

occurred at stations to the south of the centre: on the 24th, at Dodge City, 74°, Fort Gibson, 77°, and Denison, Tex., 78°; 25th, Shreveport, 80°, Montgomery, 73°, Chattanooga, 69°, Louisville, 65°, and Cleveland, 47°; 26th, Savannah, 74°, Wilmington, 73°, Fort Whipple and Philadelphia, 60°, Rochester, 46°, and Boston, 56°. The sudden fall of temperature in advance of high area No. X produced the largest daily ranges of the month at the majority of stations over the region traversed. Cautionary Signals ordered up at Milwaukee, Grand Haven and Ludington, and along the Atlantic coast from Smithville to New York, on the afternoon of the 24th; from New Haven to Boston on the morning and at Portland and Eastport at midnight of the 25th, were all justified. Maximum velocities—Milwaukee, NW., 34; Cape Lookout, NE., 44; Kittyhawk, NE., 50; Cape May, S., 40, and NW., 46; Sandy Hook, SE., 28; Wood's Holl, S., 48, and Portland, N., 36.

No. IX—was central over southwestern Montana and Wyoming on the 27th, with cloudy weather and high temperatures near or south of the centre, and cold easterly winds and snow in the Missouri and Mississippi valleys in rear of high area No. X. 28th, centre moved southeast to Iowa and thence to Wisconsin; cloudy or partly cloudy weather, with light rain or snow, prevailed thence to the Lake region; northerly winds, with snows, followed by clear weather, gradually spread southward to Kansas and Missouri. Cautionary Signals ordered up at Milwaukee, Grand Haven and Ludington on the morning, and along the Atlantic coast from Smithville, N. C., to New York on the afternoon of the 28th, were only justified at the Lake stations and on the North Carolina coast. Maximum velocities: Milwaukee, S. 30 and Cape Lookout, NE. 46.

INTERNATIONAL METEOROLOGY.

On chart No. IV are shown the probable tracks of storm-centres over the oceans, deduced from data received at this office up to February 8th; and in the upper right hand corner will be found an index to the same. In the upper left hand corner is a small table giving the approximate wind direction and probable maximum velocities (in miles per hour) attending the depressions on the dates given. Below is a brief notice of these, and also of some over the Southern Hemisphere.

Atlantic Ocean.—No. I, is a continuation of area No. VIII of the *January Review*; it probably moved rapidly east-northeast and developed into a severe storm on January 18th and 19th over the Middle Atlantic, after which it passed southeast over Spain. No. II, is a continuation of No. VII of *January Review*, and probably followed the track shown on chart in advance and to the north of the preceding area. No. III, is a continuation of area No. X of the *January Review*, and probably passed northward over Newfoundland. No. IV, is a continuation of area No. XII of the *January Review*, which moved east-northeast and on the 25th developed into quite a severe storm about lat. 54° N., long. 30° W. No. V, is a continuation of area No. XIII of the *January Review*; it passed northward on the 27th, being opposed by high pressures over the East Atlantic. No. VI.—Low pressures were indicated in the positions marked upon the chart on January 29th and 30th, and on February 2nd a "violent revolving storm," with tremendous sea, was reported in 43° N., 24' W.; this was probably near the centre of the low area which, on the 4th, passed southeastward over France. No. VII is a continuation of area No. I of the present REVIEW, which moved northeastward with increasing energy, and developed into a somewhat severe storm north of the 50th parallel. No. VIII is a continuation of No. II of the present REVIEW; it passed between the Bermudas and Nova Scotia on the 6th; on the 7th and 8th was attended over mid-ocean by rainy and squally weather, and on the 9th and 10th developed into a severe storm east of the 50th meridian; on the 11th it probably divided into two centres as shown. *South Atlantic Ocean.*—At Montevideo, December 31st, 1878, a heavy SW. gale, or "pampero," commenced, lasting until the morning of January 2nd, 1879; the barometer fell to its lowest level, 29.48, at 11 p. m., December 31st; the storm was preceded by NW. and N. winds, and accompanied by thunder, lightning and rain; the maximum velocity of wind was 65 miles per hour. On December 30th, in latitude 30° S., 28° W., a sharp shock of an earthquake was felt by the British ship "Coolen." *North Pacific Ocean.*—November 27th to 30th, from 38° N., 168° W. to 34° N., 176° W., fresh to strong westerly gales, with heavy seas, hail and sleet, lowest barometer, 29.50. January 15th, at 10 p. m., a thunder-storm passed over Yokohama attended with rain and hard squalls, during which the pressure fell to 29.61, wind SW., moderate gale. *South Pacific Ocean.*—November 13th, Bark Ophelia (from San Francisco to Queenstown) passed Pitcairn Island November 10th, and on the 13th entered a "heavy cyclone." *Victoria, Australia*, on September 24th and 25th, 1878, an area of low pressure passed over this colony, during which the barometer at Melbourne fell to 29.192 (or 0.827 below the average for September); it was accompanied by gales and squally weather, with thunder, lightning and hail showers. *Indian Ocean*, on December 15th, 1878, a cyclone, probably traveling southward, was encountered by the following vessels: Ship John O'Gaunt, lat. 20° S., long. 74° E., "hurricane"; Ship Charlotte Croom, 18° 49' S., 68° 23' E., "cyclone, barometer fell to 28.80"; Bark Dulcimer, 21° S., 73° E., "cyclone, beginning at ENE., veering to N. and ending at NNW., bad weather lasting 24 hours; Bark "Anglo-Norman," (left Amoy October 31, passed Cape of Good Hope, January 7th,) no date 20° S., 70° E., "cyclone travelling SSW., barometer 28.66, hove to 36 hours, under bare poles, terrific sea washing decks. *Bay of Bengal.*—No. I (see chart No. IV) probably formed over the Gulf of Martaban from November 12th to 17th; on the 17th the lowest pressure was southwest of Burmah, with E. gales and rain at Diamond Island; on the morning of the 21st it was east of Masulipatam, and heavy rains, with thunder and lightning from the E., prevailed along the coast northwards. The S.S. "Mira" (at Calcutta, Nov. 20th) reported bad weather from 10° N. 84° E. to 15° N. 86° E. No. II. On November 29th rain and moderate squalls were suspected to the south or southeast of Cape Negrais, with strong E. winds at Diamond Island;

