Escanaba, Michigan: the steam tug "Swain," having in tow the schooner "Swallow," left port on the morning of the 6th for Detroit. This was the last vessel to leave port this season and navigation was practically closed on that date.

Milwaukee, Wisconsin: there was more ice in Milwaukee Bay at the end of the month than there has been in any December during the past ten years; on the 31st three propellers were fast in the ice for several hours.

Erie, Pennsylvania: the propeller "Philadelphia," of the Anchor Line, reached this port, by forcing her way through the ice, on the morning of the 7th; this was the last vessel to arrive at this port, and navigation was closed for the season.

Sandusky, Ohio: Sandusky Bay became frozen over on the 1st and navigation was closed for the season. All steamers at this port have gone into winter quarters.

Little Rock, Arkansas: the steamer "Ella" arrived on the 18th, but, owing to the low stage of the water in the Arkansas River, was unable to depart. On the 27th the river was navigable for small boats only.

Louisville, Kentucky: on the 22d and 23d the Ohio River was filled with heavy floating ice which impeded the progress of steamboats.

Leavenworth, Kansas: the Missiouri River at this point was frozen over from the 4th to 10th and from the 27th to 31st; on all other days of the month it was filled with heavy floating ice.

Rochester, New York: the Genesee River became frozen on the 2d, closing navigation for the season.

Philadelphia, Pennsylvania: ice formed rapidly on the Delaware and Schuylkill rivers during the 5th, making navigation difficult. Navigation on the Schuylkill River closed this season unusually early and a large number of canal boats were ice bound.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for December, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, December, 1886.

[*Expressed in feet and tenths.*]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, Louisiana	29.9	1 to 5	10.5	28 to 31	4.0	6.5
Arkansas River:						
Fort Smith, Arkansas	22.0	24 to 27	1.6	7, 8	0.8	0.8
Little Rock, Arkansas	23.0	1	3.3	21, 22, 23	1.3	2.0
Missouri River:						
Yankton, Dakota	24.0	.....	.....	.....	.....	.....
Omaha, Nebraska	18.0	.....	.....	.....	.....	.....
Leavenworth, Kansas	20.0	12	6.0	18	3.1	2.9
Mississippi River:						
Saint Paul, Minnesota *	14.5	.....	.....	.....	.....	.....
La Crosse, Wisconsin *	24.0	.....	.....	.....	.....	.....
Dubuque, Iowa	16.0	5	3.2	1	1.7	1.5
Davenport, Iowa *	15.0	.....	.....	.....	.....	.....
Keokuk, Iowa *	14.0	.....	.....	.....	.....	.....
Saint Louis, Missouri	32.0	19	7.9	† 4, 5	† 0.1	7.8
Cairo, Illinois	40.0	1	23.8	17, 18	9.2	14.6
Memphis, Tennessee	34.0	3	18.4	20	6.6	11.8
Vicksburg, Mississippi	41.0	8, 9	20.5	25	6.3	14.2
New Orleans, Louisiana	13.0	9	5.1	26, 28	2.0	3.1
Ohio River:						
Pittsburg, Pennsylvania	22.0	26	12.3	11, 12	2.8	9.5
Cincinnati, Ohio	50.0	29	27.2	14, 15	10.0	17.3
Louisville, Kentucky	25.0	1	11.4	15	5.6	5.8
Cumberland River:						
Nashville, Tennessee	40.0	23	20.8	12, 13	4.7	16.1
Tennessee River:						
Knoxville, Tennessee	.....	14	8.0	8	2.3	5.7
Chattanooga, Tennessee	33.0	22	16.6	12	4.0	12.6
Monongahela River:						
Pittsburg, Pennsylvania	29.0	26	12.3	11, 12	2.8	9.5
Savannah River:						
Augusta, Georgia	32.0	13	11.5	4, 5	6.5	5.0
Mobile River:						
Mobile, Alabama	.....	4	16.8	16	15.1	1.7
Sacramento River:						
Sacramento, California	.....	10, 11	10.9	1 to 7	7.8	3.1
Willamette River:						
Portland, Oregon	.....	28, 29, 30	10.0	6	0.1	9.9
Colorado River:						
Yuma, Arizona	.....	18 to 22, 25, [26, 27	15.6	3, 4, 5	14.9	0.7

* River frozen. † Approximated.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Mount Washington, New Hampshire: a faint auroral light was observed from 9.50 to 11.30 p. m. of the 17th; it was accompanied by no streamers or other distinctive features.

Fort Buford, Dakota: an auroral light of a pale white color appeared on the northern horizon at 9.28 p. m of the 22d; it extended from northwest to northeast and to an altitude of about 15°. Between 10.15 and 10.25 p. m. a few white streamers, extending to an altitude of 27°, were visible in the north. The aurora was obscured by clouds at 11.45 p. m.

Saint Vincent, Minnesota: an aurora was observed in the north at 11 p. m. of the 25th; it first appeared in the form of a low line of light extending from north to northeast, and having an altitude of about three degrees. At 11.15 p. m. the light had become wider and white beams shot upward from different parts of the base. At the base the colors increased in intensity, showing successively white, lemon, orange, and red, the last-named color was the last to disappear, remaining visible until the early morning of the 26th.

Bismarck, Dakota: an auroral arch extending from azimuth 150° to 225° and to an altitude of 30° was seen at 12.45 a. m. of the 26th. The maximum intensity occurred at 1.15 a. m. when beams of bright light extended to an altitude of 40°. The display ended at 7.45 a. m.

Marquette, Michigan: an aurora was visible from 9.15 to 10.20 p. m. of the 29th; several streamers extended to a height of 40°.

Other auroral displays were observed during the month, as follows:

1st.—Escanaba, Michigan; Green Bay, Wisconsin; Gardiner, Maine.
2d.—Escanaba, Michigan; Embarras, Wisconsin.
4th.—Nashua, New Hampshire.
7th.—Moorhead, Minnesota.
12th.—Wellsborough, Pennsylvania.
15th.—Sandwich, Illinois.
17th.—Gardiner, Maine.
20th.—Eastport, Maine.
22d.—Bismarck and Fort Totten, Dakota; North Volney, New York.
23d.—Bismarck, Dakota.
25th.—Fort Totten, Dakota; Helena, Montana.
26th.—Poplar River, Montana.
28th.—Mackinaw City and Escanaba, Michigan; Nashua, New Hampshire; Embarras, Wisconsin.
29th.—Mackinaw City and Escanaba, Michigan.
31st.—Delavan, Wisconsin.

ELECTROMETER READINGS.

[Prepared under the direction of Prof. T. C. MENDENHALL, Assistant.]

Observations have been made regularly at 9 a. m., 11 a. m., 1 p. m., and 3 p. m., daily, at the six stations now supplied with electrometers. At Washington City, owing to severity of the weather, observations at the top of the Washington Monument were only made with difficulty. On December 15th, during cold, rainy weather, values were obtained as follows:

Time.	Monument.	Signal Office.	Time.	Monument.	Signal Office.
	Volts.	*Volts.*		*Volts.*	*Volts.*
9 a. m	.....	+ 90	12.05 p. m	125	— 72
11 a. m	.....	{ —270	12.10 p. m	225	— 36
		{ —390	12.15 p. m	225	+ 6
11.15 a. m	500	.....	12.20 p m	500	+132
11.30 a. m	1375	.....	12.25 p. m	450	+ 48
11.45 a. m	400	.....	12.30 p. m	125	+ 36
12 m		—228	12.35 p. m	125	+ 30

Monument elevation, 500 feet. Signal Office elevation, 35 feet.

