

MONTHLY WEATHER REVIEW,

MARCH, 1881.

(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to April 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 136 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 183 monthly journals and 178 monthly means from the former, and 15 monthly means from the latter; reports from 5 Sunset stations; 255 monthly registers from Voluntary Observers; 62 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from Voluntary Observers in, and the local Weather Services of, Iowa, Nebraska and Missouri, and of the Central Pacific Railway Co.: reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of March, 1881, is shown by isobaric lines (in black) upon chart No. II. The area of highest barometer, which has been moving steadily eastward from the Pacific since November, 1880, and which during the following months of December and January was so marked over the central portions of the country, has during the present month passed far eastward over the Atlantic leaving a remarkably low mean pressure over the eastern sections of the country, particularly from the Ohio valley and Virginia northeastward to Maine. The rapidity and extent of this eastward movement is shown quite forcibly on the wind chart by the general and decided northwesterly trend of the winds eastward of the Rocky Mountains. The regions of maximum pressure are to be found along the immediate Gulf and Pacific coasts, where only immaterial changes have taken place during the month. Compared with March, 1880, the pressure of the present month is strikingly at variance, as is shown by the position of the region of highest pressure, which in 1880 occupied the precise region now embraced by the abnormally low pressures of the present month.

Departures from the Normal values for the month.—The region of greatest departure from the normal covers the eastern portion of the Middle Atlantic and New England States ranging from -0.25 at Norfolk to -0.32 at Wood's Holl; along the South Atlantic and East Gulf coasts the departure ranges from -0.05 at Key West to -0.24 at Kittyhawk; over the Lake region from $+0.01$ at Duluth to -0.18 at Toledo and -0.23 at Oswego; in the Ohio valley and Tennessee, from -0.13 at Memphis to -0.21 at Pittsburg; in the Upper Mississippi and Lower Missouri valleys, from -0.02 at Omaha to -0.14 at St. Louis; in the West Gulf States and Texas, from -0.02 at Corsicana to -0.11 at Vicksburg; westward of the Missouri river and northward of Colorado the pressure is from 0.03 to 0.4 above the normal, while the line of no change passes southwestward from Lake Superior in nearly a direct course to Santa Fe, where it bends northward reaching the Pacific coast at the southern boundary of Oregon. Throughout California the pressure fell from 0.03 to 0.06 below the normal.

Barometric Ranges.—The range of pressure during the month has varied in the extremes from 0.35 inch at Key West to 1.42 inches at Boston. Ranges of 1.00 and above were reported from stations in Oregon, Washington Territory, Idaho and southwestern Montana, throughout the Upper Mississippi and Lower Missouri valleys, the southern portion of the Upper Lake region and thence northeastward to Newfoundland. In Tennessee and from North Carolina south and westward the range nowhere reaches above 0.98, except at Fort Gibson, where it records 1.03, while in general it varies from 0.5 to 0.75, with the lowest ranges along the immediate Gulf coast. The range everywhere increases with the latitude, being on the Pacific coast from 0.51 at San Diego to 1.12 at Olympia, and on the Atlantic coast as given above. Along the Gulf coast the range increases gradually from 0.35 at Key West to 0.74 at Brownsville, Tex.

Areas of High Barometer.—Six such areas are described for the month of March, 1881, though only one (No. I) exercised any special influence on the climatic conditions of the country; but the month is remarkable for deficiency in pressure, especially in the Eastern States. On the New England and Middle Atlantic Coast this deficiency ranges from 2.5 to 3 inches, probably the most notable deficiency that has occurred since the establishment of the Signal Service. It is also worthy of note that the minimum temperatures are not, as is the general rule, associated with the areas of high barometer, but in the majority of instances have, in March, occurred after the passage of the centre of low area and after the veering of winds to the northwest, but before the pressure had reached its maximum or risen above the normal.

