SUPPLEMENTAL REPORT BY R. J. M'CLURG

I had a conversation with the engineer, Mr. McKee, and the fireman, Mr. Klinfihn, these men gave an account of their observation of the tornado.

Mr. Klinfihn observed the storm at a distance, but did not see the funnel cloud. At the time the train was struck, he was busy at his work firing and was completely unaware of the impending disaster.

Mr. McKee, the engineer, first noticed the storm a mile or so away in the southwest, but did not see a funnel at that time. The train was traveling toward the southeast. He had seen many worse looking storms and did not give it much attention at first. The storm did not seem to move at all for several minutes, then moved slowly toward the train until it was about one-half mile away. It was then he noticed the funnel cloud and saw it take the top off a straw stack. The twister then darted forward and before he realized it was coming it had struck the train at almost right angles.

Mr. McKee thought the full force of the storm struck the engine; but due to the immense weight of the engine and the round shape, the engine and loaded tender were left standing on the rails. The remainder of the train of 12 coaches was derailed. Mr. McKee's glasses were pulled from his face by a force that he described as "a suction at his body." The fact that the coupling between the engine and the mail car was unbroken and still closed and locked after the wreck indicates that the front end of the mail car was lifted directly upward, permitting the coupling to separate without breaking. All the 12 cars remained coupled to each other, but some of the couplings were badly twisted by the derailment. All but one of the cars fell on their sides. This one exception was a car caught between two coaches and could not fall over. On page 2 of my report of June 2, 1931, I stated that five coaches were lifted from the tracks and the other 8 were pulled from it. It should read "Five coaches were lifted from the tracks and the other 7 were pulled from the track."

The conductor stated that practically all of the windows of the coaches were closed because a light rain was falling; the car ventilators were open. The greater number of the windows were not broken by the sudden lessening of the outside pressure. They had to be broken by trainmen and others to let the imprisoned passengers escape.

The following is a list of the weights of the cars and engine:

	Tons		Tons
Engine	136	Diner	89
Tender, loaded	94	Pullman	64
Mail car	70	Do	64
Baggage car	72	Do	64
Smoking car	59	Do	64
Day coach	83	Do	61
Tourist	76	Club car	85

TABLE FOR FACILITATING COMPUTATION OF POTENTIAL TEMPERATURE

By J. C. BALLARD

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The following table of factors has been found to be very useful in the computation of potential temperatures. Where P = pressure in millibars, the table gives values $K=\left(\frac{1000}{P}\right)^{0.288}$ for intervals of one millibar from 1,049 to 40 millibars of pressure. For lower pressure the computation must be made by logarithms.

The factor $\left(\frac{1000}{P}\right)^{0.288}$ is the pressure factor in the formula

$$\Theta = T\left(\frac{1000}{P}\right)^{0.288}$$

Where θ = potential temperature in °A, T = actual temperature in °A and P = pressure in millibars. Hence, it is evident that the potential temperature is computed merely by multiplying the actual temperature in °A by the proper factor (K) found in the table.

Computations have been made for whole millibars, and where pressure is used to tenths of millibars, linear interpolation for tenths has been found to be sufficiently accurate for ordinary purposes. Several cases have been tested for error in the factor due to linear interpolation and in no case has an error as much as 0.0003 been found. An error of 0.0003 in the factor would never produce an error of more than 0.1° in potential temperature, or one well within the range of accuracy of the observed temperature and pressure. The accompanying graph (fig. 1) is the curve $Y=\left(\frac{1000}{P}\right)^{0.288}$. It is apparent that for low pressures where differences in the values of the function are relatively great for small differences in pressure, the error due to interpolating linearly between two pressures for intermediate values of the function would be relatively small.

If it is desired, tables of interpolated parts can be prepared which will assist somewhat in the interpolation.[1]

