

is divided into a number of equal portions, each of which is called a degree. In the Fahrenheit scale, there are 180 degrees thus obtained, while the centigrade scale has 100 and the Reaumur has 80. Like divisions are marked off on the column above and below these two determined points in order that a greater range of temperature may be read.

For temperatures above 500 F various types of *pyrometers* are employed. The *mercurial pyrometer* is a thermometer with an inert gas, such as

TABLE 3. THERMAL PROPERTIES OF WATER^a

TEMP., ° F	SAT. PRESSURE, LB. PER SQ. IN.	VOLUME, CU. FT. PER LB.	WEIGHT, LB. PER CU. FT.	SPECIFIC HEAT	TEMP., ° F	SAT. PRESSURE, LB. PER SQ. IN.	VOLUME, CU. FT. PER LB.	WEIGHT, LB. PER CU. FT.	SPECIFIC HEAT
20	0.050	0.01603	62.37	1.0210	370	173.2	0.01829	54.66	1.053
30	0.081	0.01602	62.42	1.0104	380	195.6	0.01843	54.25	1.057
40	0.122	0.01602	62.43	1.0048	390	220.1	0.01857	53.84	1.062
50	0.178	0.01602	62.42	1.0015	400	247	0.0187	53.42	1.067
60	0.256	0.01603	62.37	0.9995	410	276	0.0189	52.99	1.072
70	0.363	0.01605	62.30	0.9982	420	308	0.0190	52.55	1.078
80	0.507	0.01607	62.22	0.9975	430	343	0.0192	52.11	1.083
90	0.698	0.01610	62.11	0.9971	440	381	0.0194	51.66	1.089
100	0.949	0.01613	62.00	0.9970	450	422	0.0195	51.2	1.095
110	1.274	0.01616	61.86	0.9971	460	466	0.0197	50.7	1.101
120	1.692	0.01620	61.71	0.9974	470	514	0.0199	50.2	1.107
130	2.221	0.01625	61.55	0.9978	480	565	0.0201	49.7	1.114
140	2.887	0.01629	61.38	0.9984	490	620	0.0203	49.2	1.121
150	3.716	0.01634	61.20	0.9990	500	679	0.0205	48.7	1.130
160	4.739	0.01639	61.00	0.9998	510	743	0.0208	48.2	1.140
170	5.99	0.01645	60.80	1.0007	520	810	0.0210	47.6	1.151
180	7.51	0.01651	60.58	1.0017	530	883	0.0212	47.1	1.164
190	9.34	0.01657	60.36	1.0028	540	960	0.0215	46.5	1.181
200	11.53	0.01663	60.12	1.0039	550	1043	0.0218	45.9	1.200
210	14.12	0.01670	59.88	1.0052	560	1131	0.0221	45.2	1.222
220	17.19	0.01677	59.63	1.0068	570	1224	0.0224	44.6	1.249
230	20.78	0.01684	59.37	1.0085	580	1323	0.0227	44.0	1.281
240	24.97	0.01692	59.11	1.0104	590	1429	0.0231	43.3	1.318
250	29.83	0.01700	58.83	1.0125	600	1540	0.0235	42.6	1.362
260	35.44	0.01708	58.55	1.0148	610	1659	0.024	41.8	1.415
270	41.87	0.01716	58.26	1.0173	620	1784	0.024	41.0	1.479
280	49.22	0.01725	57.96	1.020	630	1917	0.025	40.2	1.559
290	57.57	0.01735	57.65	1.023	640	2057	0.025	39.2	1.661
300	67.02	0.01745	57.32	1.026	650	2205	0.026	38.2	1.793
310	77.68	0.01755	56.98	1.029	660	2361	0.027	37.2	---
320	89.65	0.01766	56.62	1.033	670	2526	0.028	36.0	---
330	103.0	0.01778	56.24	1.036	680	2699	0.029	34.5	---
340	118.0	0.01790	55.85	1.040	690	2882	0.031	32.6	---
350	134.6	0.01803	55.46	1.044	700	3075	0.034	29.7	---
360	153.0	0.01816	55.06	1.048	706.3	3200	0.048	20.9	---

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nitrogen or carbon dioxide, above the mercury column to prevent the mercury from boiling. The *expansion pyrometer* is based on the difference in expansion of two substances under the same heat conditions. It can be used for temperatures up to 1500 F. It is commonly made of a brass rod enclosed in an iron pipe, with one end of the rod attached to a cap at the end of the pipe and the other connected by a multiplying gear to a pointer moving around a graduated dial.