30th, doubtful weather was indicated from Cape Negrais and the Andamans to the opposite coast of Madras; December 1st to 4th, falling pressure and cloud and rain prevailed on the Coromandel coast, and on the 5th a well-defined depression appeared, which moved northward on the 6th and 7th; very heavy rains fell during these days to the northeast of the storm-centre, the excessive amount of 21.2 inches being recorded at Vizagapatam during the 48 hours preceding 10 a. m. of the 8th; at this place the wind veered from NE. to SSE. and S. After this storm the northeast monsoon probably became fully established over the bay.

TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II illustrate the general distribution of air for the month. By reference to the table on the left side of the chart it will be seen that the temperature of the present month has been very generally below that of the mean for several years past, east of the Rocky mountains, the deviation averaging from two to three degrees, except over New England and the St. Lawrence valley, where it is from four to six degrees below. Over the Western Plateau the temperature has been decidedly above the normal.

Minimum and Maximum Temperatures, respectively: Maine—Orono, -10° and 43° ; Eastport, 0° , 46° ; Portland, 6° , 45° . New Hampshire—Mt. Washington, -23° , 14° ; Dunbarton, -10° , 46° . Vermont—Burlington, -7° , 38° ; Newport, -26° , 36° . Massachusetts—Rowe, -6° , 36° ; Boston, 4° , 56° ; Springfield, 4° , 47° . Rhode Island—Newport, 10° , 48° . Connecticut—New London, 8° , 49° ; Colebrook, -4° , 46° ; South-ington, 0° , $4, 51^{\circ}$. New York—Madison Bks., -25° , 40° ; Plattsburg Bks., -16° , 35° ; Schroon Lake, -20° , 38° ; Buffalo, -2° , 43° ; New York city, 8° , 49° ; Rochester, -2° , 46° . New Jersey—Princeton, 1° , 55° ; Atco, 8° , 63° . Pennsylvania—Tioga, -13° , 42° ; Philadelphia, 8° , 60° ; Pittsburg, 4° , 54° ; Catawissa, 1° , 46° . Delaware—Dover, 14° , 62° . Maryland—Woodstock, 7° , 55° ; New Market, 10° , 50° ; Baltimore, 12° , 58° . District of Columbia—Washington, 11° , 58° . Virginia—Wytheville, 6° , 65° ; Snowville, 10° , 48° ; Lynchburg, 17° , 57° ; Norfolk, 22° , 70° . West Virginia—Helvetia, -4° , 60° ; Morgantown, 12° , 60° ; Wellsburg, 2° , 48° . North Carolina—Highlands, 11° , 57° ; Weldon, 24° , 75° ; Wilmington, 23° , 72° . South Carolina—Aiken, 26° , 69° ; Charleston, 30° , 72° . Georgia—McPherson Bks., 14° , 71° ; Savannah, 31° , 74° ; Augusta, 27° , 74° . Florida—Key West, 56° , 82° ; St. Marks, 29° , 71° ; Houston, 34° , 78° . Alabama—Green Springs, 20° , 72° ; Mobile, 34° , 75° ; Montgomery, 28° , 73° . Mississippi—Brookhaven, 26° , 69° ; Vicksburg, 24° , 76° . Louisiana—Okalooska, 26° , 78° ; New Orleans, 38° , 75° ; Shreveport, 25° , 80° . Texas—Concho, 18° , 85° ; Indianola, 36° , 75° ; San Antonio, 32° , 88° ; Castroville, 32° , 91° ; Terrell, 22° , 74° . Ohio—Ruggles, -6° , 53° ; Columbus, 4° , 56° ; Cincinnati, 6° , 61° ; Toledo, 4° , 48° . Kentucky—Louisville, 6° , 65° ; Bowling Green, 5° , 66° . Tennessee—Nashville, 11° , 67° ; Memphis, 16° , 69° ; Chattanooga, 16° , 69° . Arkansas—Mt. Idu, 18° , 74° . Michigan—Alpena, -22° , 40° ; Marquette, -20° , 39° ; Detroit, -3° , 42° ; Northport, -10° , 38° . Indiana—St. Meinrad, -9° , 62° ; Indianapolis, -1° , 58° ; New Harmony, -2° , 61° . Illinois—Rockford, -22° , 44° ; Louisville, -4° , 60° ; Chicago, -6° , 51° ; Cairo, 8° , 67° . Missouri—Frankford, -8° , 62° ; Kansas City, 1° , 75° ; St. Louis, 4° , 65° . Kansas—Ft. Leavenworth, -3° , 71° ; Ft. Wallace, 2° , 84° ; Dodge City, 6° , 74° . Wisconsin—Neilsville, -36° , 38° ; Ashland, -30° , 29° ; Madison, -12° , 46° ; La Crosse, -21° , 45° . Iowa—Nora Springs, -20° , 43° ; Des Moines, -12° , 52° ; Vail, -16° , 57° . Nebraska—Norfolk, -16° , 67° ; Omaha, -9° , 60° ; North Platte, -13° , 47° ; Ft. Sidney, -13° , 69° . Indian Territory—Ft. Sill, 16° , 79° ; Ft. Gibson, 14° , 77° . Minnesota—Breckenridge, -34° , 39° ; St. Paul, -22° , 35° . Dakota—Pembina, -44° , 30° ; Yankton, -17° , 62° ; Bismarck, -26° , 74° . Colorado—Pike's Peak, -21° , 26° ; Denver, -3° , 72° ; Ft. Lyons, -10° , 83° . New Mexico—Santa Fe, -3° , 75° ; Ft. Union, -13° , 74° ; Ft. Craig, 14° , 82° . Wyoming Territory—Cheyenne, -6° , 59° ; Ft. Fred. Steele, -20° , 55° . Montana—Virginia City, -9° , 50° . Utah—Salt Lake City, 8° , 68° . Nevada—Winnemucca, 7° , 69° ; Pioche, 5° , 69° . Idaho—Boise City, -9° , 64° . California—Sacramento, 33° , 73° ; Visalia, 32° , 79° ; Los Angeles, 38° , 80° ; San Francisco, 43° , 70° ; Red Bluff, 31° , 76° ; San Diego, 38° , 74° .