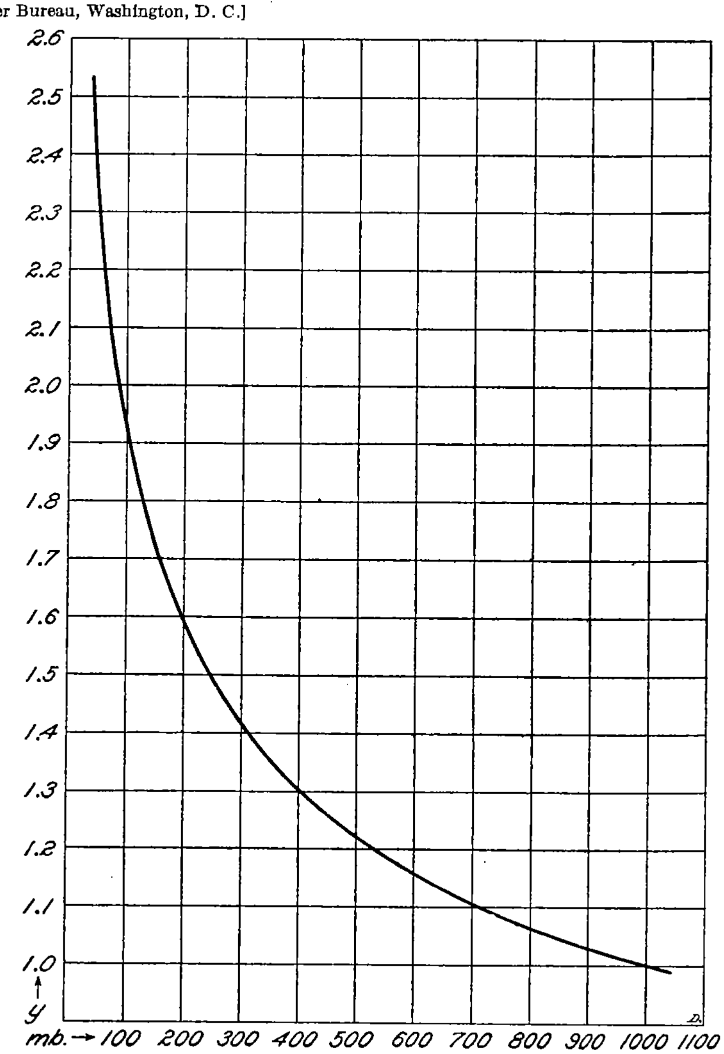

FIGURE 1.—Graph of the curve $Y=\left(\frac{1000}{P}\right)^{0.288}$

[1] Such tables are available in Publication No. 245 of the Carnegie Institution, 1918, by H. B. Hedrick.

For rapid and approximate computation of potential temperatures it may be found convenient to prepare a large graph similar to Figure 1, by which approximate values of the pressure factor can be easily obtained. The Adiabatic Chart gives potential temperatures directly for any given temperature and pressure within a limited range, and a proper extention of this chart would make it possible to read off potential temperatures for any given temperature and pressure with no computation whatever.

The paper Tables of the 0.288 th. powers by Dr. T. N. Doerr of Vienna, published in the Quarterly Journal of the Royal Meteorological Society, Vol. 47, 1921, pages 196–202, was used in the preparation of the accompanying table. The values were obtained by dividing $(1000)^{0.288}$ by $(P)^{0.288}$ where P varied from 50 to 1,049, inclusive. The values for pressures from 40 to 49 millibars, inclusive, were computed by logarithms.

Potential temperature factor (K) for various pressures in mb.

[Temperatures in absolute degrees multiplied by K=potential temperatures]

