TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service Stations, with the average depth at which observations were taken, is given in the table on the left hand side of chart No. II. At the following stations observations were not made on the dates indicated: Galveston, 5th to 26th, inclusive; New London, 28th to 31st; and San Francisco, 13th to 31st.

ATMOSPHERIC ELECTRICITY.

Thunder-storms were reported in the following States from one or more stations on almost every day in the month: New York, New Jersey, Pennsylvania, Virginia, North Carolina, Georgia, Florida Louisiana, Texas, Ohio, Michigan, Indiana, Illinois, Iowa, Wisconsin, Nebraska, Kansas, Colorado, and Washington Territory. In the following States they were reported on the dates indicated: *Maine:* 3rd, 7th, 16th, 20th, 26th to 29th. *New Hampshire:* 15th, 22nd, 26th to 28th. *Vermont:* 1st, 2nd, 3rd, 6th, 9th, 10th, 16th, 18th, 20th, 26th to 29th. *Massachusetts:* 6th, 9th, 10th, 15th, 16th, 20th, 26th, 29th and 30th. *Connecticut:* 2nd, 3rd, 6th, 9th, 10th, 11th, 17th, 20th, 26th and 27th. *West Virginia:* 5th, 10th, 19th and 26th. *South Carolina:* 5th, 12th and 17th. *Alabama:* 4th, 14th and 16th. *Mississippi:* 7th, 8th, 10th to 16th. *Tennessee:* 2nd to 5th, 8th 10th, 12th, 15th, 19th and 27th. *Kentucky:* 1st to 6th, 9th, 10th, 14th and 15th. *Arkansas:* 3rd, 9th and 15th. *Indian Territory:* 3rd, 4th, 18th, 19th, 20th and 31st. *Minnesota:* 2nd, 7th, 8th to 13th, 16th, 24th, 28th and 31st. *Dakota:* 1st to 10th, 18th, 20th to 26th. *Montana:* 1st, 4th, 6th, 10th, 11th, 16th, 25th, 26th and 27th. *New Mexico:* 6th, 15th and 16th. *Utah:* 22nd, 27th and 28th. *Nevada:* 17th. *Idaho:* 6th, 18th and 22nd. *Oregon:* 5th and 18th.

Auroras.—Auroral displays were observed north of the 40th parallel from Maine to Montana, on the 1st, 5th, 6th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 26th, 28th, 29th and 31st. The most extensive as well as the most brilliant was the aurora of the 13th, which was observed at many places along the entire northern boundary of the country from Mt. Washington to Helena, Montana, and as far south as New Corydon, Ind. At Pembina, Dak., it appeared brilliant about 8:30 p. m., and continued through the night. At first the whole northern portion of the sky, from about 140° to 300° azimuth, with an altitude of about 90°, was lit up with a pale, white light, differing in nothing from an ordinary twilight except that its upper margin was more distinctly defined. After remaining in this condition about half an hour some appearance of arches and striation began to appear but no distinct arch was formed. The color also changed from a pale white to yellowish green and the quiescent state gave place to one full of motion. The vibrations also partook of the usual dancing motion, still there were but few merry dancers. The quantity of light given off was very great, owing more, however, to the great extent of the light-giving surface than to the intensity of the illumination. On the summit of Mt. Washington an auroral arch was observed from 8 p. m. to midnight, extending from a little W. of N. to NE. In addition to the arch there were several luminous beams through which the stars were shining brightly. Arch and beams were of a white or very pale yellow color. Burlington, Vt., brilliant, a display from 10 p. m. of the 13th to 1:30 p. m. of the 14th. Dark segment not well defined but arch of light was distinct and very brght; the usual bright spots in the extreme WNW. and ENE. were especially brilliant, the streamers after midnight were numerous but did not extend upward very far, the light was a pale emerald green. At New Corydon, Ind., it was visible from 11 p. m. of the 13th to 1 a. m. of the 14th; at midnight, extension 80°, white arch, altitude 12°, a few beams in the eastern part from 12° to 15° altitude and of a greenish hue. The displays on the other days were faint and merit no extended description. The U. S. S. *Jamestown* at Sitka, Alaska Ty., reports on *January* 18th, 1880, at 1 a. m. "A magnificent aurora borealis appeared, stretching in an arch more less regular, at times perfect, from west around to NE. and for two hours presented a grand spectacle. During the display, which is the first that we have had, our compasses were watched and no effect was produced upon them."

OPTICAL PHENOMENA.