No. I.—On the 1st there was a great rise in pressure in Washington Territory and Oregon, following an area of low barometer, which on the previous day advanced to the eastward over British Columbia. At the morning observation of the 2nd the following were the highest reported barometers: Olympia, 30.44 or 0.43 above the normal; Portland, 30.48 or 0.41 above the normal; the rise in pressure for one day at these points being respectively 0.54 and 0.46 inches. The winds on the coast continued southerly during this rise, which is frequently the case on the Pacific slope; the rise in pressure appearing to come from the southwest and there is seldom the veering of winds to the northwest, after the passage of the centre of low area, which is so frequent a feature of storms east of the Rocky Mountains. On the 2nd the centre of the area of highest pressure moved slowly to the eastward into Idaho and Utah, but the greatest rise, averaging one-half of an inch, occurred in Colorado. On the 3rd the pressure, slightly yielding, continued above the mean from the Pacific coast to the Mississippi valley, while on the Texas coast there was a considerable rise. Cautionary Off-shore Signals, changed from Cautionary, that had been ordered in advance of low area No. II, were justified by the following maximum velocities: Indianola, 43 N.; Galveston, 32 N. On the 4th the region of highest barometer was transferred to Manitoba. On the 5th there was a general rise in pressure east of the Mississippi river, but the centre of the high area remained in the Lower Missouri valley. On the 6th there was a rise averaging nearly half an inch in the Lower Lake region, and the isobars of high pressure included the Lakes, the Ohio valley and Tennessee. On the 7th the highest area extended from the Lower Lakes to the South Atlantic coast. On the 8th it disappeared in advance of low area No. IV, then moving to the eastward over the Ohio valley. In connection with this high area the minimum temperatures of the month were reported from the Lower Missouri valley, Arkansas, Indian Territory and northeastern Texas on the 5th, and from the Ohio valley to South Atlantic coast on the 5th and 6th.

No. II.—On the 7th the mercury rose in rear of low-area No. IV. On the 8th a slight rise was felt from Missouri to Louisiana. On the 9th the centre of the high area was transferred to the Upper Lakes. On the 10th the high pressure extended over the Lakes. On the 11th the region of pressure above the normal was confined to the vicinity of Lake Superior, and on the succeeding day this ceased to be a distinct high area, disappearing before the advance of low-area No. V.

No. III.—On the 12th and 13th there was a great rise in pressure in the Northwest, Upper Lakes and Ohio valley, succeeding depression No. V, the greatest rises in twenty-four hours being 0.75 inches at Leavenworth and 0.74 inches at Keokuk. On the 14th the high area extended from the Lakes to the Atlantic coast, the greatest rise of mercury occurring in New England. The highest barometer was reported from Pittsburg, 30.33, or 0.3 inches above the normal. On the 15th highest pressure was transferred to the Middle Atlantic and New England coast. At the morning report the barometer in New England and the Middle Atlantic States was in general 0.3 above the normal. On the 16th, with yielding pressure, the high area moved along the South Atlantic coast, and on the 17th disappeared before the advance of a low area in the Ohio valley and Tennessee.

No. IV.—On the 16th there was a marked rise of mercury on the North Pacific coast, which rise on the 17th extended over the Rocky Mountain region and Northwest, the highest barometers being in Washington Ty., and Idaho. On the 18th the highest area continued in Washington Ty., the highest pressure being at Olympia, 30.35, Portland, 30.4, Roseburg, 30.4, or respectively 0.42, 0.41, 0.35 above the normal. On the 19th the barometer was generally above the mean west of the Mississippi river, with the greatest rise in the Gulf States, but the centre of highest pressure continued, as for the several previous days, stationary in Washington Ty. On

the 20th the barometer still continued highest in Washington Ty. On the 21st the region of highest barometer moved eastwardly to Idaho and Montana. On the 22nd the highest area was rapidly transferred to Texas. On the 23rd and 24th it disappeared to the southward as an independent high area, in advance of low area No. IX moving over the Ohio valley. During its regime on the Pacific coast unusually fair weather prevailed from the 18th until the 23rd. On the 18th Cautionary Signals at Galveston and Indianola were changed to Cautionary Off-shore Signals, and were justified by the following maximum velocities: Galveston, 30 NW.; Indianola, 38 N.

No. V.—On the 25th there was a great rise in pressure in the Northwest, thence extending to Texas in rear of low-area No. IX. On the 26th the region of highest pressure reached from the Lakes to the Gulf. Cautionary Off-shore Signals, changed from Cautionary on the Texas coast, were justified at Indianola by the following maximum velocity, 31 N. On the 27th, with rapidly diminishing pressure, the high area was transferred to the Gulf States, where, on the succeeding day, it disappeared before the advance of low-area No. X.