Mb.	0	1	2	3	4	5	6	7	8	9
40	2.5270	2.5091	2.4917	2,4749	2,4586	2.4428	2.4273	2.4124	2.3977	2.3834
50	2.3697	2.3562	2.3431	2.3303	2.3178	2.3056	2.2936	2.2820	2.2706	2.2594
60	2.2485	2.2378	2.2274	2.2171	2.2071	2.1973	2.1876	2.1782	2.1689	2.1598
70	2.1509	2.1421	2.1335	2.1250	2.1167	2.1086	2.1005	2.0926	2.0849	2.0772
80	2.0697	2.0623	2.0550	2.0479	2.0408	2.0339	2.0271	2.0203	2.0137	2.0071
90	2.0007	1.9943	1.9880	1.9819	1.9758	1.9698	1.9638	1.9580	1.9522	1.9465
100	1.9409	1.9354	1.9298	1.9244	1.9191	1.9138	1.9086	1.9034	1.8983	1.8933
110	1.8883	1.8834	1.8786	1.8738	1.8690	1.8643	1.8597	1.8551	1.8505	1.8460
120	1.8416	1.8372	1.8328	1.8285	1.8243	1.8201	1.8159	1.8118	1.8077	1.8036
130	1.7996	1.7956	1.7917	1.7878	1.7840	1.7802	1.7764	1.7726	1.7689	1.7652
140	1.7616	1.7580	1.7545	1.7509	1.7474	1.7439	1.7405	1.7370	1.7336	1.7303
150	1.7270	1.7237	1.7204	1.7171	1.7139	1.7107	1.7076	1.7044	1.7013	1.6982
160	1.6952	1.6921	1.6891	1.6861	1.6831	1.6802	1.6773	1.6744	1.6715	1.6686
170	1.6658	1.6630	1.6602	1.6574	1.6547	1.6520	1.6493	1.6466	1.6439	1.6412
180	1.6386	1.6360	1.6334	1.6308	1.6283	1.6257	1.6232	1.6207	1.6182	1.6157
190	1.6133	1.6109	1.6085	1.6061	1.6037	1.6013	1.5989	1.5966	1.5943	1.5919
200	1.5896	1.5874	1.5851	1.5829	1.5806	1.5784	1.5762	1.5740	1.5718	1.5696
210	1.5675	1.5653	1.5632	1.5611	1.5590	1.5569	1.5548	1.5527	1.5507	1.5487
220	1.5466	1.5446	1.5426	1.5406	1.5386	1.5367	1.5347	1.5327	1.5307	1.5288
230	1.5269	1.5250	1.5231	1.5212	1.5194	1.5175	1.5157	1.5138	1.5120	1.5102
240	1.5083	1.5065	1.5047	1.5029	1.5012	1.4994	1.4977	1.4959	1.4942	1.4924
250	1.4907	1.4890	1.4873	1.4856	1.4839	1.4822	1.4805	1.4789	1.4773	1.4756
260	1.4740	1.4724	1.4707	1.4691	1.4675	1.4659	1.4643	1.4627	1.4612	1.4596
270	1.4580	1.4564	1.4549	1.4534	1.4519	1.4504	1.4488	1.4473	1.4458	1.4443
280	1.4428	1.4414	1.4399	1.4384	1.4369	1.4355	1.4340	1.4326	1.4312	1.4298
290	1.4283	1.4269	1.4255	1.4241	1.4227	1.4213	1.4199	1.4186	1.4172	1.4158
300	1.4144	1.4130	1.4117	1.4104	1.4091	1.4077	1.4064	1.4051	1.4038	1.4025
310	1.4012	1.3999	1.3986	1.3973	1.3960	1.3947	1.3934	1.3921	1.3909	1.3897