Solar Halos were reported in the following districts on the dates indicated: *New England*, 1st to 6th, 10th, 12th, 16th, 19th, 21st, 22nd, 25th: *Middle Atlantic States*, 5th, 12th, 14th, 18th; *South Atlatnic States*, 31st; *Florida*, 6th, 13th, 18th, 19th, 29th: *Gulf States*, 2nd, 7th, 23rd, 24th, 26th, 31st: *Ohio Valley and Tennessee*, 3rd, 5th, 7th, 10th, 14th, 18th, 23rd, 26th, 28th, 31st; *Lake region*, 1st, 2nd, 3rd, 5th, 11th, 12th, 17th, 22nd, 23rd, 25th, 29th, 31st; *Northwest*, 2nd, 3rd, 4th, 5th, 9th, 17th, 19th, 22nd to 26th; *Utah*, 8th, 15th, 16th; *California*, 12th; *Oregon*, 11th.

Lunar Halos were reported in the following districts on the dates indicated: *New England*, 1st, 21st, 23rd, 24th. *Middle States*, 11th to 14th, 16th, 17th, 20th, 21st, 30th, 31st. *South Atlantic States and Florida*, 12th, 14th, 15th, 17th to 22nd, 24th, 29th. *Gulf States*, 11th, 13th, 18th to 21st, 26th. *Ohio valley and Tennesse:* 11th, 12th, 19th, 21st and 31st. *Lake region:* 11th to 14th, 17th, 18th, 19th and 23rd. *Northwest:* 13th to 21st, 26th and 30th. *Indian Territory:* 15th and 16th.

MISCELLANEOUS PHENOMENA.

Zodiacal Light.—Nashville, 6th, 8th, 25th, 29th and 31st; Summit, Col., 30th; Monticello, Ia., 28th; Yates Centre, Kan., 10th, 26th, 27th and 31st; Fall River, Mass., 7th. Mr. Chas. Hassel-

brink, Havana, Cuba, reports June 25th, zodiacal light visible, 8 to 8:30 p. m., axis inclined to south about 45°; 27th to 30th, imperfectly visible. July 26th to 30th, imperfectly visible and apparently located more toward the south.

Polar Bands.—Gardiner, Me., 25th; Clear Creek, Neb., 21st; Freehold, N. J., 12th; Vineland, N. J., 17th and 18th; Wytheville, Va., 2nd, 16th and 26th.

Locusts.—Dayton, Wash. Ty., 23rd, taking wing, no definite line of travel; Winnemucca, Nev., 3rd, flying southeast in large masses, obscuring the sun; Ft. Douglas, Utah., 5th, in large numbers,

Mirage.—was observed at Duluth on the 13th and at Richmond, Va., on the 15th. In the latter case it occurred about sunset and is described as follows: "the mirage of a steamer, far down the river, was projected on the black background of heavy clouds."

Meteors.—Lansing, Mich., 30th, very brilliant meteor, leaving train visible for 30 seconds. Cincinnati, 10:30 p. m., very brilliant meteor, course southwest, trail visible 10 seconds. Little Rock, Ark., 25th, 9:15 p. m., very brilliant meteor, leaving a train 20° long, lasting about 10 seconds, "bright as moonlight."

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service Stations. Reports from 124 stations show 3,812 observations to have been made, of which 29 were reported doubtful; of the remainder, 3,058 or 80.8 per cent. were followed by the expected weather.

Prairie and Forest Fires.—Summit, Col., 2nd. Near Portland, Or., 16th, 17th, 20th, 24th, 26th. Colorado Springs, Col., 7th and 8th. Eastport, Me., 11th and 14th. In Penobscot and Washington Cos., Me., 20th, fires raging with great fury, causing an immense amount of damage to forests and crops. St. John's, N. B., 16th, fires raging all along the line of the St. John and Maine, and European and North American R. R. Many bridges destroyed and great loss caused to timber and crops.

Earthquakes.—Memphis, Tenn., 13th, between 8:10 and 8:45 p. m., two shocks with interval of about 50 seconds; direction from NNE. to SSW. Low rumbling noise preceded shocks lasting about 10 seconds; motion oscillatory, accompanied by a quivering sensation; windows shook; katydids on trees silenced; furniture rocked and mirrors vibrated. Antrim, N. H., 21st, about 7 p. m., two shocks, with interval of a few seconds. There was a low rumbling sound like a heavy carriage passing by. Houses shook, windows and dishes rattled. These shocks were experienced by several persons living at various places, about two miles from village. Kingston, Jamaica, July 16th, 10.25, p. m., Washington mean-time, slight earthquake, oscillations from N. to S.; lasted about 3 seconds. Ottawa, Canada, 22nd, 2 a. m., "a decided shock, seemed to be going from W. to E., accompanied by a low rumbling noise."