Ranges of Temperature.—The monthly ranges will appear from an examination of the minima and maxima just given. Greatest daily ranges vary in New England from 27° at New London and 32° at Eastport to 34° at Boston; Middle States, 17° at Cape May and 27° at Albany to 33° at Cape Henry; South Atlantic States, 23° at Savannah, Smithville, Cape Lookout and Cape Hatteras to 37° at Augusta; Gulf States, 14° at Key West and 18° at Galveston to 33° at Montgomery and Corsicana; Ohio valley and Tennessee, 25° at Indianapolis to 41° at Cincinnati and 35° at Morgantown; Upper Lake region, 27° at Chicago and Grand Haven to 36° at Marquette and Escanaba; Lower Lake region, 23° at Sandusky to 35° at Rochester; the Northwest, 26° at Davenport to 47° at Yankton and 45° at Pembina; Eastern Slope, 39° at Fort Gibson to 41° at North Platte; Rocky Mountains, 22° on Pike's Peak to 44° at Denver and 43° at Santa Fé; Western Plateau, 27° at Salt Lake City to 35° at Winnemucca; California, 20° at San Francisco to 30° at Los Angeles and Visalia and 28° at Red Bluff and Sacramento.

Frost—has occurred quite frequently over the northern sections of the country; in the interior of the Southern States and Texas from the 1st to 4th, 6th to 10th, 13th to 24th, 27th, 28th; along the immediate Gulf coast on the 3rd, 4th, 8th, 9th, 14th, 19th, 20th, 21st, 27th, 28th; and on the Pacific coast, 1st, 2nd, 3rd, 5th, 6th.

Ice formed in the Gulf, South Atlantic and Pacific States as follows: Charlotte, N. C., 17th; Charleston, 2nd, 3rd; Augusta, 21st, 22nd, 27th, 28th; Denison, Tex., 6th, 7th; Gatesville, Tex., 3rd, 6th, (8th, "intensely cold, ice all about,"), 13th, 14th, 18th; Melissa, Tex., 3rd, 15th, 25th, $\frac{1}{4}$ inch; Wilmington, N. C., 21st; Brookhaven, Miss., 2nd, 3rd, 8th, 9th, 14th, 15th, 19th, 20th, 27th, 28th; Fayettee, Miss., 3rd, 19th, 27th; Gainesville, Ga., 17th, $\frac{1}{2}$ in.; Sacramento, Cal., 5th, 6th.