320	1.3884	1.3871	1.3859	1.3847	1.3835	1.3822	1.3810	1.3798	1.3786	1.3774
330	1.3762	1.3750	1.3738	1.3726	1.3714	1.3702	1.3690	1.3678	1.3667	1.3655
340	1.3644	1.3632	1.3621	1.3609	1.3598	1.3586	1.3575	1.3564	1.3553	1.3541
350	1.3530	1.3519	1.3508	1.3497	1.3486	1.3475	1.3464	1.3453	1.3443	1.3432
360	1.3421	1.3410	1.3400	1.3389	1.3378	1.3367	1.3357	1.3346	1.3336	1.3325
370	1.3315	1.3305	1.3295	1.3284	1.3274	1.3264	1.3254	1.3244	1.3234	1.3224
380	1.3214	1.3204	1.3194	1.3184	1.3174	1.3164	1.3154	1.3144	1.3135	1.3125
390	1.3115	1.3105	1.3096	1.3086	1.3077	1.3067	1.3058	1.3048	1.3039	1.3029
400	1.3020	1.3010	1.3001	1.2992	1.2983	1.2973	1.2964	1.2955	1.2946	1.2937
410	1.2928	1.2919	1.2909	1.2900	1.2892	1.2883	1.2874	1.2865	1.2856	1.2847
420	1.2838	1.2829	1.2821	1.2812	1.2803	1.2794	1.2786	1.2777	1.2769	1.2760
430	1.2751	1.2743	1.2735	1.2726	1.2717	1.2709	1.2701	1.2692	1.2684	1.2675
440	1.2667	1.2659	1.2651	1.2642	1.2634	1.2626	1.2618	1.2610	1.2602	1.2594
450	1.2586	1.2578	1.2570	1.2562	1.2554	1.2546	1.2538	1.2530	1.2522	1.2514
460	1.2506	1.2498	1.2491	1.2483	1.2475	1.2467	1.2460	1.2452	1.2444	1.2436
470	1.2429	1.2421	1.2414	1.2406	1.2399	1.2391	1.2384	1.2376	1.2369	1.2361
480	1.2354	1.2346	1.2339	1.2331	1.2324	1.2317	1.2310	1.2302	1.2295	1.2288
490	1.2281	1.2273	1.2266	1.2259	1.2252	1.2245	1.2238	1.2231	1.2224	1.2216
500	1.2209	1.2202	1.2195	1.2188	1.2181	1.2174	1.2168	1.2161	1.2154	1.2147
510	1.2140	1.2133	1.2127	1.2120	1.2113	1.2106	1.2099	1.2093	1.2086	1.2079
520	1.2072	1.2066	1.2059	1.2052	1.2045	1.2039	1.2032	1.2026	1.2019	1.2013
530	1.2006	1.2000	1.1993	1.1987	1.1980	1.1974	1.1967	1.1961	1.1955	1.1948
540	1.1942	1.1935	1.1929	1.1923	1.1917	1.1910	1.1904	1.1898	1.1891	1.1885
550	1.1879	1.1872	1.1866	1.1860	1.1854	1.1848	1.1842	1.1836	1.1830	1.1823
560	1.1817	1.1811	1.1805	1.1799	1.1793	1.1787	1.1781	1.1775	1.1769	1.1763
570	1.1757	1.1751	1.1745	1.1739	1.1734	1.1728	1.1722	1.1716	1.1710	1.1704
580	1.1699	1.1693	1.1687	1.1681	1.1675	1.1669	1.1664	1.1658	1.1653	1.1647
590	1.1641	1.1635	1.1630	1.1624	1.1618	1.1613	1.1607	1.1602	1.1596	1.1591