Sun Spots.—The following record of observations, made by Mr. D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent, Nautical Almanac Office, Washington, D. C.:

DATE—July, 1880.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots	
3rd, 6 p. m....	0	0	0	7	0	0	2	13	Faculæ.
4th, 4 p. m....	1	7	1	4	0	0	2	16	Faculæ.
7th, 10 a. m....	0	20†	0	0	0	0	2	36†	Faculæ. Many of the spots small.
9th, 4 p. m....	0	0	1	10	0	0	1	10	Faculæ.
11th, 5 p. m....	0	0	0	0	0	0	0	4	Faculæ.
12th, 8 a. m	0	0	0	0	0	0	0	0	Faculæ.
16th, 10 a. m....	0	0	0	0	0	0	0	0	Large areas of faculæ.
17th, 10 a. m....	0	0	0	0	0	0	0	0	Large areas of faculæ.
18th, 9 a. m....	1	4	0	0	0	0	1	4	
23rd, 2 p. m....	1	16†	0	0	.....	.....	2	20†	
24th, 2 p. m....	0	0	0	0	0	0	2	20†	Faculæ.
26th, 12 m....	2	12	1	8	2	12	3	24†	Many groups of faculæ.
27th, 12 m....	0	0	0	6	0	0	3	18†	Faculæ.
28th, 5 p. m....	0	0	1	6	0	0	2	12	Many groups of faculæ.
29th, 5 p. m..	0	0	0	0	0	0	2	12	
30th, 5 p. m....	0	0	0	0	0	0	2	6	Faculæ.
31st, 3 p. m....	2	6	0	0	1	3	2	6	

†Approximated

Mr. Wm. Dawson, at Spiceland, Ind., reports: 1st, 2 groups, 15 spots; 2d, 2 groups, 6 spots, one large spot in SW. quadrant, observation poor; 4th, 2 groups, 16 spots, large spot gone, new group of 10 spots S. of centre; 8th, 2 groups, 25 spots, three pretty large spots 1′ from SW. edge, 22 spots 9′ east of 3 former spots; 9th, 2 groups, 17 spots; 10th, 2 groups, 10 spots; 12th, only one small spot nearly S. of centre, bright faculæ at W. edge; 13th and 14th, no spots; 15th, one to the S. very near E. edge; 16th, 1 group, 4 spots; 17th, no spots, air poor; 18th, 2 groups, 18 spots, groups near each other, 8′ from E. edge; 19th, 2 groups, 20 spots; 20th, 2 groups, 35 spots, air poor; 22nd, 3 groups, 40 spots; 23rd, 3 groups, 56 spots; 24th, 3 groups, 27 spots, air poor; 25th, 4 groups, 40 spots, new group at E. edge; 26th, 3 groups, 24 spots, two large spots have each divided into 2 spots; 27th, 2 groups, 26 spots, four spots at W. edge, 22 near E. edge, all

small; 29th, 2 groups, 24 spots, mostly very small, air very good; 30th, 1 group, 12 spots; 31st, 2 groups, 10 spots, a long narrow spot very close to E. edge, probably a very large one.

Mr. H. D. Gowey, at North Lewisburg, O., observed spots on the 7th, and from the 21st to the 26th, inclusive. They disappeared by solar rotation.

NOTES AND EXTRACTS.

[American Journal of Science, April, 1880, page 300.]

Observations on the Height of Land and Sea Breezes, taken at Coney Island, by O. T. Sherman.—The following observations were taken at Coney Island with the captive balloons of the American Aeronautic Society, S. A. King, aeronaut in charge. Captain Howgate furnished the observer.

With the exception of the hotels, no height rises to interrupt the flow of the wind. We might expect, therefore, to find the sea breeze and its counter current undisturbed. The standard thermometer employed was of the Signal Service pattern, made by James Green, and carefully tested by the observer. The aneroid barometers were kept compared with a standard mercurial instrument at the surface. The anememeter, of Robinson's pattern, furnished by James Green, was used to measure the velocity of the wind at the top of the ascent, and also at the bottom. In the other cases, the forces were estimated.

The record was commenced as the balloon left the earth and continued without interruption till the balloon attained its highest point. At the top, the velocity of the wind was recorded by a "five minute" observation. On the descent the same plan was followed.

From the barometric readings, reduced to the mercurial standard, the heights were reduced by Loomis' table as given by Guyot. A comparison of these heights with those deduced from the length of the rope in use showed a close agreement. The thermometric readings reduced to the standard thermometer were then plotted in a curve whose ordinates were heights, and the abscissas, the degrees of the thermometric scale. The ascent and descent giving somewhat discordant values, a free hand curve was drawn between them. The positions of the curve are given in the annexed table. The force of the wind was treated in a like manner. The observed directions were then plotted opposite the heights. When discordant at one height, they were referred to that one of the sixteen equal divisions of the compass which lay between them. The whole was then referred to the mean of the times of leaving and regaining the earth, an interval of about fifteen minutes. New York time was employed. The results are given in the following table:

Table showing the direction and force of wind and the temperature at heights from 0 to 1200 feet above the beach at Coney Island, New York.