Sparks could be obtained at the Monument by connecting

Table of miscellaneous meteorological data for December, 1886—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths). Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes. Highest barometer	Date.	Lowest barometer.	Date.	Monthly range of barometer.	Temperature of the air (in degrees Fahrenheit). Monthly mean.	Departure from normal.	Extremes. Max.	Date.	Mean max.	Min.	Date.	Mean min.	Monthly range.	Daily ranges. Greatest.	Date.	Least.	Date.	Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Winds. Total movement.	Prevailing direction.	Maximum velocity. Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of clear days.
New England.																																		
Eastport	.....	29.91	.....	.....	30.56	5	29.01	2	1.52	24.7	— 0.6	46.6	1	.....	— 9.0	30	.....	55.6	.....	.....	.....	.....	.....	.....	6.51	+ 2.51	.....	nw.	.....	.....	.....	17	12	12	7
Portland	99	29.95	+ .06	30.06	30.70	5	29.26	14	1.44	23.1	— 0.3	49.6	11	30.1	— 4.0	30	15.3	53.6	31.3	25	3.2	13	78.9	17.1	5.04	+ 1.91	6,620	n.	28	nw.	16	14	11	13	7
Mount Washington	6,279	23.45	.....	30.03	30.08	23	29.15	14	1.53	8.5	— 0.7	32.4	25	17.3	—25.2	3	— 1.2	57.6	42.4	25	4.8	12	93.6	7.0	3.10	— 2.27	23,410	nw.	100	nw.	25	20	3	19	9
Boston	124	29.95	+ .05	30.08	30.63	5	29.34	14	1.28	28.8	— 1.4	54.9	24	36.1	6.0	30	20.6	48.9	35.6	25	4.9	12	70.1	19.6	3.66	— 0.13	9,933	w.	37	w.	3	12	13	12	6
Block Island	27	30.06	+ .04	30.08	30.58	4	29.39	13	1.20	34.0	— 2.2	54.3	18	40.8	15.5	16	28.7	38.8	28.0	25	4.4	13	84.0	29.6	6.70	+ 2.06	13,641	nw.	51	ne.	6	13	14	12	5
Narragansett Pier	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.6	.....	53.0	24	37.8	7.0	17	21.5	46.0	.....	.....	.....	.....	.....	.....	5.26	+ 1.61	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Haven	107	29.99	.....	30.10	30.60	4	29.39	13	1.21	27.3	— 4.0	55.6	25	35.6	6.9	5	20.0	48.7	28.7	25	4.0	13	75.6	20.2	3.47	— 2.26	7,318	w.	32	ne.	7	14	11	13	7
New London	47	30.00	.....	30.04	30.54	4	29.36	13	1.17	29.9	— 2.2	54.1	25	37.3	10.3	30	22.4	43.8	32.1	25	7.9	29	81.0	24.6	4.37	+ 0.83	5,475	n.	24	n.	6	14	12	9	10
Nantucket	13	30.06	.....	.....	.....	.....	.....	.....	1.17	36.3	.....	56.0	25	42.2	17.0	16	28.9	39.0	32.5	16	4.6	29	82.0	31.2	4.93	.....	9,779	ne.	50	ne.	7	19	14	13	4
Edgartown	.....	.....	.....	.....	.....	.....	.....	.....	.....	33.7	.....	51.6	11	40.8	12.2	3	26.6	39.4	28.7	18	2.2	29	.....	.....	5.20	.....	.....	.....	.....	.....	.....	17	.....	.....	.....
Vineyard Haven	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	56.6	18	42.6	.....	.....	.....	.....	21.5	2	7.5	29	.....	.....	3.28	.....	.....	.....	.....	.....	.....	14	.....	.....	.....
Mid. Atlantic States.																																		
Albany	85	30.06	+ .06	30.15	30.69	4	29.37	13	1.33	23.6	— 5.0	46.2	24	31.8	0.0	30	15.3	46.2	27.8	18	5.5	13	75.4	16.8	2.19	— 0.46	4,852	s.	24	w.	2	16	13	17	1
New York City	168	29.95	+ .03	30.12	30.59	4	29.44	13	1.15	30.8	— 2.5	54.2	11	37.8	14.0	17	25.5	40.2	25.5	25	4.5	12	75.2	23.4	3.73	+ 0.55	7,461	ne.	34	nw.	2	13	10	11	10
Philadelphia	117	30.02	+ .03	30.14	30.60	4	29.51	13	1.09	31.0	— 3.5	55.3	24	37.7	12.9	5	25.0	42.4	24.2	11	6.6	13	70.9	22.1	3.09	+ 0.48	8,866	nw.	34	nw.	2	12	10	11	10
Atlantic City	13	30.12	+ .03	30.12	30.56	4	29.51	13	1.06	33.2	— 2.6	51.4	24	40.6	13.7	16	26.1	37.7	25.0	9	6.0	31	85.0	29.0	3.93	— 0.42	7,026	nw.	36	ne.	6	14	10	10	11
Sandy Hook	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cape Henlopen	.....	.....	.....	.....	.....	.....	.....	.....	.....	32.1	.....	49.0	1	37.1	12.1	5	28.0	9.1	17.0	18	3.9	24	.....	.....	2.23	.....	.....	.....	.....	.....	.....	16	.....	.....	.....
Baltimore	45	30.10	+ .02	30.14	30.55	4	29.52	13	1.01	31.3	— 5.8	52.2	24	38.4	15.0	16	24.7	37.2	26.0	8	5.4	30	71.2	22.3	3.12	— 0.01	4,02[illegible]	nw.	26	nw.	2	16	11	11	9
Washington City	100	30.05	+ .02	30.15	30.57	4	29.53	13	1.04	30.7	— 5.0	54.2	24	38.8	10.8	17	22.9	43.4	33.0	11	7.0	18	73.7	22.6	3.19	+ 0.42	4,148	n.	26	nw.	2	13	12	10	9
Cape Henry	16	30.11	— .01	30.11	30.51	4	29.48	15	1.02	38.7	— 4.8	58.5	24	45.7	18.8	16	32.4	39.7	24.2	25	6.1	7	79.4	32.6	5.02	+ 0.70	11,159	sw.	47	nw.	16	14	8	16	7
Chincoteague	8	30.12	+ .01	30.11	30.53	4	29.50	15	1.04	36.4	— 2.8	59.0	24	44.8	10.0	16	29.9	49.0	36.8	16	4.6	30	78.9	30.3	4.54	+ 0.45	10,541	nw.	52	nw.	6	16	6	16	9
Lynchburg	652	29.44	+ .03	30.14	30.53	4	29.54	15	0.99	33.1	— 5.7	56.0	27	42.6	15.0	3	25.7	41.0	36.1	11	2.0	30	75.9	25.7	2.81	— 1.05	1,704	nw.	20	nw.	15	14	14	11	6
Norfolk	30	30.11	+ .01	30.12	30.49	4	29.49	15	1.00	37.7	— 4.8	66.1	24	46.2	19.8	10	31.8	46.3	28.5	16	4.1	4	80.8	31.4	5.85	+ 2.01	4,921	n.	23	nw.	3	15	13	11	7
South Atlantic States.																																		
Charlotte	808	29.28	+ .01	30.13	30.43	10	29.56	15	0.88	39.0	— 4.0	61.9	23	47.3	17.5	16	31.5	44.4	28.6	27	3.8	31	74.4	30.7	6.26	+ 1.68	2,601	ne.	20	n.	5	14	10	14	7
Fort Macon	11	30.15	.00	30.13	30.51	17	29.56	15	0.95	45.2	— 2.9	64.6	1	52.6	24.8	3	37.3	39.8	27.0	16	7.5	5	79.1	38.7	3.07	— 1.03	7,120	sw.	34	n.	5	12	12	10	9
Hatteras	12	30.13	+ .01	30.12	30.51	17	29.53	15	0.98	45.1	— 2.3	68.5	1	54.1	27.4	16	38.5	41.1	26.8	16	5.7	30	83.7	40.2	5.96	— 0.44	9,219	n.	37	nw.	6	11	7	15	9
Kitty Hawk	9	30.13	— .01	30.12	30.47	4	29.52	15	0.95	42.5	— 2.6	66.3	24	50.1	21.3	3	36.1	45.0	27.2	16	4.5	29	85.1	38.0	3.89	— 1.48	11,045	ne.	52	ne.	25	13	6	18	7
New River Inlet	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.7	.....	60.5	11	48.1	21.2	3	37.3	39.2	.....	.....	.....	.....	.....	.....	4.25	+ 0.74	.....	.....	.....	.....	.....	11	.....	.....	.....
Smithville	.....	.....	.....	.....	.....	.....	.....	.....	.....	45.0	— 2.5	63.0	1	53.7	19.0	3	37.4	44.0	28.0	2	7.8	6	.....	.....	3.14	— 0.37	.....	.....	.....	.....	.....	11	.....	.....	.....
Wash Woods	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.8	.....	73.0	25	55.4	20.0	3	34.1	53.0	.....	.....	.....	.....	.....	.....	2.62	.....	.....	.....	.....	.....	.....	13	.....	.....	.....
Wilmington	52	30.08	— .03	30.11	30.46	17	29.59	15	0.88	45.3	— 2.6	69.2	1	55.5	22.2	3	36.0	47.0	32.6	22	5.0	6	74.2	36.6	4.02	+ 0.36	4,233	ne.	25	sw.	15	12	11	8	12
Charleston	52	30.10	.00	30.12	30.45	17	29.62	15	0.83	48.4	— 2.7	71.8	1	55.7	24.8	16	41.9	47.0	24.0	15	4.9	16	79.2	41.7	1.79	— 2.00	5,084	w.	24	nw.	15	11	12	9	10
Augusta	183	29.98	— .02	30.15	30.44	17	29.61	15	0.82	42.6	— 5.1	67.5	1	55.2	19.7	17	33.3	47.8	36.1	22	9.0	30	86.8	38.3	3.55	— 0.28	2,778	w.	23	w.	15	9	9	12	10
Savannah	87	30.07	.00	30.13	30.43	17	29.67	15	0.76	48.5	— 3.8	74.0	1	57.7	25.0	16	40.6	49.0	28.4	22	3.5	5	77.1	40.6	3.16	— 0.39	4,741	nw.	26	nw.	26	11	9	11	11
Jacksonville	43	30.11	.00	30.12	30.39	17	29.70	15	0.69	52.8	— 3.0	75.8	1	62.9	27.4	7	44.4	48.4	30.9	17	9.6	19	82.7	47.2	3.20	— 0.09	3,885	ne.	26	sw.	15	12	8	13	10
Florida Peninsula.																																		
Cedar Keys	22	30.16	+ .03	30.14	30.40	17	29.81	15	0.59	54.4	— 4.3	70.0	23	62.1	29.8	7	47.8	40.2	26.9	21	6.2	27	82.9	48.9	1.95	— 1.35	6,050	ne.	38	nw.	15	15	11	12	8
Key West	20	30.11	+ .01	30.08	30.28	16	29.87	31	0.41	67.5	— 2.5	82.5	31	72.8	55.2	17	63.5	27.3	16.9	15	4.6	6	81.3	61.2	0.83	— 0.99	8,156	ne.	41	nw.	5	4	3	19	9
Sanford	25	30.10	.....	30.09	30.34	17	29.77	15	0.57	57.9	— 3.3	78.0	30	67.3	33.3	7	49.2	44.7	28.6	15	4.5	10	77.7	50.2	3.20	+ 1.70	4,384	n.	22	w.	16	12	10	13	8
