

tures, an electromotive force will be set up between these junctions. Its amount will depend on the composition of the wires and the difference in temperature. When one junction is held at a constant temperature, the electromotive force will be dependent on the temperature of the other junction, and if a delicate galvanometer of high resistance be connected to the *thermocouple*, as it is called, the deflection of the needle will indicate the temperature of this other junction. Instruments for the measurement of high temperatures are calibrated with the aid of the known melting points of pure metals.

TABLE 4 PROPERTIES OF SATURATED STEAM^a (Continued)

ABSOLUTE PRESSURE, LB. PER SQ. IN.	TEM- PERATURE, DEG. FAHR.	VOLUME, CU. FT. PER LB.	WRIGHT, LB. PER CU. FT.	HEAT CONTENT IN B.T.U.		LATENT HEAT IN B.T.U.		ENTROPY		
				of Liquid	of Vapor	of Vapor- ization	In- ternal	of Liquid	of Vapor- ization	of Vapor
<i>p</i>	<i>t</i>	<i>v_{lg}</i>	$\frac{1}{v_{lg}}$	<i>h_f</i>	<i>h_g</i>	<i>h_{fg}</i>	<i>u</i>	<i>S_f</i>	<i>S_{fg}</i>	<i>S_g</i>
120	341.3	3.735	0.2678	311.9	1191.4	879.5	796.9	0.4911	1.0982	1.5893
122	342.5	3.676	0.2720	313.2	1191.6	878.5	795.8	0.4927	1.0952	1.5879
124	343.7	3.620	0.2762	314.4	1191.9	877.5	794.8	0.4943	1.0922	1.5865
126	345.0	3.566	0.2805	315.7	1192.1	876.4	793.7	0.4958	1.0894	1.5852
128	346.2	3.513	0.2847	316.9	1192.4	875.4	792.6	0.4974	1.0865	1.5838
130	347.4	3.461	0.2889	318.2	1192.6	874.4	791.6	0.4989	1.0836	1.5825
132	348.5	3.412	0.2931	319.4	1192.9	873.5	790.5	0.5004	1.0808	1.5812
134	349.7	3.363	0.2973	320.6	1193.1	872.5	789.5	0.5019	1.0781	1.5800
136	350.8	3.316	0.3016	321.8	1193.3	871.5	788.5	0.5033	1.0754	1.5787
138	352.0	3.270	0.3058	323.0	1193.5	870.5	787.4	0.5048	1.0727	1.5775
140	353.1	3.226	0.3100	324.2	1193.7	869.6	786.4	0.5062	1.0700	1.5762
142	354.2	3.182	0.3142	325.3	1193.9	868.6	785.4	0.5076	1.0674	1.5750
144	355.3	3.140	0.3184	326.5	1194.1	867.7	784.5	0.5090	1.0648	1.5738
146	356.3	3.099	0.3227	327.6	1194.3	866.8	783.5	0.5104	1.0623	1.5727
148	357.4	3.059	0.3269	328.7	1194.5	865.8	782.5	0.5117	1.0598	1.5715
150	358.5	3.020	0.3311	329.8	1194.7	864.9	781.6	0.5131	1.0573	1.5704
152	359.5	2.982	0.3353	330.9	1194.9	864.0	780.6	0.5144	1.0548	1.5692
154	360.5	2.945	0.3396	332.0	1195.1	863.1	779.7	0.5157	1.0524	1.5681
156	361.6	2.909	0.3438	333.1	1195.3	862.3	778.7	0.5170	1.0500	1.5670
158	362.6	2.874	0.3480	334.1	1195.5	861.4	777.8	0.5183	1.0476	1.5659
160	363.6	2.839	0.3522	335.2	1195.7	860.5	776.9	0.5196	1.0453	1.5649
162	364.6	2.806	0.3564	336.2	1195.8	859.6	776.0	0.5209	1.0429	1.5638
164	365.6	2.773	0.3606	337.3	1196.0	858.7	775.1	0.5221	1.0406	1.5627
166	366.5	2.741	0.3648	338.3	1196.2	857.9	774.2	0.5233	1.0384	1.5617
168	367.5	2.710	0.3691	339.3	1196.3	857.0	773.3	0.5245	1.0361	1.5607
170	368.5	2.679	0.3733	340.3	1196.5	856.2	772.4	0.5258	1.0339	1.5597
172	369.4	2.649	0.3775	341.3	1196.6	855.3	771.5	0.5270	1.0317	1.5587
174	370.4	2.620	0.3817	342.3	1196.8	854.5	770.6	0.5281	1.0295	1.5577
176	371.3	2.591	0.3859	343.3	1196.9	853.6	769.8	0.5293	1.0274	1.5567
178	372.2	2.563	0.3901	344.3	1197.1	852.8	768.9	0.5305	1.0252	1.5557
180	373.1	2.536	0.3943	345.2	1197.2	852.0	768.0	0.5316	1.0231	1.5547
182	374.0	2.509	0.3985	346.2	1197.4	851.2	767.2	0.5328	1.0210	1.5538
184	374.9	2.483	0.4027	347.1	1197.5	850.4	766.4	0.5339	1.0189	1.5528
186	375.8	2.457	0.4069	348.0	1197.6	849.5	765.5	0.5350	1.0169	1.5519
188	376.7	2.432	0.4111	349.0	1197.8	848.7	764.7	0.5361	1.0148	1.5509
190	377.6	2.408	0.4154	350.0	1197.9	847.9	763.9	0.5372	1.0128	1.5500
192	378.5	2.383	0.4196	350.9	1198.0	847.1	763.0	0.5383	1.0108	1.5491
194	379.3	2.360	0.4238	351.8	1198.1	846.3	762.2	0.5394	1.0089	1.5482
196	380.2	2.337	0.4280	352.7	1198.2	845.6	761.4	0.5404	1.0069	1.5473
198	381.0	2.314	0.4322	353.6	1198.4	844.8	760.6	0.5415	1.0049	1.5464
200	381.9	2.292	0.4364	354.5	1198.5	844.0	759.8	0.5426	1.0030	1.5456
202	382.7	2.270	0.4406	355.4	1198.6	843.2	759.0	0.5436	1.0011	1.5447
204	383.5	2.248	0.4448	356.2	1198.7	842.5	758.2	0.5446	0.9992	1.5438
206	384.4	2.227	0.4490	357.1	1198.8	841.7	757.4	0.5457	0.9973	1.5430
208	385.2	2.206	0.4532	358.0	1198.9	840.9	756.7	0.5467	0.9954	1.5421
210	386.0	2.186	0.457	358.8	1199.0	840.2	755.9	0.5477	0.9936	1.5413
212	386.8	2.166	0.462	359.7	1199.1	839.4	755.1	0.5487	0.9918	1.5405
214	387.6	2.147	0.466	360.5	1199.2	838.7	754.3	0.5497	0.9900	1.5396
216	388.4	2.128	0.470	361.4	1199.3	837.9	753.6	0.5507	0.9881	1.5388
218	389.2	2.109	0.474	362.2	1199.4	837.2	752.8	0.5516	0.9864	1.5380
220	390.0	2.090	0.478	363.0	1199.5	836.5	752.1	0.5526	0.9846	1.5372