The first line in the table gives the heights above the ground in feet. The upper numbers indicate the temperature in Fahrenheit degrees. The lower the direction and the velocity of the wind. —— indicates no record of direction, or rather a direction between two neighboring directions.

Day.	Hr.	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
1879.	h m	78.5	76	74.8	74.0	73.5	73.3	73.3						
July 31	10 15	NE. 3	—— 2.3	N. 2	—— 2.1	NNW. 2.3	—— 2.4	NW. 3						
		79.0	77.2	77.0	77.2	77.7	78.2							
"	81	2 46	SW. 2.8	S. 2.6	S. 2.0	S. 1.8	—— 1.8	Calm.			NW *			
		74.0	73.4	73.5	71.0	74.2	75.0							
"	81	7 26	SSW. 2.8	—— 2.8	S. 3.0	—— 3.0	—— 2.8	SSE. 2.2						
		77.0	76.6	75.2	74.3	74.2	74.2							
Aug.	1	9 46	SSW. 3	—— 3	SW. 4	SW. 5.6	SW. 7	SW. 7.5						
		82.0	77.2	76.0	75.2	74.8	74.4							
"	1	10 54	SSW. 5	—— 5	SSW. 5.5	—— 6.0	—— 6.5	SSW. 6.5						
		76.8	75.0	75.2	75.8	76.0								
"	2	9 0	SW. 3	—— 6.3	WSW. 7.0	W. 6.8	W. 6.3							
		84.0	84.2	84.6	85.2	85.6	86.0	86.2	87.0					
"	2	1 55	SSE. 9.0	SSE. 7	S. 5.0	S. 4.5	——	SSW. 5.0	—— 4.5	SW. 4.5					
		70.5	68.2	67.6	67.3	67.0	67.0	66.4	66.2	66.0	65.6	65.3	65.0	64.7
"	10	1 19	NNE. 2.0	—— 5.0	—— 5.4	—— 5.4	N. 6.0	—— 7.5	—— 8.7	—— 8.0	—— 6.0	—— 4.5	—— 5.0	NNW. 5.2	NNW. 5.7
		73.3	72.7	72.2	71.8	70.8	69.5	68.8	68.0	68.0	68.0	67.6	67.2	66.8	
"	10	3 10	NW. .3	—— 5.3	—— 7.5	—— 9.0	—— 11.0	—— 13.5	—— 16.5	—— 16.5	—— 14.0	—— 12.0	—— 11.5	—— 11.7	NNW. 12.0
		72.8	71.0	70.3	69.8	69.2	68.5	68.0	67.5	67.0	66.8	66.4	66.2	66.0	
"	10	5 42	NW. .3	NW. 4	—— 4	—— 3	—— 3	—— 3.8	NW. 4	—— 4	NW. 4	—— 4.0	—— 4.0	—— 4.0	NW. 3.8
		79.0	74.8	73.9	73.0	72.4	71.7	71.2	70.6	70.6	70.3	70.5	70.0		
"	11	2 10	SSE. .8	SSE. 5.3	—— 9.3	S. 8.2	S. 7.0	SSW. 6	—— 5.5	SSW. 5.2	—— 5.0	—— 5.2	—— 7.5	SSW. 10.5	
		74.5	73.2	72.7	72.7	72.7	72.7	72.0	72.0	72.0	72.0	71.5	71.3	71.1	
"	12	10 50	S. 5	—— 5	—— 4.5	SW. 4.5	SW. 4.5	WSW. 3.6	WSW. 4.0	W. 4.5	—— 5.0	WNW. 6	—— 6	NW. 6.8	
		78.0	71.5	71.3	70.6	70.0	69.6	69.5	69.2	69.2	69.2	68.7	68.2	68.3	
"	13	11 30	SSE. 7.5	SSE. 8.4	SSE. 8.4	S. 8.4	SSW. 7.6	—— 5.0	SW. 3.8	WSW. 4.2	W. 4.7	WNW. 5.8	WNW. 6.8	WNW. 10.5	WNW. 12
		80.3	80.0	79.2	78.7	78.2	77.8	77.4	77.8					
"	14	1 42	SSE. 7.2	—— 4	—— 4.5	S. 7.5	SW. 9.8	SW. 11	—— 11.5	W. 12					

* Shown by a toy balloon as compared with the captive.

A slight inspection of the return rates of change shows that the return current has influenced the temperature of the air around it to a noticeable extent.

We may consider the observed wind as composed of the wind produced by a great storm in progress, and the sea or land breeze. The sea breeze blows perpendicular to the coast, or about southeast. To obtain the storm wind, I examined the 7:35 A. M. maps of the Signal Service, but since the observations were taken almost directly under areas of maximum pressure, the examination gave no useful results. I therefore adopted a method based upon the following considerations. Of all those directions and velocities which combined with the direction of the sea breeze can produce