Eastern Gulf States.																																		
Atlanta	1,129	28.96	— .01	30.14	30.38	9	29.69	15	0.69	40.7	— 4.3	64.6	28	48.2	14.9	16	32.6	49.7	26.5	27	5.3	30	75.4	32.8	3.03	— 2.57	7,272	w.	36	e.	5	11	9	12	10
Pensacola	30	30.12	— .01	30.11	30.35	20	29.75	31	0.60	51.3	— 3.4	71.9	1	60.2	26.2	6	43.7	45.7	30.9	4	6.4	31	75.6	43.3	4.13	— 1.14	4,615	ne.	37	se.	4	10	12	7	12
Mobile	35	30.13	.00	30.13	30.37	20	29.75	31	0.62	48.9	— 3.0	69.0	1	58.1	22.9	6	39.8	46.1	30.2	21	8.0	11	75.4	40.3	1.97	— 2.78	5,471	nw.	28	nw.	15	6	10	12	10
Montgomery	219	29.93	.00	30.14	30.35	20	29.73	31	0.62	44.8	— 4.2	66.8	28	53.8	22.1	16	36.7	44.7	28.8	21	5.1	3	79.4	38.2	3.05	— 2.20	3,698	nw.	25	nw.	15	9	8	13	9
Vicksburg	222	29.94	+ .03	30.15	30.39	19	29.80	30	0.60	46.9	— 3.3	69.1	17	56.6	19.2	5	38.3	49.9	28.6	16	9.0	5	70.2	36.6	1.76	— 3.91	5,249	se.	30	se.	24	8	11	11	10
New Orleans	52	30.11	+ .02	30.13	30.37	20	29.77	31	0.60	51.6	— 3.6	72.4	12	60.1	27.0	5	43.8	45.4	28.2	17	7.5	30	74.2	42.9	2.57	— 2.45	5,919	e.	25	nw.	4	10	7	12	12
Western Gulf States.																																		
Shreveport	227	29.92	+ .02	30.14	30.50	4	29.80	30	0.70	46.3	— 2.9	72.0	17	58.3	20.2	5	37.7	51.8	30.6	14	9.2	23	75.1	39.7	1.52	— 3.81	4,812	s.	25	nw.	15	12	9	8	14
Fort Smith	470	29.65	+ .03	30.12	30.56	4	29.75	14	0.78	36.1	— 4.5	63.8	10	46.3	7.7	5	28.0	56.1	34.3	16	3.1	30	70.9	26.6	0.79	— 2.31	4,505	e.	24	nw.	12	5	9	10	12
Little Rock	288	29.85	+ .02	30.14	30.49	4	29.74	14	0.75	37.4	— 7.5	65.9	14	46.6	14.7	5	29.9	50.3	30.7	14	4.2	28	74.9	29.0	0.88	— 4.08	4,926	ne.	28	nw.	15	12	12	7	12
Galveston	40	30.13	+ .03	30.13	30.50	5	29.78	31	0.71	56.2	— 0.3	72.2	1	62.3	25.4	5	50.6	46.8	32.5	4	3.2	22	81.1	50.0	2.10	— 2.67	6,170	n.	32	n.	4	7	6	9	16
Palestine	533	29.62	+ .03	30.16	30.57	5	29.80	30	0.77	47.5	— 2.4	71.0	17	58.4	14.4	5	38.4	57.2	30.5	17	9.7	9	69.1	36.7	0.45	— 3.10	7,339	s.	33	s.	17	7	10	7	14
San Antonio	781	29.33	+ .01	30.12	30.59	5	29.75	30	0.84	52.8	— 1.1	78.8	17	65.1	17.3	5	41.8	61.5	35.2	26	12.1	9	67.4	40.2	0.30	— 1.71	5,485	n.	34	n.	31	3	3	11	17
Rio Grande Valley.																																		
Brownsville	57	30.08	+ .03	30.09	30.56	5	29.72	31	0.83	61.2	+ 0.6	79.6	1	72.3	26.5	5	51.4	53.1	33.4	6	10.7	29	81.7	54.7	0.69	— 1.43	5,286	s.	28	s.	16	2	0	11	20
Rio Grande City	230	29.94	+ .02	30.14	30.66	5	29.78	31	0.88	61.1	+ 1.4	87.2	17	75.6	25.0	6	48.6	62.2	42.5	14	9.4	29	63.3	46.2	0.08	— 1.18	2,950	n.	20	s.	10	1	1	8	22
Ohio Val. & Tenn.																																		
Chattanooga	783	29.34	+ .01	30.17	30.44	9	29.65	15	0.79	37.8	— 5.4	64.0	23	47.1	12.1	8	29.2	51.9	33.0	21	4.8	4	75.2	29.7	3.09	— 2.54	4,379	nw.	28	nw.	15	16	11	15	5
Knoxville	980	29.12	+ .01	30.18	30.46	10	29.67	15	0.78	34.9	— 4.2	57.7	24	42.9	6.4	7	26.6	51.3	29.9	21	4.7	5	78.4	28.5	5.34	+ 0.87	3,878	ne.	22	nw.	1	15	7	15	9
Memphis	320	29.84	+ .03	30.16	30.47	2	29.72	14	0.75	37.3	— 5.1	66.0	23	45.4	17.0	6	30.4	49.0	28.2	24	4.2	28	72.3	22.2	3.00	— 0.99	5,917	nw.	33	w.	15	14	8	14	9
Nashville	549	29.57	+ .02	30.15	30.45	2	29.69	14	0.76	34.7	— 6.3	62.1	23	43.2	10.9	16	26.2	51.2	29.5	17	1.9	28	73.7	26.7	1.46	— 2.30	5,143	nw.	27	w.	15	12	13	14	4
Louisville	551	29.58	+ .04	30.17	30.50	2	29.68	14	0.86	31.4	— 6.5	62.5	11	39.7	5.5	2	23.0	57.0	30.1	11	5.1	26	74.2	23.1	2.69	— 1.72	6,090	se.	28	sw.	18	15	12	10	9
Indianapolis	766	29.33	+ .05	30.17	30.56	4	29.58	14	0.98	25.2	— 7.3	57.7	11	33.0	— 3.5	27	17.0	61.2	26.2	1	5.1	12	77.0	18.4	2.20	— 1.25	4,655	nw.	28	nw.	15	14	11	10	10
Cincinnati	628	29.49	+ .04	30.17	30.52	4	29.58	14	0.94	28.7	— 7.8	60.4	11	36.1	— 2.6	3	19.4	63.0	30.1	11	8.0	22	75.0	21.4	1.67	— 2.16	6,114	sw.	30	w.	1	13	11	11	9
Columbus	812	29.26	+ .03	30.15	30.55	4	29.56	15	0.99	26.7	— 5.6	59.5	11	36.1	1.2	2	18.3	58.1	30.4	11	7.8	25	71.1	18.0	3.41	— 0.15	5,968	s.	40	w.	1	16	11	10	10
Pittsburg	847	29.20	.00	30.11	30.53	4	29.43	13	1.10	29.5	— 3.8	58.5	24	37.8	6.8	2	22.1	51.7	27.3	24	6.9	14	78.2	23.2	1.81	— 1.12	5,590	n.	28	w.	1	14	13	12	6
Lower lake region.																																		
Buffalo	690	29.34	+ .07	30.11	30.68	4	29.34	13	1.34	23.6	— 5.6	47.6	12	31.9	— 3.0	5	17.3	50.6	32.4	27	5.0	7	84.9	19.5	3.26	— 0.20	9,584	w.	44	w.	2	19	17	13	1
Oswego	335	29.72	+ .05	30.10	30.66	4	29.35	13	1.31	22.7	— 7.0	47.1	24	29.3	— 3.6	5	14.7	50.7	26.5	15	5.8	13	82.7	17.9	2.33	— 1.34	9,551	s.	33	nw.	2	14	23	6	2
Rochester	621	29.42	+ .07	30.12	30.68	4	29.32	13	1.36	22.5	— 5.6	48.2	24	29.7	— 4.1	5	16.1	52.3	29.0	6	4.7	3	84.2	18.4	1.89	— 1.10	8,933	sw.	40	w.	2	15	21	10	0
Erie	681	29.36	+ .04	30.21	30.63	4	29.39	13	1.24	25.8	— 6.7	23.0	10	28.0	— 1.0	5	17.8	55.0	31.0	1	11.8	6	82.4	20.9	4.04	+ 0.62	8,421	sw.	42	w.	2	33	21	5	5
Cleveland	690	29.36	+ .03	30.12	30.59	4	29.47	13	1.12	25.3	— 4.7	52.6	11	32.4	0.3	17	16.4	52.3	27.7	17	5.8	14	76.0	18.3	3.57	+ 0.88	7,183	sw.	31	w.	1	17	14	10	7
Sandusky	638	29.45	+ .06	30.15	30.60	4	29.54	13	1.00	24.4	— 8.0	57.9	11	31.8	3.7	2	17.4	54.2	23.5	17	5.1	14	82.4	91.5	2.97	+ 0.19	9,189	sw.	52	n.	15	15	13	12	6
Toledo	651	29.43	+ .07	30.15	30.64	4	29.50	13	1.14	22.3	.....	54.4	11	28.9	— 0.7	28	14.5	55.1	25.6	11	7.9	21	78.5	16.1	2.78	+ 0.27	6,184	w.	32	w.	1	15	15	9	7
Detroit	662	29.39	+ .06	30.13	30.63	4	29.48	13	1.15	24.0	— 5.0	51.8	10	30.2	2.5	28	17.5	49.3	23.7	1	4.3	29	75.7	17.3	2.21	— 0.56	6,213	w.	28	nw.	1	15	12	14	4
Port Stanley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dover	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Upper lake region.																																		
Green Bay	616	29.44	.....	30.15	36.76	4	29.62	14	1.14	13.8	.....	43.8	9	21.1	—21.0	27	5.8	64.8	30.4	1	4.0	12	83.0	9.5	1.36	.....	5,005	sw.	29	w.	1	12	12	11	8
Alpena	609	29.39	+ .07	30.08	30.68	4	29.47	13	1.21	19.9	— 3.7	52.6	10	21.5	1.7	30	14.1	54.3	18.8	24	3.3	12	85.5	16.3	1.97	— 0.42	6,860	w.	31	nw.	14	16	19	11	1
Escanaba	608	29.41	+ .09	30.11	30.71	4	29.58	14	1.12	15.0	— 5.8	38.7	9	22.4	—15.2	27	6.9	53.9	26.7	1	4.1	12	76.9	8.7	0.90	— 0.93	6,121	sw.	28	sw.	20	10	7	16	8
Grand Haven	620	29.42	+ .07	30.11	30.63	4	29.51	14	1.12	22.5	— 6.7	49.1	11	28.0	— 3.4	30	15.6	52.5	23.1	5	2.1	10	79.4	16.9	1.67	— 0.95	8,653	sw.	39	sw.	21	19	21	6	4
Mackinaw City	605	29.38	+ .06	30.06	30.69	4	29.51	13	1.18	22.0	— 3.3	45.7	10	27.4	0.2	29	16.7	45.5	21.7	14	3.3	8	73.8	15.6	0.79	— 3.20	9,719	w.	36	w.	1	14	13	16	2
Marquette	672	29.32	+ .00	30.09	30.70	4	29.56	20	1.14	15.6	— 6.6	42.4	10	22.5	—12.5	27	9.4	54.9	21.9	9	3.7	12	79.1	10.3	2.79	+ 0.71	8,807	w.	34	w.	27	18	18	11	2
Port Huron	639	29.40	+ .08	20.12	30.63	4	29.47	13	1.16	20.3	— 6.7	45.9	10	26.8	— 1.9	28	12.4	47.8	23.8	9	5.9	18	77.4	14.3	1.76	— 0.07	8,331	s.	38	w.	1	14	8	19	4
Chicago	661	29.43	+ .09	30.16	30.65	4	29.51	14	1.15	25.0	— 3.9	59.8	11	33.7	— 9.5	27	16.8	59.3	29.7	26	9.2	30	75.5	18.2	1.76	— 0.54	5,111	s.	28	w.	1	12	11	12	8
Milwaukee	697	29.35	+ .08	30.14	30.69	4	29.56	14	1.13	17.5	— 7.0	47.6	9	25.5	—17.3	27	9.0	64.9	30.1	20	6.0	10	81.3	12.6	2.03	+ 0.14	8,108	w.	39	w.	1	13	10	15	6
Duluth	672	29.39	+ .07	30.17	30.85	4	29.54	20	1.30	8.9	— 7.6	42.0	10	18.2	—20.8	27	— 0.1	62.8	29.0	17	5.1	12	74.7	2.2	0.93	— 0.40	4,174	sw.	38	nw.	2	10	8	13	10
Extreme northwest.																																		
Moorhead	926	29.14	+ .11	30.23	30.93	3	29.59	20	1.34	— 0.3	—11.1	33.6	9	9.1	—34.