No. VI.—On the 26th a marked barometric rise was reported from the Pacific coast, which rise extended the next day into Idaho and Wyoming. On the 28th the greatest rise occurred in the Northwest, but the region of highest barometer, 0.3 inches above the normal, was in Dakota, Montana and Idaho. On the 29th the greatest rise was in the Southwest, with the pressure generally above the mean west of the Mississippi River, but the highest area remained nearly stationary in the extreme Northwest. On the 30th there was a slight change in the distribution of pressure, but on the 31st a great rise occurred in Manitoba, where at the last report of the day the barometer at Ft. Garry was 30.62, or 0.53 inches above the normal. The following high pressures were also reported: Bismarck, 30.54, or 0.53 above the normal; St. Vincent, 30.57; Moorehead, 30.54. In connection with this high area, whose further history will appear in the April REVIEW, there were ordered Cautionary Northwest Signals at Milwaukee and Grand Haven, and justified as follows: Milwaukee, 26 NW.; Grand Haven, 25 NW.

Areas of Low Barometer.—Nine such areas have had their tracks charted for the month of March, 1881. (No. I not charted.) Of these one (No. V) has its track charted across the continent, finally disappearing beyond the New England Coast. Another depression (No. VII) undoubtedly crossed the continent from the Pacific over Mexico, but not within the limits of the chart. Four (Nos. II, IV, VII and X) exhibited great energy at some portions of their tracks. Five (Nos. III, VI, VII, IX and X) developed within the limits of the United States. One (No. VII) after crossing the continent and leaving the St. Lawrence valley on the 21st, became a permanent low area for the rest of the month in the Maritime Provinces and Nova Scotia; the lowest reported barometer was at Chatham, 28.82 at the afternoon observation of the 27th, which was 1.05 inches below the normal. Two depressions (Nos. VIII and IX) skirted the edge of the great depression (No. VII), but neither developed much energy nor merged with the original low area.

No. I (not charted).—This is a continuation of low-area No. X, described at length in the MONTHLY WEATHER REVIEW OF FEBRUARY. On the last day of February it moved over the Middle Atlantic States and beyond the coast. On the 1st and 2nd the circulation of the winds and fall of the barometer shows that the centre of depression moved slowly but with great energy and in a track nearly parallel to the New England Coast. The following low barometers are noted: Boston, 29.15; Portland, 29.18; both 0.79 inches below the normal. Violent northeast to northwest gales prevailed on the New England Coast. A maximum velocity of 48 NE. was reported from Eastport on the morning of the 2nd, where the storm was the most violent experienced during the season, delaying steamers from 36 to 48 hours, and considerable damage was done in the lower part of the city by the flooding of cellars.

Nos. II & III.—On the 1st a depression moved from the British Possessions in a southeasterly track down the Missouri valley. It was accompanied by a sharp fall of pressure, but no precipitation fell in front of the centre of low area. On the 2nd the storm centre changed its course more to the eastward, entering, at the midnight observation, the Ohio valley; the pressures then reported were at St. Louis, Cairo and Memphis below the normal respectively, 0.5, 0.54, 0.51 inches; at North Platte at 3 p. m. the temperature was 27°, a fall of 36° since the previous day. Snow and sleet were reported from Missouri, Iowa and Wisconsin, with high northeast to northwest winds. On the 3rd, with a great increase of energy, the storm centre moved from the Ohio valley to southern Michigan. The following are the lowest pressures at the hours of tri-daily telegraphic reports: Toledo, 29.25, or 0.7 inches below the normal; Sandusky, 29.31, or 0.69 below the normal. Snow fell generally in the Lake region, Ohio valley and Tennessee, while rain was reported from the South Atlantic States. During the day there was a great fall of temperature in the Gulf States, Tennessee and the Ohio valley, averaging from 20° to 25°. At the morning report of the 4th there were two distinct centres of depression on the map: No. II, as charted, central over Lake Michigan, and No. III, which had been developed by the great fall in pressure in the Middle Atlantic States, in advance of low-area No. II; during the day the centre of depression (No. II) moved slowly over the Lower Lakes. At the midnight report the lowest pressure was at Oswego, 29.3 or 0.69 below the normal. At the morning observation of the 4th