Thermo-electric pyrometers may be used to measure temperatures up to 2900 F and are based on the principle that when wires of two different metals are joined with two junctions which are held at different tempera-

TABLE 4. PROPERTIES OF SATURATED STEAM^a

ABSOLUTE PRESSURE, LB. PER SQ. IN.	TEMP- ERATURE, DEG. FAHR.	VOLUME, CU. FT. PER LB.	WEIGHT, 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_{fg}</i>	$\frac{1}{v_{fg}}$	<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>
1	101.76	333.3	0.00300	69.76	1105.4	1035.6	973.9	0.1327	1.8448	1.9775
2	126.10	173.6	0.00576	94.02	1116.2	1022.2	957.9	0.1750	1.7452	1.9203
3	141.49	118.7	0.00843	109.38	1122.9	1013.5	947.6	0.2009	1.6862	1.8871
4	152.99	90.6	0.01104	120.9	1127.9	1007.0	939.9	0.2199	1.6438	1.8637
5	162.25	73.5	0.01360	130.1	1131.7	1001.6	933.6	0.2348	1.6107	1.8456
6	170.07	62.0	0.01614	137.9	1135.0	997.1	928.2	0.2473	1.5835	1.8308
7	176.85	53.7	0.01864	144.7	1137.8	993.1	923.6	0.2581	1.5603	1.8184
8	182.87	47.35	0.02112	150.8	1140.3	989.5	919.4	0.2675	1.5402	1.8077
9	188.28	42.41	0.02358	156.2	1142.5	986.3	915.6	0.2759	1.5223	1.7982
10	193.21	38.43	0.02602	161.1	1144.4	983.3	912.2	0.2835	1.5062	1.7897
11	197.75	35.16	0.02844	165.7	1146.2	980.5	909.0	0.2905	1.4916	1.7821
12	201.96	32.41	0.03086	169.9	1147.9	978.0	906.0	0.2969	1.4783	1.7752
13	205.88	30.07	0.03326	173.8	1149.4	975.6	903.2	0.3028	1.4659	1.7687
14	209.56	28.06	0.03564	177.5	1150.8	973.3	900.6	0.3083	1.4545	1.7628
14.7	212.0	26.81	0.03730	180.0	1151.7	971.7	898.8	0.3120	1.4469	1.7589
16	216.3	24.76	0.04038	184.3	1153.4	969.1	895.8	0.3184	1.4337	1.7521
18	222.4	22.18	0.04508	190.5	1155.7	965.2	891.4	0.3274	1.4153	1.7427
20	228.0	20.10	0.04976	196.0	1157.7	961.7	887.3	0.3356	1.3987	1.7343
22	233.1	18.38	0.0544	201.2	1159.6	958.4	883.6	0.3430	1.3837	1.7267
24	237.8	16.95	0.0590	206.0	1161.3	955.3	880.1	0.3499	1.3698	1.7197
26	242.2	15.73	0.0636	210.4	1162.8	952.4	876.8	0.3563	1.3570	1.7133
28	246.4	14.67	0.0681	214.6	1164.3	949.7	873.7	0.3622	1.3452	1.7074
30	250.3	13.76	0.0727	218.6	1165.7	947.1	870.7	0.3679	1.3340	1.7019
32	254.0	12.95	0.0772	222.4	1166.9	944.6	867.9	0.3731	1.3236	1.6967
34	257.6	12.24	0.0818	225.9	1168.1	942.2	865.2	0.3781	1.3137	1.6918
36	260.9	11.60	0.0862	229.4	1169.2	939.9	862.7	0.3829	1.3044	1.6873
38	264.2	11.03	0.0907	232.6	1170.3	937.7	860.2	0.3874	1.2956	1.6830
40	267.2	10.51	0.0951	235.8	1171.3	935.5	857.8	0.3917	1.2871	1.6788
42	270.2	10.04	0.0996	238.8	1172.2	933.5	855.5	0.3958	1.2791	1.6749
44	273.0	9.61	0.1040	241.7	1173.2	931.5	853.3	0.3998	1.2714	1.6712