Table of miscellaneous meteorological data for December, 1886—Signal Service observations—Continued.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths). Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes. Highest barometer	Date.	Lowest barometer	Date.	Monthly range of barometer.	Temperature of the air (in degrees Fahrenheit). Monthly mean.	Departure from normal.	Extremes. Max.	Date.	Mean max.	Min.	Date.	Mean min.	Monthly range.	Daily ranges. Greatest.	Date.	Least.	Date.	Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Winds. Total movement.	Prevailing direction.	Maximum velocity. Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
Upper Miss. Valley.																																			
Saint Paul	831	29.24	+.11	30.19	30.86	4	29.64	14	1.21	8.4	—10.4	42.7	9	16.5	—23.7	27	— 2.0	66.4	31.3	5	4.0	11	77.0	2.4	1.48	+ 0.19	3,978	nw.	21	nw.	14	8	4	19	8
La Crosse	725	29.39	+.12	30.21	30.85	4	29.62	14	1.23	16.1	— 6.6	48.0	9	25.1	—14.9	27	9.0	62.9	29.9	1	5.2	10	76.0	9.8	0.50	— 0.83	5,437	n.	28	n.	14	10	10	13	8
Davenport	615	29.50	+.08	30.19	30.70	4	29.63	14	1.07	17.5	— 9.8	54.0	11	29.9	—21.6	27	8.8	75.6	39.4	20	9.3	10	77.9	11.5	0.53	— 1.17	5,276	nw.	24	sw.	10	8	4	15	12
Des Moines	849	29.27	+.09	30.21	30.79	4	29.59	14	1.19	19.2	— 5.0	54.2	11	27.0	—19.5	27	10.2	73.7	30.9	5	7.2	17	83.5	15.0	0.81	— 0.78	4,262	n.	23	n.	14	7	5	12	14
Dubuque	665	29.45	.....	30.20	30.79	4	29.59	14	1.21	15.8	— 9.6	50.4	11	24.6	—23.5	27	6.8	73.9	38.3	20	3.6	29	75.4	9.4	1.03	— 0.87	2,980	nw.	18	n.	14	8	5	11	15
Keokuk	618	29.52	+.09	30.20	30.59	2	29.65	14	0.94	21.2	— 7.4	55.0	11	30.1	—14.9	27	13.3	69.9	35.7	20	7.2	13	79.6	15.8	1.03	— 1.22	5,715	nw.	28	nw.	1	7	4	14	13
Cairo	359	29.80	+.03	30.18	30.51	2	29.70	14	0.81	30.7	— 7.6	57.2	10	37.7	11.3	3	24.5	45.9	23.5	7	3.4	28	73.6	22.6	1.74	— 1.94	6,848	n.	32	nw.	15	11	14	12	5
Springfield	644	29.49	+.07	30.20	30.62	4	29.57	14	1.05	26.4	— 5.9	54.5	11	36.2	— 5.6	27	18.1	60.1	28.7	26	7.2	12	72.9	18.8	0.80	— 2.46	5,937	s.	28	n.	15	11	8	13	10
Saint Louis	571	29.56	+.05	30.18	30.58	4	29.60	14	0.98	29.8	— 4.7	61.1	11	38.5	— 2.8	27	21.3	63.9	32.3	26	9.1	12	69.0	20.1	2.65	+ 0.23	8,386	n.	36	nw.	14	10	11	12	8
Missouri Valley.																																			
Lamar	1,028	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...
Leavenworth	842	29.30	+.08	30.22	30.76	4	29.77	12	0.99	23.7	— 6.7	58.7	10	33.0	—10.4	27	15.4	69.1	32.5	20	5.4	3	75.1	16.5	0.65	— 1.02	5,508	n.	28	s.	10	7	6	13	12
Omaha	1,113	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...
Valentine	2,604	27.35	.....	30.17	30.85	4	29.69	16	1.16	19.2	.....	60.7	9	30.3	—16.2	26	8.0	76.9	39.6	14	8.0	11	81.9	13.9	0.10	.....	8,371	nw.	56	nw.	14	9	11	13	7
Huron	1,307	28.75	+.11	30.23	30.96	4	29.68	20	1.28	8.4	—10.6	48.2	9	19.8	—32.0	4	— 1.6	80.2	44.1	14	3.6	11	74.9	1.8	0.74	+ 0.42	5,650	nw.	31	nw.	20	10	3	18	10
Yankton	1,234	28.81	+.06	30.20	30.91	4	29.65	20	1.26	14.0	— 6.9	49.0	9	23.9	—22.7	4	4.4	71.7	38.4	8	5.1	3	75.9	7.6	0.90	+ 0.20	5,882	nw.	36	n.	14	11	9	13	9
Northern slope.																																			
Fort Assinaboine	2,720	27.20	+.04	30.15	30.81	31	29.58	19	1.23	18.9	— 0.7	61.8	19	27.6	—37.1	26	6.9	98.9	44.5	27	9.3	22	62.2	7.8	0.62	— 0.12	7,970	sw.	52	s.	13	4	9	16	6
Fort Custer	3,040	26.87	+.02	30.13	30.73	31	29.66	16	1.06	24.1	+ 3.8	59.2	13	32.9	—12.6	26	16.0	71.8	31.5	19	4.7	10	78.0	17.4	1.26	+ 0.34	5,281	n.	38	nw.	16	9	11	16	4
Fort Maginnis	4,340	25.51	.....	30.04	30.61	31	29.53	8	1.08	23.6	+ 0.1	56.0	8	34.1	—22.4	26	14.7	78.4	45.0	2	8.8	18	64.9	12.6	0.44	— 0.36	8,860	nw.	54	w.	19	12	10	16	5
Fort Shaw	3,550	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...
Helena	4,069	25.80	—.06	30.06	30.50	18	29.53	8	0.97	27.1	+ 4.9	55.8	19	36.1	—15.5	26	18.7	71.3	47.9	25	8.3	26	73.0	19.2	0.98	— 0.40	4,724	sw.	44	sw.	14	10	13	14	4
Poplar River	2,030	27.94	.....	30.21	30.97	31	29.65	19	1.31	4.5	.....	40.0	9	16.7	—38.0	26	— 6.3	78.0	37.7	20	9.0	2	81.9	— 0.1	0.67	+ 0.36	4,347	w.	42	w.	20	11	6	19	6
Deadwood	4,600	25.32	+.02	30.13	30.68	31	29.68	16	1.00	24.8	+ 1.8	50.8	13	34.0	—14.6	26	15.5	65.4	39.2	4	3.0	17	80.1	19.4	1.51	+ 0.01	3,544	sw.	23	sw.	22	13	2	20	9
Cheyenne	6,105	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...
North Platte	2,841	27.13	+.03	30.17	30.84	4	29.67	16	1.17	23.2	— 2.6	57.0	8	33.7	— 6.8	4	15.1	63.8	31.1	5	7.2	31	79.3	17.6	0.40	— 0.37	5,828	w.	34	nw.	14	6	3	13	15
Middle slope.																																			
Denver	5,294	24.71	—.03	30.02	30.53	4	29.58	16	0.94	37.1	+ 6.5	64.8	28	49.6	1.4	26	21.1	63.4	60.4	27	12.5	17	53.4	19.2	0.87	+ 0.13	6,610	s.	36	w.	17	6	0	15	16
Pike's Peak	14,134	17.63	.....	30.12	30.56	19	29.69	10	0.88	8.6	+ 2.3	23.1	9	14.3	— 8.6	23	3.3	31.7	23.3	19	5.4	25	78.9	2.7	1.17	— 0.31	23,649	nw.	80	w.	26	8	2	11	18
Las Animas	3,899	26.06	+.05	30.11	30.62	4	29.63	10	0.99	29.6	+ 1.1	71.5	9	49.6	1.2	27	14.2	70.3	55.3	9	14.3	21	79.8	23.3	0.07	— 0.78	4,001	w.	44	n.	14	2	3	12	16
Concordia	1,384	28.68	.....	30.19	30.82	4	29.74	16	1.08	24.2	.....	59.2	10	34.7	— 7.4	26	15.1	66.6	36.6	8	6.2	3	75.5	16.8	0.56	.....	5,853	n.	36	nw.	14	4	5	11	15
Dodge City	2,523	27.47	+.05	30.18	30.80	4	29.73	11	1.07	28.6	— 2.5	63.0	9	43.5	— 5.0	27	16.3	68.0	46.6	26	9.0	4	70.0	18.9	0.25	— 0.55	6,393	se.	40	nw.	14	2	1	12	18
Fort Reno	.....	.....	.....	.....	.....	...	.....	...	.....	32.0	.....	66.8	14	49.1	— 2.0	27	14.9	68.8	.....	...	.....	...	.....	.....	0.04	— 2.22	.....	.....	.....	.....	...	2	...	...	...
Fort Supply	.....	.....	.....	.....	.....	...	.....	...	.....	33.4	.....	65.4	9	45.1	1.0	27	21.7	64.4	.....	...	.....	...	.....	.....	0.01	— 0.12	.....	.....	.....	.....	...	3	...	...	...
Fort Elliott	2,700	27.30	—.04	30.06	30.62	4	29.62	16	1.00	34.0	— 0.7	71.3	20	49.6	2.4	27	21.3	68.9	45.2	26	10.5	3	64.4	21.9	0.09	— 0.93	8,231	nw.	52	nw.	14	1	0	13	18
Southern slope.																																			
Fort Sill	1,200	28.90	+.06	30.17	30.72	4	29.72	16	1.00	37.4	— 0.7	69.0	14	49.8	3.1	27	26.2	65.9	40.1	26	10.0	30	58.4	22.2	0.02	— 2.11	9,058	n.	46	n.	26	1	4	6	21
Abilene	1,748	28.30	.....	30.13	30.69	4	29.74	16	0.95	44.1	.....	73.1	26	57.5	9.1	5	33.7	64.0	50.5	27	11.7	28	58.9	29.1	0.00	.....	9,417	sw.	38	sw.	16	0	3	8	20
Fort Davis	4,928	25.24	+.01	30.08	30.54	4	29.73	30	0.81	49.9	+ 4.8	74.3	2	64.3	18.1	5	37.4	56.2	40.5	13	12.0	10	30.2	15.9	0.00	— 0.39	6,038	sw.	38	n.	18	0	1	7	23
Fort Stanton	6,150	24.00	.....	29.98	30.37	19	29.59	30	0.78	38.0	.....	63.6	13	54.5	11.5	19	25.8	52.1	42.2	5	11.7	11	56.1	21.6	0.08	.....	6,648	nw.	46	n.	11	1	0	7	24
Southern plateau.																																			
El Paso	3,764	26.35	+.03	30.12	30.46	4	29.81	30	0.65	47.7	+ 1.4	74.0	21	62.7	23.4	5	34.0	50.6	44.6	21	20.0	7	56.5	32.0	0.04	— 0.70	3,123	w.	26	w.	23	1	0	5	26
Lava	.....	.....	.....	.....	.....	...	.....	...	.....	41.6	.....	67.0	17	58.5	18.0	16	24.8	49.0	.....	...	.....	...	.....	.....	trace	.....	.....	.....	.....	.....	...	1	...	...	...
Santa Fé	7,026	23.30	+.07	30.14	30.50	13	29.72	10	0.78	34.0	+ 3.5	54.0	2	45.3	13.3	12	24.1	40.7	33.6	6	8.2	11	52.3	17.0	0.32	— 0.54	4,984	n.	26	n.	25	2	1	5	25
Fort Apache	5,050	25.11	+.04	30.17	30.52	13	29.77	10	0.74	40.3	+ 3.7	67.3	1	60.2	18.5	24	24.8	48.8	45.5	1	16.5	11	58.5	24.4	0.24	— 1.91	3,576	e.	20	s.	10	1	1	7	23
Fort Bowie	.....	.....	.....	.....	.....	...	.....	...	.....	51.1	.....	66.2	21	61.3	31.5	5	40.8	34.7	.....	...	.....	...	.....	.....	0.15	.....	.....	.....	.....	.....	...	1	...	...	...
Fort Grant	4,910	25.31	.....	30.13	30.43	13	29.89	9	0.54	50.8	+ 5.4	70.4	2	63.3	32.5	12	41.3	37.9	30.9	20	12.2	29	36.3	23.5	0.09	— 1.64	4,903	ne.	28	e.	4	1	2	10	19
Fort McDowell	.....	.....	.....	.....	.....	...	.....	...	.....	53.1	.....	80.0	14	71.2	27.0	26	35.0	53.0	.....	...	.....	...	.....	.....	0.30	.....	.....	.....	.....	.....	...	1	...	...	...
Fort Thomas	2,710	27.34	.....	30.12	30.45	13	29.80	10	0.65	43.5	— 0.3	69.6	1	63.4	19.4	13	27.3	50.2	45.2	1	14.8	10	69.3	32.7	0.04	— 1.47	1,701	se.	20	se.	19	1	0	2	29
Fort Verde	.....	.....	.....	.....	.....	...	.....	...	.....	45.4	+ 3.5	69.0	9	61.6	22.5	25	29.1	46.5	.....	...	.....	...	.....	.....	0.60	— 1.19	.....	.....	.....	.....	...	1	...	...	...
Maricopa	.....	.....	.....	.....	.....	...	.....	...	.....	55.2	.....	77.2	20	74.5	29.7	12	36.0	47.5	.....	...	.....	...	.....	.....	0.11	.....	.....	.....	.....	.....	...	1	...	...	...
Phœnix	.....	.....	.....	.....	.....	...	.....	...	.....	55.3	+ 4.3	85.1	7	73.7	32.1	8	36.9	53.0	.....	...	.....	...	.....	.....	0.07	— 1.11	.....	.....	.....	.....	...	1	...	...	...
Prescott	5,389	24.82	+.07	30.16	30.46	13	29.79	9	0.67	40.5	+ 3.5	64.1	8	57.0	21.6	15	28.6	42.5	35.9	15	16.4	10	66.0	28.5	trace	— 1.88	2,200	sw.	24	sw.	10	0	1	9	21
San Carlos	.....	.....	.....	.....	.....	...	.....	...	.....	46.0	.....	72.1	18	63.5	20.1	3	28.6	52.0	.....	...	.....	...	.....	.....	0.00	.....	.....	.....	.....	.....	...	0	...	...	...
Willcox	.....	.....	.....	.....	.....	...	.....	...	.....	45.8	.....	82.0	3	69.4	15.0	23	22.3	67.0	.....	...	.....	...	.....	.....	0.08	.....	.....	.....	.....	.....	...	1	...	...	...
Yuma	141	29.94	+.05	30.06	30.25	13	29.86	9	0.40	59.3	+ 3.4	79.3	18	72.5	34.3	11	47.3	45.0	32.6	18	18.1	15	47.7	38.1	0.00	— 0.44	4,025	n.	23	nw.	10	0	0	3	28
Keeler	3,622	26.45	.....	30.13	30.44	13	29.67	9	0.77	44.7	.....	62.4	20	54.7	30.2	11	36.1	32.2	26.5	20	12.5	7	49.7	26.5	0.00	.....	1,959	sw.	29	s.	9	0	1	14	16
Middle plateau.																																			
Fort Bidwell	4,615	25.46	.....	30.18	30.59	13	29.79	8	0.81	38.4	.....	55.4	18	46.5	16.6	21	28.8	38.8	31.8	1	8.4	22	80.8	32.6	4.25	.....	4,742	w.	30	w.	19	17	17	10	4
Winnemucca	4,358	25.73	+.05	30.19	30.68	13	29.78	9	0.90	37.1	+ 5.1	61.3	19	47.6	15.8	2	28.6	45.5	32.0	2	6.9	30	64.3	25.4	0.83	— 0.40	6,436	sw.	29	sw.	24	8	7	16	8
Frisco	6,406	23.78	.....	30.06	30.50	13	29.61	9	0.83	39.0	.....	57.2	16	46.2	18.2	21	31.1	39.0	22.2	13	9.5	18	56.1	23.5	0.05	.....	6,058	sw.	43	sw.	9	1	2	12	17
Salt Lake City	4,348	25.76	+.07	30.22	30.73	13	29.73	9	1.00	36.6	+ 3.7	55.7	28	44.0	19.0	1	28.2	36.7	25.6	8	6.1	10	74.6	28.7	1.27	— 0.16	2,239	se.	28	sw.	24	12	7	17	7
Montrose	5,780	24.38	.....	30.18	30.61	13	29.64	10	0.98	32.1	.....	53.3	9	44.4	10.7	21	20.6	42.6	31.5	20	8.3	30	66.7	21.7	0.50	.....	3,176	se.	20	nw.	18	4	6	10	15
Fort Bridger	6,643	23.35	.....	30.14	30.55	13	29.73	26	0.82	30.0	.....	49.0	1	38.6	5.6	11	20.6	43.4	32.2	9	9.8	17	69.6	20.6	0.32	.....	9,640	w.	40	nw.	26	5	3	23	5
Northern plateau.																																			
Boisé City	2,750	29.30	.....	30.20	30.71	13	29.73	26	0.98	37.7	+ 5.7	60.2	8	44.0	21.2	1	30.2	39.0	22.7	6	6.6	15	79.7	31.4	2.64	+ 0.43	2,672	se.	18	se.	8	19	12	14	5
Cœur d'Alene	.....	.....	.....	.....	.....	...	.....	...	.....	32.8	.....	47.0	7	36.5	10.0	27	29.1	37.0	.....	...	.....	...	.....	.....	4.29	+ 1.94	.....	.....	.....	.....	...	22	...	...	...
Ashland	.....	.....	.....	.....	.....	...	.....	...	.....	43.0	.....	63.0	12	51.0	24.0	1	35.0	39.0	27.0	15	8.0	7	.....	.....	4.66	.....	.....	.....	.....	.....	...	20	...	...	...
Fort Klamath	.....	.....	.....	.....	.....	...	.....	...	.....	34.3	.....	51.0	3	42.3	15.0	23	26.2	36.0	.....	...	.....	...	.....	.....	6.55	.....	.....	.....	.....	.....	...	24	...	...	...
Lakeview	.....	.....	.....	.....	.....	...	.....	...	.....	37.4	.....	53.0	14	44.7	16.5	21	30.1	36.5	28.0	14	3.0	28	.....	.....	3.13	.....	.....	.....	.....	.....	...	17	...	...	...
Linkville	.....	.....	.....	.....	.....	...	.....	...	.....	41.3	.....	57.7	31	49.1	24.2	21	33.5	33.5	.....	...	.....	...	.....	.....	2.27	.....	.....	.....	.....	.....	...	14	...	...	...
Fort Spokane	.....	.....	.....	.....	.....	...	.....	...	.....	32.8	.....	55.0	14	37.9	12.0	28	27.8	43.0	.....	...	.....	...	.....	.....	3.83	.....	.....	.....	.....	.....	...	21	...	...	...
Spokane Falls	1,909	28.00	—.04	30.07	30.53	14	29.67	8	0.85	35.1	+ 3.8	57.2	13	42.3	14.4	27	30.3	42.8	24.8	26	6.3	3	90.8	32.7	3.87	+ 1.57	3,048	sw.	25	sw.	13	23	18	11	2
N. Pac. coast region.																																			
Fort Canby	179	29.73	—.07	29.93	30.41	13	29.59	8	0.82	47.5	.....	58.0	19	51.3	36.7	16	43.6	21.3	14.3	16	3.8	25	92.6	45.3	17.35	.....	13,373	se.	58	s.	28	28	24	7	0
Neah Bay	.....	.....	.....	.....	.....	...	.....	...	.....	47.5	.....	59.0	11	53.9	28.0	26	41.5	31.0	.....	...	.....	...	.....	.....	30.70	.....	.....	.....	.....	.....	...	20	...	...	...
Olympia	36	29.94	—.04	29.99	30.46	13	29.58	28	0.87	44.6	+ 4.4	60.2	3	49.2	31.0	26	39.9	29.2	16.4	13	4.8	5	94.0	42.9	13.38	+ 4.19	3,354	s.	17	s.	16	27	20	10	1
Port Angeles	14	29.91	.....	29.93	30.44	13	29.41	28	1.02	40.8	.....	53.4	13	45.4	25.5	26	35.7	27.9	13.6	22	4.6	4	96.5	39.8	7.71	.....	2,356	s.	15	n.	25	28	14	16	1
Pysht	.....	.....	.....	.....	.....	...	.....	...	.....	40.4	.....	55.5	12	42.2	23.0	26	38.5	32.5	.....	...	.....	...	.....	.....	21.61	.....	.....	.....	.....	.....	...	30	...	...	...
Tatoosh Island	86	29.78	—.10	29.88	30.39	13	29.45	28	0.95	45.9	.....	54.5	13	49.3	28.0	26	42.2	26.5	18.8	27	3.2	30	90.9	43.3	25.84	.....	12,452	se.	51	se.	12	31	24	7	0
Astoria	.....	.....	.....	.....	.....	...	.....	...	.....	47.1	.....	59.0	12	51.9	39.0	1	43.1	20.0	.....	...	.....	...	.....	.....	16.89	.....	.....	.....	.....	.....	...	31	...	...	...
Portland	88	29.94	—.02	30.03	30.43	13	29.69	8	0.74	45.5	+ 4.6	65.4	13	50.8	29.7	27	40.2	35.7	19.7	31	4.0	25	89.4	42.3	11.52	+ 3.37	3,995	s.	24	s.	15	24	18	12	1
Roseburg	523	29.53	+.03	30.10	30.45	13	29.69	27	0.76	47.0	+ 5.4	65.8	12	54.9	31.5	1	40.7	34.3	23.6	23	6.6	11	86.7	43.0	7.30	+ 0.97	2,078	ne.	24	se.	28	24	14	13	4
Walla Walla	1,018	28.99	.....	30.11	30.48	13	29.73	8	0.75	39.7	.....	63.2	13	47.9	13.3	28	33.7	49.9	26.4	1	5.5	27	79.0	32.8	4.41	.....	4,622	sw.	26	sw.	24	17	10	19	2
Mid. Pac. coast reg.																																			
Cape Mendocino	637	29.42	+.08	30.10	30.38	13	29.68	28	0.71	50.8	+ 1.1	63.8	18	55.4	42.3	10	47.8	21.5	12.4	2	4.1	24	88.6	47.5	3.49	+ 0.98	18,815	se.	88	s.	28	16	9	20	2
Red Bluff	332	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...
Sacramento	64	30.11	+.06	30.16	30.40	13	29.86	8	0.54	49.2	+ 2.4	65.2	2	57.6	32.0	1	42.2	33.2	32.2	2	5.5	26	82.9	43.8	2.21	— 2.03	3,294	se.	25	se.	29	6	8	11	12
San Francisco	60	30.12	+.08	30.17	30.38	13	29.90	8	0.48	53.1	+ 1.3	66.0	18	58.9	43.3	2	48.4	22.7	18.4	3	4.0	5	82.4	47.7	2.07	— 2.86	3,939	n.	20	w.	1	7	12	10	8
S. Pac. coast region.																																			
Los Angeles	339	29.75	+.05	30.08	30.25	11	29.93	20	0.32	55.7	+ 0.6	84.8	14	67.3	37.3	3	45.5	47.5	33.6	13	9.9	21	79.1	48.6	0.26	— 3.41	3,671	ne.	20	nw.	10	3	1	12	18
San Diego	67	30.04	+.06	30.08	30.24	11	29.94	20	0.30	56.0	+ 0.4	75.5	19	63.4	40.5	11	49.2	35.0	24.5	19	7.6	30	82.2	50.0	0.10	— 2.12	2,719	n.	16	n.	30	2	7	9	15