there had been, in twenty-four hours, a fall in pressure at Philadelphia of 0.78 inches and at Baltimore of 0.77 inches, the readings being at each 29.2 or respectively, 0.87 and 0.89 inches below the normal. At this report the circulation of the winds showed the development of a secondary depression central in the Middle Atlantic States with the original depression central over Lake Michigan; during the 4th this depression, moving with diminishing energy in a northerly track, became merged in low area No. II near Lake Ontario. On the 5th and 6th, with greatly diminished energy, the centre of depression moved over New England and beyond the coast. In connection with these areas there were ordered Cautionary Signals on the 1st at Indianola and Galveston, justified by maximum velocities as follows: Indianola, 45 SW.; Galveston, 32 N. Cautionary Northwest Signals on the 2nd at Milwaukee and Grand Haven, justified at Milwaukee by 32 NW. Cautionary Signals on the 3rd from Smithville to Eastport, justified as follows: Smithville, 31 SW.; Hatteras, 38 SE.; Kittyhawk, 29 W.; Cape Henry, 32 E.; Chincoteague, 40 E.; Delaware Breakwater, 50 SW.; Cape May, 40 NE.; Atlantic City, 44 SE.; Barnegat, 49 E.; Sandy Hook, 40 NE.; New York, 42 NE.; New Haven, 29 NE.; New London, 30 E.; New Shoreham, 32 E.; Newport, 26 NE.; Wood's Holl, 32 E.; Boston, 33 NE.; Thatcher's Island, 42 E.; Portland, 28 E.; Eastport, 40 NE. On the 4th Cautionary Signals were changed to Cautionary Off-shore Signals from Smithville to Cape May, and were justified, but the off-shore winds were not as high as the on-shore winds.

No. IV.—On the 5th there was a depression of great extent covering New Mexico, Arizona, California and the northern States of Mexico. At the morning report of the 6th the lowest barometers were in western Texas; during the day the center of low area moved slowly to the eastward. During the ensuing night there appears to have been developed two separate centres of depression, one, as charted, moving to the southeast and disappearing as a low area after the morning of the 7th; the other, pursuing the more usual track to the northeast, was at the midnight report of the 7th central in Missouri. On the 8th the depression moved up the Ohio valley, showing but slight energy, but was accompanied by general rains in the Southern and Middle States, and light snow in the Lake region. At the a. m. report of the 9th the storm centre had moved near Norfolk, with a great increase of energy. During the day the storm moved slowly to the northeast along the coast with increasing violence. The following are the lowest barometers reported: Sandy Hook, 29.4; Barnegat, 29.35; Atlantic City, 29.37; below the normal respectively 0.64, 0.66 and 0.66 inches. On the 10th, with the centre of depression at sea, the storm moved nearly parallel to the New England coast, with the lowest barometer at New Shoreham, 29.43. On the 11th the centre of low area advanced slowly to the northeast nearly parallel to the Maine coast. The following are the lowest reported pressures: Portland, 29.24; Eastport, 29.29; below the normal, respectively, 0.69 and 0.61 inches. On the 12th, remaining nearly stationary in position, the barometer rose at the centre of depression. In its track along the Atlantic coast this storm exhibited very great energy. Cautionary Signals were displayed for this storm on the 8th, from Smithville to Sandy Hook; on the 9th from New York to Eastport. The display was justified by the following velocities: Smithville, 26 S.; Macou, 31 SE.; Hatteras, 36 SW.; Kittyhawk, 32 W.; Cape Henry, 32 W.; Norfolk, 26 NW.; Chincoteague, 40 SW.; Delaware Breakwater, 70 NE.; Cape May, 44 NE.; Atlantic City, 34 NE.; Barnegat, 42 N.; Sandy Hook, 40 W.; New York, 36 NE.; New Haven, 36 NE.; New London, 28 NW.; New Shoreham, 44 NE.; Newport, 32 W.; Wood's Holl, 41 NW.; Boston, 40 NE.; Thatcher's Island, 66 NW.; Portland, 29 NE.; Eastport, 46 E. Cautionary were changed to Cautionary Off-shore Signals on the 9th from Hatteras to Atlantic City, and on the 10th from Barnegat to Portland. These Signals were all justified, both as to direction and as to velocity.

