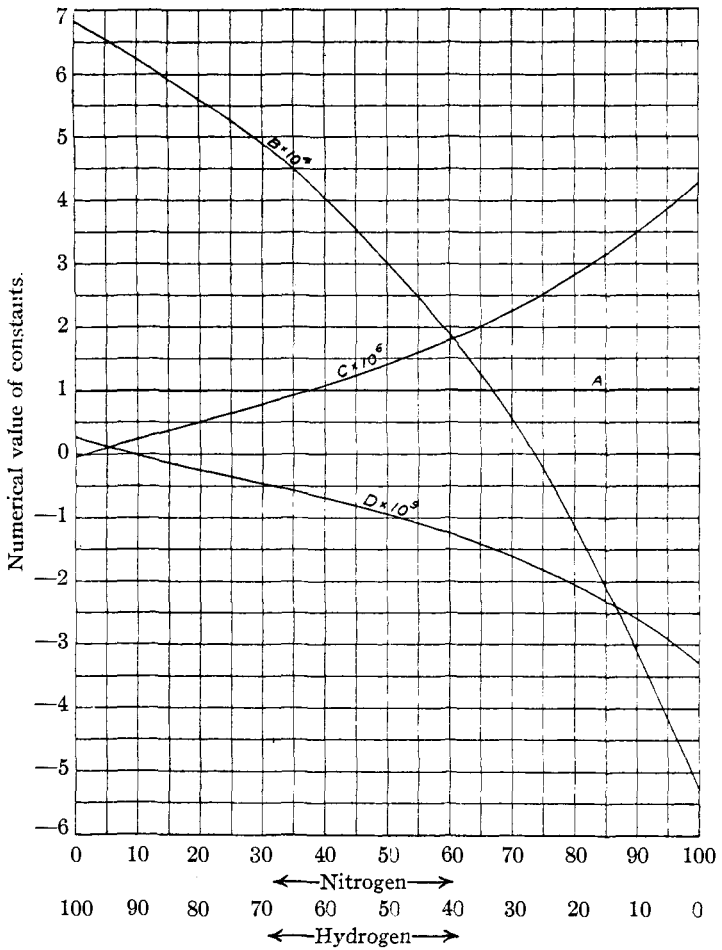

Fig. 4.—Numerical values of constants for use in calculation of compressibility factors of nitrogen, hydrogen and their mixtures to 400 atmospheres' pressure at 0°; $pv/p_0v_0 = A + Bp + Cp^2 + Dp^3$.

TABLE VI

VALUES OF CONSTANTS IN EQUATION OF TYPE 7 FROM OBSERVED DATA

Constant	*a*	*b*	*c*	*d*
B	6.810×10^{-4}	-5.245×10^{-6}	-2.508×10^{-8}	-4.371×10^{-10}
C	-3.487×10^{-8}	$+2.914 \times 10^{-8}$	-1.488×10^{-10}	$+2.885 \times 10^{-12}$
D	2.564×10^{-10}	-3.072×10^{-11}	$+3.086 \times 10^{-13}$	-3.562×10^{-15}

Equation 9 $A = 1.2839 + (1.2084 \times 10^{-4})x$

Equation 10 $B = (7.211 \times 10^{-4}) + (5.322 \times 10^{-6})x + (1.0562 \times 10^{-8})x^2$

Equation 11 $A = 1.2585 + (5.155 \times 10^{-4})\ (100-x)$

Equation 12 $1/B = (1.3128 \times 10^{3}) - (7.153)x + (1.416 \times 10^{-2})x^2$

WASHINGTON, D. C.