Meteorological record of voluntary observers and Army post surgeons, December, 1886.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
	°	°	°	Inches
Alabama.				
Greensborough	70	22	45.8	2.11
Livingston	71	20	45.8	2.48
Mount Vernon B'ks.	71	20	49.3	1.42
Arizona.				
Apache, Fort	80	26	53.0	0.10
Arkansas.				
Lead Hill	67	0	32.5	1.51
British Columbia.				
New Westminster	.....	.....	.....	15.89
California.				
Alcatraz Island	62	44	51.9	1.85
Angel Island	71	42	53.2	2.00
Benicia Barracks	62	38	51.6	1.42
Bidwell, Fort	55	20	39.9	3.92
Fall Brooke	84	38	53.9	0.30
Gaston, Fort	61	32	48.8	15.81
Mason, Fort	63	44	53.6	1.36
Nicolaus	74	31	50.0	1.99
Oakland	63	36	52.0	3.60
Oroville	70	37	52.2	2.75
Presidio of San F	68	39	52.4	1.18
Princeton	72	27	49.3	1.57
Sacramento	63	26	47.3	2.13
Salinas	77	32	49.8	0.72
Santa Barbara	82	40	55.8	0.86
Susanville	54	20	38.0	2.23
Colorado.				
Colorado Springs	61	0	33.5	0.16
Lewis, Fort	58	5	30.1	0.26
Connecticut.				
Bethel	.....	.....	.....	3.30
Hartford	44	2	22.8	4.31
North Colebrook	47	— 2	21.4	1.35
Voluntown	54	1	.....	6.15
Dakota.				
Abr. Lincoln, Fort	43	—34	2.5	1.20
Henry	39	—22	8.1	0.25
Meade, Fort	53	—24	20.5	0.72
Pembina, Fort	33	—35	—0.7	1.70
Richardson	38	—35	7.2	0.90
Sisseton, Fort	40	—37	4.1	0.32
Sully, Fort	51	—23	9.9	0.74
Totten, Fort	39	—34	1.6	0.49
Webster	44	—37	1.4	2.32
Yates, Fort	40	—44	5.8	1.60
District of Columbia.				
Distributing reserv'r	46	13	30.8	2.77
Kendall Green*	50	14	36.8	2.45
Receiving reservoir	46	10	29.9	2.54
Rock Creek	50	14	33.9	.....
Florida.				
Archer *	78	24	56.0	3.52
Alva*	83	34	59.2	4.45
Duke	80	29	53.3	2.56
Meade, Fort	.....	.....	.....	2.30
Manatee	84	38	59.5	1.78
Limona *	82	32	62.6	1.90
Tallahassee	72	25	51.0	4.85
Georgia.				
Athens	57	16	39.1	4.39
Forsyth*	65	33	46.1	3.18
Milledgeville	65	19	43.4	3.25
Quitman	73	26	.....	2.65
Idaho.				
Boise Barracks	61	21	37.8	2.28
Cœur d'Alene, Fort	58	9	34.1	5.38
Illinois.				
Anna *	56	6	30.4	3.25
Bloomington	64	—16	.....	.....
Collinsville	53	— 4	24.6	1.88
Charleston*	53	— 9	22.6	1.92
Geneseo *	55	—25	13.5	0.81
Mattoon *	54	— 8	24.7	1.88
Pekin *	54	—19	19.4	1.18
Peoria	56	—15	23.0	0.89
Riley	50	—23	15.4	1.13
Rockford	49	—18	18.2	1.65
Sandwich	58	—22	19.9	1.30
South Evanston	56	—21	.....	1.94
Sycamore	53	—24	17.0	1.54
Windsor	54	— 9	23.1	1.85
Indian Territory.				
Gibson, Fort	69	— 3	34.0	0.04
Supply, Fort	69	— 5	31.4	0.00
Indiana.				
Butlerville *	63	— 4	27.1	3.22
Fort Wayne*	64	0	26.0	1.94
Jeffersonville	60	4	29.1	2.52
Laconia	.....	.....	.....	2.17
La Grange	52	— 5	19.4	.....
Logansport*	57	— 8	24.2	2.83
Lafayette	60	—17	22.5	1.96
Manzy	58	— 5	20.4	3.14
Monticello	56	—14	.....	.....
Sunman*	53	— 3	25.1	2.70
Vevay	60	4	29.6	2.89
Iowa.				
Bancroft	42	—24	10.3	1.32
Cedar Rapids *a*	50	—20	16.5	.....
Cedar Rapids *b*	33	—28	13.3	.....
Cresco	43	—32	9.1	0.80
Des Moines	54	—28	16.9	.....
Independence *	46	—26	13.6	0.84
Monticello *	53	—29	14.2	0.84
Mount Vernon	51	—27	14.2	.....
Muscatine	48	—26	10.6	0.71
Kansas.				
Allison	68	— 2	26.3	trace
Blue Rapids*	59	— 7	26.0	0.88
Elk Falls	.....	.....	.....	0.20
El Dorado	59	— 4	27.8	0.19
Emporia	59	— 9	26.1	0.56
Globe	59	—12	22.4	0.80
Hays, Fort	66	— 9	27.4	0.68
Lawrence	58	— 6	24.0	0.83
Manhattan *a*	60	— 7	23.5	1.39
Manhattan *b*	62	— 5	24.3	1.58
Minneseah	62	— 5	27.2	0.22
Riley, Fort	59	— 8	24.3	0.62
Salina	52	— 2	29.4	1.05
West Leavenworth	59	— 5	.....	2.10
Wyandotte	59	— 7	24.4	1.18
Wellington	62	— 4	28.3	0.08
Wakefield	58	— 4	26.0	1.20
Yates Centre	60	—11	25.5	0.49
Kentucky.				
Frankfort	64	1	28.9	3.52
Richmond	59	4	30.4	3.89
Louisiana.				
Grand Coteau	72	22	52.2	3.26
Liberty Hill	.....	.....	.....	2.11
Maine.				
Bar Harbor	52	—10	.....	3.30
Cornish *	46	— 7	20 0	1.96
Gardiner	52	—10	23.3	4.08
Orono *	47	—15	18.1	6.38
Maryland.				
Cumberland	44	8	29.1	1.77
Emmittsburg	46	9	28.0	2.89
Fallston*	51	11	28.6	4.22
Great Falls	50	10	29.6	3.07
McDonough	51	10	29.4	2.39
McHenry, Fort	53	14	31.3	1.29
New Midway	50	12	32.1	1.93
Woodstock	50	6	29.0	2.11
Massachusetts.				
Amherst *a*	49	1	23.0	3.61
Amherst *b*	48	5	25.6	3.12
Blue Hill Obs'y	51	3	25.1	5.54
Deerfield	50	0	23.5	2.98
Dudley	50	1	22.1	4.06
Fall River	48	8	28.4	5.25
Milton	52	9	28.9	4.16
New Bedford	52	7	29.9	6.92
North Truro	.....	.....	.....	2.58
Princeton	48	— 2	21.9	4.21
Somerset *	57	6	28.4	5.54
Taunton	54	5	27.7	3.74
Westborough	46	4	28.3	4.06
Williamstown	49	0	22.1	4.04
Worcester	47	4	24.6	4.24
Michigan.				
Birmingham	43	— 9	.....	2.03
Harrisville *	50	—10	.....	.....
Hudson	49	—13	.....	2.65
Kalamazoo	48	— 2	25.0	2.02
Lansing	50	—10	19.6	1.22
Manistique	42	—24	6.8	1.37
Mottville	52	— 8	.....	1.63
Pentwater	48	—22	.....	2.94
Swartz Creek	47	—14	17.8	1.95
Thornville	47	—12	19.6	3.12
Traverse City	46	— 7	.....	3.16
Minnesota.				
Snelling, Fort	38	—28	7.3	0.98
Missouri.				
Carthage	60	—10	31.5	0.90
Centreville	66	— 6	.....	2.42
Central College*	60	— 8	.....	0.79
Conception	55	—18	19.6	1.70
Montana.				
Keogh, Fort	55	—30	19.0	0 34
Missoula, Fort	50	3	30.6	1.90
Nebraska.				
Brownville	54	— 8	22.0	1.00
Crete	57	—11	18.0	0.57
De Soto *	49	—13	16.4	1.58
Fremont *	52	—12	18.2	1.63
Genoa	59	—14	17.0	1.22
Hay Springs *	50	—13	19.9	0.60
Marquette	.....	.....	.....	1.13
Niobrara, Fort	62	—18	19.1	0.80
Sidney, Fort	57	— 3	28.0	0.33
Stockham	.....	.....	.....	0.41
Tecumseh	57	— 8	22.0	2.00