No. V.—This is the only low-area of the month whose centre is distinctly traced across the continent. On the 8th there was a great fall of mercury in Oregon and Washington Ty., the pressure, at the end of the day, averaging, along the coast, one-half inch below the mean. Rains fell generally on this and the succeeding day, as far south as Lower California. On the 9th, pursuing a southeasterly track, the depression advanced into Utah Ty., accompanied by light rain or snow in Idaho and Nevada. On the 10th the low-area became central in western Kansas, and light snow was reported from its north and west quadrants; the lowest barometer at Dodge City was 0.57 inches below the normal. On the 11th, developing greatly increased energy, the storm-centre moved slowly into eastern Kansas, the lowest pressure at Leavenworth, 29.15, was 0.8 inches below the normal. Rain fell this day south of the track of the centre of low area to the Gulf, and snow to the north. On the 12th, with diminished energy, the depression moved to Lake Michigan. At midnight the lowest barometer was at Chicago, 29.5, or 0.35 inches higher than at Leavenworth the previous twenty-four hours. During the day rain fell in all the Southern and Middle States, rain or snow in New England and the Lower Lakes, snow in the Upper Lakes and in the Northwest. On the 13th, with the barometer rising at the centre of low-area, the depression moved with greatly diminishing energy over New England and beyond the coast. Cautionary Signals were displayed for this storm on the 9th at Indianola and Galveston, not justified; on the 10th at Milwaukee and Grand Haven, justified respectively by maximum velocities of 26 NE., 25 E. On the 11th from Mobile to Cape May, on the 12th from Atlantic City to Wood's Holl, generally justified

by the following maximum velocities: Pensacola, 36 S.; Cedar Keys, 40 SW.; Jacksonville, 30 SE.; Savannah, 25 S.; Smithville, 28 S.; Wilmington, 28 SW.; Hatteras, 36 SW.; Kittyhawk, 35 NE.; Cape Henry 28 NW.; Delaware Breakwater, 34 NE.; Cape May, 37 NW.; Atlantic City, 27 SE.; Burnegat, 27 NW. On the New England coast these signals were only justified at New Shoreham by 28 N.

No. VI.—On the 12th and 13th a great depression was developed in Utah and Arizona, the lowest pressures being 0.5 inches below the mean. The position of the storm centre cannot, however, be defined. The low area was accompanied by rain in southern California, southern Nevada and in Arizona, extending on the 13th across the Rocky Mountains into New Mexico and Colorado. On the 14th the depression pursued a northeasterly track over Kansas and Nebraska, the lowest pressure at Omaha, 29.65, being 0.35 below the normal. On the 15th, with diminishing energy, the storm-centre passed over Lake Superior and beyond the limits of the chart. Cautionary Signals were displayed at Milwaukee and Grand Haven on the 14th, and justified at Milwaukee by the following maximum velocity, 34 SW.

No. VII.—The changes in barometric pressure, circulation of the winds and rain-fall in southern California and Arizona on the 15th and 16th, leads to the inference that on those days a depression, moving from the Pacific Ocean, crossed in an easterly track Lower California and Northern Mexico, the centre of low area entering the valley of the Rio Grande at the midnight report of the 17th. On the 18th, with increasing energy, it moved in a northeasterly path over Texas and Arkansas into northern Mississippi, the lowest pressure at Memphis, 29.49, being 0.59 below the normal. On the 19th it moved with increasing violence into southern Michigan. The lowest pressures of the day were at Indianapolis, 29.19, 0.75 below the normal, Port Huron, Chicago and Grand Haven, below the normal 0.72, 0.73 and 0.73, respectively; heavy snow-storms, with high northeast to northwest gales, blocking railway communication, were reported from the Upper Mississippi valley and the Upper Lake region. On the 20th, with diminishing energy, the depression moved over Lake Huron into Canada. The lowest pressure of the day was at the morning report of Grand Haven, 29.19 or 0.79 below the normal. This day the snow extended over the Lower Lake region, where on the previous day rain had fallen. On the 21st, with greatly diminished energy, the centre of depression moved down the St. Lawrence valley. At the midnight report the barometers at Quebec and Father Point were both 0.62 below the normal. Cautionary Signals were ordered on the 18th at Milwaukee and Grand Haven, and on the same day from Smithville to Norfolk. These were fully justified by the following maximum velocities: Milwaukee, 47 N.; Grand Haven, 30 NE.; Smithville, 40 S.; Wilmington, 27 SW.; Macon, 26 E.; Hatteras, 28 E.; Kittyhawk, 28 SW.; Cape Henry, 38 S.