^aThis table is abstracted by permission from *Properties of Steam and Ammonia*, by the late Prof. G. A. Goodenough.

In the measuring of room temperatures care must be exercised to prevent the results from being affected by the body heat of the observer, by drafts from doors, windows and other openings or by radiant heat from some local source such as a radiator, wall, etc. All thermometers should be mercury thermometers with engraved stems. The total graduations of the thermometers should be from 20 to 120 F, in one degree graduations. No ten degrees should occupy a space of less than one-half inch. The accuracy throughout the whole scale must be within one-half degree. The operator should take hold of the top and no part of the body, including the hand, should be nearer than 10 in. to the bulb. The thermometer should not be closer than 5 ft to any door, window, or other opening; should not be closer than 12 in. to any wall; and should be between 3 and 5 ft from the floor. A sling instrument should be used for extreme accuracy.

For measuring duct temperatures an angle-duct thermometer should be used, having a flange to bolt on the side of the duct, with the bulb extending into the duct at least 6 in.

Recording thermometers generally have considerable lag and should not be used for the taking of temperatures for testing, but rather for giving continuous records of the operation of the plant, as the charts will indicate any lack of attention on the part of those responsible for the operation of the plant.

Humidity

The sling psychrometer is the recognized standard instrument for determining humidities. In order to obtain accurate readings considerable skill is required on the part of the operator. The wicking must be clean, distilled water should be used, and the temperature of the water should be slightly above the wet-bulb temperature of the surrounding air.

The psychrometer should be swung rapidly and two or three observations should be made to see that the wet-bulb temperature has become stationary before the final reading is noted. Standard psychrometric tables should be used.

In taking humidity readings in ducts it is usually impracticable to use a sling psychrometer. For this work the stationary hygrodeik arranged for bolting on to the side of the duct, with two bulbs extending into the duct, will be found very convenient. Due to the velocity of the air passing over the bulbs within the duct an accurate reading will be secured, corresponding to that given by the sling psychrometer.

CO₂ Determinations

At ordinary concentrations carbon dioxide is not harmful. The amount of carbon dioxide in the air is a convenient index of the rate of air supply, and of the distribution of the air within large rooms. A high carbon dioxide concentration in parts of an occupied room may indicate air stagnation which can result in objectionable odors or in failure to remove local surplus heat.

The Petterson-Palmquist apparatus has been generally accepted as the standard device for the determination of carbon dioxide in air investigations. The principle involved is the measurement of a given volume of