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
	°	°	°	Inches
Nevada.				
Carson City	64	16	40.8	0.72
McDermit, Fort	56	18	37.4	2.52
New Hampshire.				
Antrim	.....	.....	.....	4.35
Ashland	.....	.....	.....	4.40
Belmont	.....	.....	.....	4.50
Berlin Mills	49	—22	.....	2.99
Bristol	.....	.....	.....	4.05
Lake Village	.....	.....	.....	4.75
Nashua	49	1	23.9	4.51
Wier's Bridge	.....	.....	.....	4.26
Wolfborough	.....	.....	.....	5.00
Woodstock	.....	.....	.....	4.25
New Jersey.				
Beverly *	53	6	28.3	3.35
Clayton *	60	2	28.3	3.86
Moorestown	53	8	28.3	4.01
Paterson	50	10	28.0	1.93
Readington	54	12	32.4	.....
Roseland	50	— 2	.....	3.22
South Orange	48	14	28.9	3.55
Upper Montclair	51	3	26.8	1.62
New Mexico.				
Bayard, Fort	77	23	46.0	0.00
Gallinas Spring	74	22	.....	0.25
Selden, Fort	72	17	44.6	0.00
Union, Fort	69	8	38.4	0.45
Wingate, Fort	57	14	37.1	0.10
New York.				
Auburn	47	— 3	24.2	2.95
Brooklyn	62	12	27.2	.....
Cooperstown *	46	— 3	21.0	2.00
Factoryville*	46	— 4	22.3	0.77
Humphrey	44	— 6	20.1	2.67
Ithaca	48	— 4	23.6	1.61
Le Roy	46	— 8	21.0	0.88
Madison Barracks	45	—16	19.7	1.88
Menand	44	— 1	21.6	1.89
Niagara, Fort	48	1	24.9	1.00
North Volney *	45	— 7	21.5	.....
Palermo*	43	—14	19.3	2.97
Penn Yan	.....	.....	.....	1.51
Setauket	56	11	30.6	4.43
West Point	54	5	26.3	3.00
White Plains	51	10	27.8	2.19
North Carolina.				
Chapel Hill	64	15	36.7	4.13
Flat Rock	54	10	33.5	5.20
Lenoir	52	15	.....	.....
Lincolnton	49	18	34.2	1.89
Raleigh	63	17	39.0	3.00
Statesville*	55	18	36.5	3.08
Wake Forest	59	13	38.6	3.63
Weldon	66	8	36.6	3.76
Ohio.				
Cleveland	53	0	25.5	4.00
College Hill*	40	— 5	27.7	2.62
Elyria	55	— 4	35.4	3.58
Garrettsville	51	—10	23.4	2.82
Hiram	50	— 3	22.7	2.84
Jacksonborough*	60	— 4	24.6	3.05
Napoleon	52	1	24.1	2.57
North Lewisburg	58	— 1	25.2	3.45
Portsmouth	62	6	30.4	2.42
Tiffin *a* *	52	2	23.4	3.51
Tiffin *b*	53	2	21.7	30.8
West Milton	65	0	28.0	3.50
Wauseon	56	— 5	19.3	3.07
Westerville	59	1	26.0	1.95
Yellow Springs	56	— 2	26.1	2.71
Oregon.				
Albany*	64	39	49.5	10.31
Bandon*	57	32	48.1	11.97
East Portland*	60	28	.....	11.34
Eola *	59	37	47.0	9.08
Gardiner	65	32	.....	13.97
La Grande	51	22	.....	4.64
Mount Angel*	64	37	48.0	12 45
Pennsylvania.				
Altoona	53	8	31.6	0.99
Blooming Grove *	50	0	18.4	2.40
Bethlehem	49	4	26.7	3.66
Catawissa *	52	0	26.0	2.36
Drifton	50	1	21.8	2.64
Dyberry	44	1	21.5	2.32
Easton	.....	.....	.....	3.86
Fallsington	50	7	26.4	3.50
Franklin*	42	0	18.2	3.36
Grampian Hills	46	0	21.5	2.94
Meadville	56	8	27.3	.....
Phillipsburg *	47	—10	22.3	4.80
Quakerstown*	49	6	25.9	2.43
Wellsborough *	45	— 6	23.9	1.50
West Chester	50	6	27.5	4.88
Wilkesbarre	52	0	24.7	2.27
Wysox	45	0	22.6	1.08
Zionsville	42	12	26.9	1.24
South Carolina.				
Aiken	66	20	45.0	3.26
Kirkwood *	60	19	39.7	2.19
Pacolet	56	17	37.0	2.99
Spartanburg	46	34	39.0	4.55
Statesburg*	65	22	43.9	2.56
Tennessee.				
Ashwood	61	5	33.0	3.41
Milan	64	11	34.2	2.22
Texas.				
Austin *	74	20	51.9	0.19
Cleburne	78	14	41.0	0.05
Comfort	.....	.....	.....	0.20
Concho, Fort	75	8	46.0	trace
Corsicana	.....	.....	.....	0.24
Midland	70	11	42.4	.....
McIntosh, Fort	84	22	57.9	0.00
New Ulm	79	18	52.7	0.97
Ringgold, Fort	87	25	60.3	trace
Silver Falls	73	8	.....	trace
Vermont.				
Burlington	48	—12	20.2	1.70
Charlotte*	40	—10	18.0	2.20
Lunenburg	44	—18	15.4	3.40
Newport	42	—24	15.6	2.81
Post Mills*	38	—22	1.33	2.70
Poultney	53	—15	18.0	2.10
Strafford	44	—14	17.3	2.70
Virginia.				
Accotink	56	2	30.3	2.76
Bird's Nest*	61	19	39.0	5.25
Bruington	.....	.....	.....	2.05
Dale Enterprise*	50	7	31.4	4.15
Marion	.....	.....	.....	5.60
Monroe, Fort	65	16	37.6	5.85
Rappahannock	72	— 2	29.8	2.45
Snowville	53	3	.....	.....
Summit	58	1	29.4	.....
University of Va.	60	9	29.7	2.19
Variety Mills	53	6	30.6	3.06
Wytheville	51	6	29.2	3.35
Washington Territory.				
Bainbridge Island *	62	30	46.2	11.15
Kenewick	61	12	.....	2.28
Tacoma *	60	32	44.3	11.09
Townsend, Fort	62	26	44.7	5.10
Walla Walla, Fort	63	13	40.4	7.86
West Virginia.				
Clarksburg	57	2	28.5	1.23
Helvetia*	60	— 1	28.9	4.57
Middlebrook	53	— 2	26.0	.....
Parkersburg	59	7	29.6	1.98
Wisconsin.				
Delavan	50	—24	15.8	1.36
Embarras *	46	—26	12.7	1.70
Fond du Lac *	44	—27	12.4	1.31
Madison	44	—26	14.2	1.03
Manitowoc	43	—17	17.4	1.45
Prairie du Chien	51	—22	14.6	1.03
Wausau	40	—24	10.0	0.43
Wyoming.				
Laramie, Fort	62	— 5	28.8	0.32
Washakie, Fort	50	— 4	27.2	0.27