Potential temperature factor (K) for various pressures in mb.—Contd.

Mb.	0	1	2	3	4	5	6	7	8	9
600	1.1585	1.1579	1.1574	1.1568	1.1563	1.1557	1.1552	1.1546	1.1541	1.1535
610	1.1530	1.1524	1.1519	1.1513	1.1508	1.1502	1.1497	1.1492	1.1487	1.1482
620	1.1476	1.1471	1.1465	1.1460	1.1455	1.1449	1.1444	1.1439	1.1434	1.1428
630	1.1423	1.1418	1.1413	1.1408	1.1403	1.1398	1.1393	1.1387	1.1382	1.1377
640	1.1372	1.1366	1.1361	1.1356	1.1351	1.1346	1.1341	1.1336	1.1331	1.1326
650	1.1321	1.1316	1.1311	1.1306	1.1301	1.1296	1.1291	1.1286	1.1281	1.1276
660	1.1271	1.1266	1.1261	1.1256	1.1252	1.1247	1.1242	1.1237	1.1232	1.1228
670	1.1223	1.1218	1.1213	1.1208	1.1203	1.1198	1.1194	1.1189	1.1184	1.1180
680	1.1175	1.1170	1.1165	1.1160	1.1156	1.1151	1.1146	1.1142	1.1137	1.1133
690	1.1128	1.1123	1.1118	1.1114	1.1109	1.1105	1.1100	1.1096	1.1091	1.1087
700	1.1082	1.1078	1.1073	1.1069	1.1064	1.1060	1.1055	1.1051	1.1046	1.1042
710	1.1037	1.1033	1.1028	1.1023	1.1019	1.1014	1.1010	1.1005	1.1001	1.0996
720	1.0992	1.0988	1.0983	1.0979	1.0975	1.0970	1.0966	1.0962	1.0957	1.0953
730	1.0949	1.0944	1.0940	1.0935	1.0931	1.0927	1.0923	1.0918	1.0914	1.0910
740	1.0906	1.0901	1.0897	1.0893	1.0889	1.0884	1.0880	1.0876	1.0872	1.0868
750	1.0864	1.0859	1.0855	1.0851	1.0847	1.0843	1.0839	1.0834	1.0830	1.0826
760	1.0822	1.0818	1.0814	1.0810	1.0806	1.0802	1.0798	1.0794	1.0790	1.0786
770	1.0782	1.0778	1.0774	1.0770	1.0766	1.0762	1.0758	1.0754	1.0750	1.0746
780	1.0742	1.0738	1.0734	1.0730	1.0726	1.0722	1.0718	1.0714	1.0710	1.0706
790	1.0702	1.0698	1.0695	1.0691	1.0687	1.0683	1.0679	1.0675	1.0671	1.0668
800	1.0664	1.0660	1.0656	1.0652	1.0648	1.0644	1.0641	1.0637	1.0633	1.0629
810	1.0626	1.0622	1.0618	1.0615	1.0611	1.0607	1.0603	1.0599	1.0596	1.0592
820	1.0588	1.0584	1.0581	1.0577	1.0573	1.0570	1.0566	1.0563	1.0559	1.0555
830	1.0551	1.0548	1.0544	1.0541	1.0537	1.0533	1.0529	1.0526	1.0522	1.0519
840	1.0515	1.0512	1.0508	1.0505	1.0501	1.0497	1.0493	1.0490	1.0486	1.0483
850	1.0479	1.0476	1.0472	1.0469	1.0465	1.0462	1.0458	1.0455	1.0451	1.0448
860	1.0444	1.0441	1.0437	1.0433	1.0430	1.0427	1.0423	1.0420	1.0416	1.0413
870	1.0409	1.0406	1.0402	1.0399	1.0396	1.0392	1.0389	1.0385	1.0382	1.0378
880	1.0375	1.0372	1.0368	1.0365	1.0362	1.0358	1.0355	1.0351	1.0348	1.0344
890	1.0341	1.0338	1.0334	1.0331	1.0327	1.0324	1.0321	1.0318	1.0315	1.0311
900	1.0308	1.0305	1.0302	1.0298	1.0295	1.0292	1.0288	1.0285	1.0282	1.0279
910	1.0275	1.0272	1.0269	1.0266	1.0262	1.0259	1.0256	1.0253	1.0249	1.0246
920	1.0243	1.0240	1.0236	1.0233	1.0230	1.0227	1.0224	1.0221	1.0218	1.0214
930	1.0211	1.0208	1.0205	1.0202	1.0198	1.0195	1.0192	1.0189	1.0186	1.0183
940	1.0180	1.0177	1.0173	1.0170	1.0167	1.0164	1.0161	1.0158	1.0155	1.0152
950	1.0149	1.0146	1.0143	1.0140	1.0137	1.0133	1.0130	1.0127	1.0124	1.0121
960	1.0118	1.0115	1.0112	1.0109	1.0106	1.0103	1.0100	1.0097	1.0094	1.0091
970	1.0088	1.0085	1.0082	1.0079	1.0076	1.0073	1.0070	1.0067	1.0064	1.0061
980	1.0058	1.0055	1.0052	1.0049	1.0047	1.0044	1.0041	1.0038	1.0035	1.0032
990	1.0029	1.0026	1.0023	1.0020	1.0017	1.0014	1.0012	1.0009	1.0006	1.0003
1000	1.0000	0.9997	0.9994	0.9991	0.9989	0.9986	0.9983	0.9980	0.9977	0.9974
1010	0.9971	0.9969	0.9966	0.9963	0.9960	0.9957	0.9954	0.9952	0.9949	0.9946
1020	0.9943	0.9940	0.9938	0.9935	0.9932	0.9929	0.9926	0.9924	0.9921	0.9918
1030	0.9915	0.9912	0.9910	0.9907	0.9904	0.9901	0.9899	0.9896	0.9893	0.9890
1040	0.9888	0.9885	0.9882	0.9879	0.9877	0.9874	0.9871	0.9869	0.9866	0.9863

RECOVERY OF SOUNDING-BALLOON METEOROGRAPH AFTER THREE YEARS AND THREE MONTHS

By L. T. SAMUELS

What is believed to be a long-period record for the return of a balloon meteorograph occurred recently when a Fergusson meteorograph which was sent up from the Weather Bureau office, Los Angeles, Calif., on December 31, 1927, at 4:58 a. m. and found on April 12, 1931, approximately 125 miles to the southeast. The official in charge at Los Angeles reports, "The meteorograph was nearly covered with trash and the basket in which the meteorograph was tied when released was not found. The remains of the balloon were near the spot where the instrument was lying. The instructions that were tied to the instrument were still with it but they were only partly legible."

It was found that the smoked record was entirely legible and the computation of the ascent and descent are in strikingly close agreement. The record indicates a maximum altitude of 14,196 meters, although the stratosphere was not reached. The temperature decreased from 11.1° C. at the surface to −74.1° C. at the maximum altitude.