46	275.8	9.22	0.1085	244.5	1174.0	929.6	851.2	0.4036	1.2640	1.6676
48	278.4	8.86	0.1129	247.2	1174.8	927.7	849.1	0.4072	1.2570	1.6642
50	281.0	8.53	0.1173	249.8	1175.6	925.9	847.1	0.4108	1.2501	1.6609
52	283.5	8.22	0.1217	252.3	1176.4	924.1	845.1	0.4142	1.2436	1.6577
54	285.9	7.93	0.1261	254.7	1177.1	922.4	843.2	0.4174	1.2373	1.6547
56	288.2	7.67	0.1304	257.1	1177.8	920.7	841.4	0.4206	1.2311	1.6517
58	290.5	7.42	0.1348	259.5	1178.5	919.0	839.5	0.4237	1.2252	1.6489
60	292.7	7.18	0.1392	261.7	1179.1	917.4	837.8	0.4267	1.2195	1.6462
62	294.9	6.97	0.1435	263.9	1179.7	915.8	836.0	0.4296	1.2139	1.6435
64	296.9	6.76	0.1479	266.1	1180.3	914.3	834.3	0.4324	1.2085	1.6409
66	299.0	6.57	0.1522	268.2	1180.9	912.7	832.7	0.4352	1.2032	1.6384
68	301.0	6.39	0.1566	270.2	1181.5	911.2	831.1	0.4379	1.1981	1.6360
70	302.9	6.22	0.1609	272.2	1182.0	909.8	829.5	0.4405	1.1931	1.6336
72	304.8	6.05	0.1652	274.2	1182.5	908.3	827.9	0.4431	1.1883	1.6313
74	306.7	5.90	0.1695	276.1	1183.0	906.9	826.4	0.4456	1.1835	1.6291
76	308.5	5.75	0.1738	278.0	1183.5	905.5	824.9	0.4480	1.1789	1.6269
78	310.3	5.61	0.1781	279.8	1184.0	904.2	823.4	0.4504	1.1744	1.6248
80	312.0	5.48	0.1824	281.6	1184.4	902.8	821.9	0.4527	1.1700	1.6227
82	313.7	5.35	0.1868	283.4	1184.9	901.5	820.5	0.4550	1.1657	1.6207
84	315.4	5.23	0.1910	285.1	1185.3	900.2	819.1	0.4572	1.1615	1.6187
86	317.1	5.12	0.1953	286.8	1185.7	898.9	817.7	0.4594	1.1574	1.6168
88	318.7	5.01	0.1996	288.5	1186.1	897.7	816.3	0.4615	1.1534	1.6149
90	320.3	4.905	0.2039	290.1	1186.5	896.4	815.0	0.4636	1.1495	1.6131
92	321.8	4.805	0.2081	291.7	1186.9	895.2	813.7	0.4657	1.1456	1.6113
94	323.3	4.709	0.2124	293.3	1187.3	894.0	812.4	0.4677	1.1419	1.6096
96	324.8	4.617	0.2166	294.8	1187.7	892.8	811.1	0.4697	1.1381	1.6079
98	326.3	4.528	0.2209	296.4	1188.0	891.6	809.8	0.4717	1.1345	1.6062
100	327.8	4.442	0.2251	297.9	1188.4	890.5	808.6	0.4736	1.1309	1.6045
102	329.2	4.359	0.2294	299.4	1188.7	889.3	807.4	0.4755	1.1274	1.6028
104	330.7	4.279	0.2337	300.9	1189.0	888.2	806.1	0.4773	1.1239	1.6012
106	332.0	4.202	0.2380	302.3	1189.4	887.1	804.9	0.4791	1.1205	1.5996
108	333.4	4.128	0.2422	303.7	1189.7	885.9	803.8	0.4809	1.1172	1.5981
110	334.8	4.057	0.2465	305.1	1190.0	884.8	802.6	0.4827	1.1138	1.5965
112	336.1	3.988	0.2508	306.5	1190.3	883.7	801.4	0.4844	1.1106	1.5950
114	337.4	3.921	0.2550	307.9	1190.6	882.7	800.3	0.4861	1.1074	1.5935
116	338.7	3.857	0.2593	309.2	1190.8	881.6	799.2	0.4878	1.1043	1.5921
118	340.0	3.795	0.2635	310.6	1191.1	880.6	798.0	0.4895	1.1012	1.5907