the ground with the needle. At 12.05 the rain ended at the Monument.

Of the regular series of observations at the Signal Office, negative values were recorded on December 3d, during fair weather; on December 5th, during hail, with values from 213 to 360 volts; on December 7th, during light snow, value 18 volts; on the 15th, during light rain, throughout the day, the values decreasing from 390 at the first observation to 30 volts at the last observation; on the 16th, during cloudy weather; on the 18th, during rain, from 72 to 420 volts; on the 24th, 18 volts, during cloudy weather.

Snow occurred on December 4th, with zero potential; on the

5th, with positive values; on the 7th, with positive and negative values.

At Baltimore, Maryland, a continuous photographic record has been obtained. Fluctuations during rain are marked on several sheets. The record for forty-eight hours from noon of December 4th to noon of December 6th includes the first snow storm of the season. Beginning at 2.05 p. m. of the 4th the potential continues positive, averaging 100 volts, with a sudden fall almost to zero about 7 p. m.; becoming positive again, slightly higher than before, until about 10 p. m. when the value is doubled, continuing until shortly before midnight when great fluctuations begin, extending to 500 volts on each side of zero, and continuing until 2.30 a. m. High positive values prevail until 7 a. m., decreasing steadily from that time, and become slightly negative about 12 m. of the 5th. Very high positive values prevailed from 12.30 p. m. to 1.45 p. m., followed by variable indications turning to negative, reaching a maximum, 300 volts, shortly after 5 p. m., or about the time the snow ended. It is to be noted that here, as at the other stations, positive electricity predominates during snow. Fluctuations of 1,000 volts on each side occur, during rain, from 10.40 a. m. to 10.50 p. m. of December 15th.

At Columbus, Ohio, negative values occurred on the following dates: on the 9th, in value 3 volts, during smoke almost as thick as fog. This is quite an exceptional instance, as no negative values are recorded for some time preceding and following, and as there appears to be no change in the weather with which this might be connected. On December 13th, negative values occurred during light rain; on the 22d, during light snow; on the 23d, during light rain, and on the 24th, during rain and snow. Snow occurred on November 30th, accompanied with positive values; on December 1st, with positive values; on the 17th, with high positive values; on the 22d, with negative values, and on the 24th, with negative values. The highest positive values were 136 volts on November 30th, during fair weather; 70 volts on December 2d, during clear weather; 92 volts on December 17th, during light snow, and 155 volts on December 29th, during fair weather. Zero potentials occurred on the 14th and 15th, during rain. The highest negative values occurred on the 24th, during snow.

At New Haven, Connecticut, negative values were obtained on the following dates: December 7th, at 9 a. m., value 8.8 volts, during cloudy weather, with high northeasterly winds, and preceding snow two hours. December 13th, at 1 p. m., value 57 volts, during light rain, which continued for some time. December 15th, at 1 p. m. and 3 p. m., during light rain, and preceding snow. December 18th, at 9 a. m. and 11 a. m., during light rain which continued for some time after last observation.

Rain occurred on the 13th, 15th, 18th, and 24th, the last being the only date not accompanied by negative values. The value during the rain, which ended soon after, was 23 volts positive. Snow occurred on December 7th, with values changing from minus 7 volts to plus 540 volts; on December 16th, with high positive values, and on the 27th, with low positive values.

The highest positive values occurred on December 7th, 540 volts, during heavy snow; on the 9th, 93.7 volts, during clear and cloudless weather; on the 10th, 67 volts, during clear weather; on the 16th, 1.307 volts, during light snow, 957, during heavy snow; and on the 17th, 102 volts, during clear weather. The values nearest zero occurred on the 15th, minus 5 volts, during light rain.

The highest negative values were 57 volts on the 13th, during light rain; 688 volts on the 15th, during light rain, and 108.5 volts on the 18th, during light rain. Dense fog is recorded on the morning of the 24th, accompanied with positive electrification, in value 60 volts, the average value for the remainder of the day being 22.6 volts.

At Boston, Massachusetts, a complete set of observations has been obtained. Negative indications occur on the following dates: December 4th, under circumstances to be mentioned later; on December 6th, following snow, during cloudy weather, on the same date in the afternoon, preceding snow by twelve hours; on the 12th, during cloudy weather, preceding rain seven hours; on the 15th, preceding snow twelve hours; on the 18th, preceding rain two and a half hours; on the 20th, during fair weather; on the 23d, preceding rain nine hours; on the 24th, preceding rain four hours; on the 26th, preceding snow two hours; on the 29th, preceding snow twelve hours; on the 30th, during snow, changing to positive; on the 31st, during snow.

Snow occurred on the 5th, accompanied by high positive potentials, increasing during the day; on the 7th, early in the morning, accompanied throughout the day by high positive potentials; on the 15th, at 11.30 a. m., and all day on the 16th, accompanied by high increasing positive potentials; on the 26th, beginning at 11 a. m. and ending at 12.30 p. m., high negative values, changing with the snow to high positive; on the 27th, from 10 a. m. to 1.15 p. m., accompanied by increasing positive values; on the 30th, from early in the morning throughout that day and the following, high negative changing to high positive values, becoming negative for a few hours on the 31st. There are at least three instances in which the coming snow might have been predicted from the indications of the electrometer, viz., on December 6th, 15th, and 29th.

Rain on the 12th was preceded by negative values, and accompanied on the 13th by low positive values. Likewise on the 18th and 24th negative indications preceded the rain sufficiently long to be of practical benefit. The highest positive potentials occurred on the 16th, 405 volts, during heavy snow, and on the 29th, 343 volts, during fair weather. In no case yet has the highest positive value obtained during fair weather exceeded or equalled that obtained during snowfall.

On three dates polar bands were observed, and the behaviour of the electrometer during their prevalence is most interesting. On December 4th the values were at 9 a. m., positive 75; at 11 a. m., positive 142.5; at 1 p. m., minus 226.5; and at 3 p. m., positive 257 volts. There were no noticeable changes in the weather. Polar bands were noticed from 3.30 p. m. to 6 p. m. On the 11th and 14th there are also marked variations in the potential during the continuance of polar bands.

At Ithaca, New York, observations have been continued during the month with the following results: on November 30th, during light snow, negative electricity was followed by heavy snow and positive values; on December 2d very high but variable negative indications occurred in advance of snow, with a change to increasing positive values during the snow; on December 3d negative values, snowing at intervals; on December 4th very high positive values in the forenoon, during snow, decreasing after snow ended, and in the afternoon, during cloudy weather, negative values; on December 5th negative values, during snow; on December 6th negative during light snow, positive after the snow ended; on December 7th negative in advance of snow, decreasing during snow; on December 9th small negative values in the morning, during calm cloudy weather; on December 13th negative values in the morning during threatening weather; on December 14th negative in the morning during threatening weather; on December 16th negative throughout the day, with snow in the forenoon; on December 18th negative during rain; on the 19th negative during snow but decreasing in value; on the 23d negative during threatening weather; on the 25th, in the morning, snow with high positive values, followed by threatening weather and high negative values, followed still later by snow and high negative values; on the 27th positive values during snow, with negative values after the snow had ended; on the 28th negative values during calm fair weather.

Snow, accompanied by high positive values, is recorded on December 15th, 22d, and 26th. December 5th is the most noteworthy of the dates on which snow fell accompanied by negative values; and even this seems to show a decrease in the negative electrification during snow. The values for the

different observations were respectively, —150, —5, —525, and —324 volts, the snow beginning a little before, and ending a little after the last observations.

These observations at Ithaca seem to strongly confirm the statement first made by Wislicenus, and subsequently hinted at by many observers, that a negative value, during winter months and under certain conditions of weather, is almost always an indication of snowfall within a certain distance of the place of observation.

During the snowfall at the place of observation the values are, as a rule, positive, and increasing during the continuance of the snow, or, if negative, the values decrease with the continuance of snow, which is virtually the same condition.

The highest positive values occurred on the following dates, with, in every case, close connection with snow: On 2d, value 800 volts, during light snow; on 3d, value 1,200 volts, during light snow; on 4th, 2,200 volts, during light snow; on the 15th, 2,270 volts, during light snow, 2,500 volts, during heavy snow, 960 volts, during light snow; on the 25th, 615 volts, during light snow; on the 26th, 1,550 to 2,000 volts, during light snow; on 27th, 2,300 volts, following snow one hour.

The values nearest zero were as follows, marked, as a rule, by cloudy, threatening weather: On November 29th, 7 volts, during threatening weather; on December 5th, 35 volts, during threatening weather; on the 7th, 5 volts, and on the 16th, 0 to —10 volts, during threatening weather; and on the 19th, 0 volts, during threatening weather. It may be of interest to note that for the first date given rain followed in twelve hours; on the second date snow followed in three hours; on the third date snow followed in one hour and fifty minutes; and on the fourth date snow followed in thirty minutes. For the 19th no precipitation is recorded within forty hours, although the weather remained for some time threatening and cloudy.

The highest negative values occurred on December 14th, 350 volts, during threatening weather, preceding snow twelve hours; on December 16th, 400 volts, during light snow, which soon ended; on December 18th, 668 volts, during light rain; and on December 25th, during light snow.

On chart vi is plotted the observations made during the month of December, 1886, at Boston, Ithaca, and New Haven. The observations for the present are made at 9 a. m., 11 a. m., 1 p. m., and 3 p. m. In the case of Boston, considering the curve generally, we notice that there are four periods of marked fluctuation, namely, December 5-6th, December 15-16th, December 25th, and December 29th. All these are found to correspond with certain atmospheric disturbances, and it is very evident that these fluctuations are closely connected with the movements of storm-areas. In this special case, the dates mentioned above are dates of heavy snow at Boston. To some extent there is an agreement between the dates of marked fluctuation at Boston and Ithaca, and there seems to be, as might be anticipated, a certain time difference between the two places. Thus, at Ithaca, the highest positive values on the 4th and 15th appear to precede by some hours the highest positive values obtained at Boston. But the snow began at Ithaca on 4th at 7.45 a. m., while it did not not begin at Boston until 8.15 a. m. of the 5th, and on the 15th snow began at Ithaca during the early morning while it did not begin at Boston until 11.30 p. m. of the 15th; or the time difference between certain electrometer indications at two places is connected with their distance from the disturbing influences.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories on the following dates:

Arizona.—4th, 6th, 16th, 28th.
California.—1st, 3d, 4th, 10th, 15th, 16th, 22d, 28th, 31st.
Colorado.—2d, 5th, 9th, 12th.
Dakota.—1st to 4th, 6th, 11th, 23d, 26th, 27th, 29th, 31st.
Florida.—4th, 8th, 25th, 28th.
Georgia.—29th, 31st.
Idaho.—21st.
Illinois.—3d, 7th, 11th, 15th, 16th, 20th, 22d, 23d, 25th, 27th, 28th, 30th.
Indiana.—2d.
Iowa.—3d, 27th, 29th.
Kansas.—1st, 13th, 21st, 22d, 23d, 27th, 28th, 29th, 31st.
Kentucky.—3d.
Maine.—22d, 24th, 30th.
Massachusetts.—4th, 10th, 27th.
Michigan.—7th, 8th, 10th, 11th, 17th, 18th, 20th, 22d, 25th, 27th, 28th, 30th.
Minnesota.—1st to 4th, 11th, 14th, 20th, 22d, 23d, 26th, 27th, 29th.
Missouri.—19th.
Montana.—3d, 5th, 25th, 29th.
Nebraska.—30th, 31st.
Nevada.—26th.
New Hampshire.—6th.
New Jersey.—3d, 4th, 26th, 28th, 29th.
New York.—5th, 10th, 16th, 17th, 23d, 28th, 29th, 30th.
North Carolina.—1st, 8th, 9th, 12th, 14th, 17th, 19th, 24th, 28th.
Ohio.—4th, 7th, 10th, 15th, 20th, 25th, 26th, 28th, 30th.
Oregon.—18th, 20th.
Pennsylvania.—17th, 23d.
South Carolina.—8th, 9th, 28th, 29th.
Tennessee.—8th, 9th, 18th, 20th, 25th, 26th.
Texas.—7th, 27th.
Vermont.—10th, 23d, 30th.
Virginia.—9th, 19th.
Wisconsin.—1st, 11th, 18th, 24th, 27th to 30th.
Wyoming.—1st, 2d, 5th, 11th, 15th, 21st.

LUNAR HALOS.

Lunar halos were observed in the various states and territories on the following dates:

Alabama.—7th, 8th, 9th,
Arizona.—3d to 9th, 28th, 29th.
Arkansas.—7th, 8th, 10th.
California.—1st to 5th, 10th, 11th, 15th, 30th, 31st.
Colorado.—6th, 9th.
Connecticut.—4th, 10th.
Dakota.—2d, 6th, 7th, 9th, 10th, 15th.
District of Columbia.—11th.
Florida.—4th, 7th, 8th, 9th, 17th, 30th.
Georgia.—7th, 8th, 9th, 31st.
Idaho.—2d, 4th, 6th, 10th, 19th.
Illinois.—3d, 6th, 10th, 11th, 14th, 15th, 28th, 30th, 31st.
Indiana.—3d, 6th, 7th, 11th, 18th.
Indian Territory.—7th, 10th.
Iowa.—3d, 6th, 9th, 11th, 13th, 19th, 20th, 31st.
Kansas.—1st, 2d, 3d, 5th, 6th, 9th, 10th, 15th, 16th, 18th, 22d, 29th, 31st.
Kentucky.—3d, 4th, 8th.
Louisiana.—7th, 30th.
Maine.—4th, 6th, 7th, 11th, 29th.
Maryland.—11th.
Massachusetts.—4th, 6th, 10th, 11th, 18th.
Michigan.—4th, 5th, 7th to 10th, 17th, 29th, 30th.
Minnesota.—1st, 5th, 6th, 8th, 9th, 14th, 16th, 17th.
Mississippi.—7th.
Missouri.—6th.
Montana.—5th, 7th, 9th, 12th, 29th.
Nebraska.—6th, 7th, 9th, 10th, 11th, 13th, 31st.
Nevada.—1st, 6th, 10th.
New Hampshire.—4th, 6th, 10th, 14th, 19th.
New Jersey.—4th, 7th, 11th, 14th, 26th.
New Mexico.—6th.
New York.—4th, 5th, 10th, 11th, 28th.
North Carolina.—3d, 4th, 8th, 9th, 13th, 30th.
Ohio.—1st, 2d, 7th, 8th, 11th, 15th, 17th, 30th.
Oregon.—1st, 4th, 5th, 7th, 30th.