No. VIII.—On the 20th the pressure was below the mean east of the 100th meridian, with the greatest depression in the Lower Lakes and the St. Lawrence valley. At the morning report of the 21st there was shown a slight fall in barometer in western Arkansas, where the circulation of the winds showed the development of a new or secondary centre of depression. During the day the low area moved in an easterly track into Georgia and South Carolina, accompanied by rain in the East Gulf States and by snow in Tennessee. On the 22nd it passed over North Carolina and beyond the limits of the chart. During its passage there were some high winds of brief duration on the East Gulf and South Atlantic coasts. Cautionary Signals were ordered for this storm on the 21st from Mobile to Cedar Keys; on the 22nd at Jacksonville and Savannah; north of Savannah signals were still displayed for the previous storm, No. VII. This storm is interesting as the secondary development of an independent low area within a region of low barometer.

No. IX.—On the 24th the fall in mercury and the circulation of the winds show the development of a low area in eastern Colorado and Kansas. On the 25th, with a slight increase in energy, the centre of depression moved into eastern Tennessee, and on the 26th passed over North Carolina beyond the limits of the chart. This storm at no point showed special energy.

No. X.—On the 27th there was a considerable fall of pressure in Colorado, and at the 3 p. m. report the circulation of the winds indicated the development of a low-area in eastern Colorado, which pursued a southeasterly track until the morning report of the 28th, when a trough-like depression, averaging 0.3 inches below the normal, extended from Illinois to western Texas. So far the low-area had been attended by no precipitation to the eastward and by only occasional light rain in its rear. On the 28th, developing considerable increase in energy, the centre of depression moved into the Ohio valley and Tennessee, where the lowest pressures, at Louisville 29.55, and at Nashville 29.64, were respectively below the normal 0.46 and 0.41 inches. On the 29th, with slightly increasing energy, the storm-centre moved to the eastward, with the pressure in general 0.6 inches below the normal in North Carolina at the midnight report. On the 30th the storm-centre changed its direction, moving in a northeasterly track over Maryland, Delaware and New Jersey and also developing greater energy; the lowest barometer at Sandy Hook, 29.04, was 0.99 below the normal. The pressure fell to less than 0.9 below the normal at New London, New York, Philadelphia, Baltimore, Washington, Norfolk and at all stations on the Middle Atlantic coast. On the 31st the depression continued its northeasterly course, with its centre beyond the limits of

the chart; the lowest reported barometer was at Thatcher's Island, 28.96 or more than one inch below the mean. High northeasterly gales prevailed on the New England coast during this and the previous day. Cautionary Signals were ordered for this storm on the 28th at Milwaukee and Grand Haven, only justified at Milwaukee by a maximum velocity of 29 NE.; also ordered on the 28th from Smithville to Cape Henry, and from Chincoteague to Cape May; on the 29th from Pensacola to Charleston, and from Atlantic City to Wood's Holl; on the 30th from Boston to Eastport. These signals were generally justified by the following maximum velocities: Pensacola, 32 NW.; Cedar Keys, 39 NW.; Jacksonville, 42 SW.; Savannah, 32 W.; Charleston, 32 W.; Smithville, 32 SW.; Wilmington, 30 W.; Macon, 28 S.; Hatteras, 58 SW.; Kittyhawk, 55 W.; Cape Henry, 29 W.; Norfolk, 30 SW.; Chincoteague, 40 W.; Delaware Breakwater, 38 SW.; Cape May, 44 W.; Atlantic City, 47 NE.; Barnegat, 52 E.; Sandy Hook, 56 E.; New York, 48 NE.; New Haven, 28 NE.; New London, 27 E.; New Shoreham, 52 NE.; Wood's Holl, 29 E.; Boston, 41 NE.; Thatcher's Island, 65 NE.; Portland, 26 NE.; Eastport, 46 NE. On the 30th, Cautionary Signals were changed to Cautionary Off-shore from Hatteras to Cape May, and on the 31st from Atlantic City to Wood's Holl. These were generally justified both as to direction and as to velocity.

INTERNATIONAL METEOROLOGY.

Two international charts accompany the present REVIEW. No. IV is for the month of February, 1881. No. V is for the month of April, 1877, and is published in accordance with the explanation given in the opening paragraph under International Meteorology in the January, 1881, REVIEW.

Chart No. IV, for the month of February, 1881, indicates, as well as is at present (April 16, 1881,) possible, the general course taken by the most prominent storm-areas over the North Atlantic ocean and adjacent land-areas during that month. The tracks Nos. I, IV and VI are continuations of Nos. I, IV and IX, respectively, of chart No. I for February. Only one (No. I) storm appears to have crossed the Atlantic from the American to the European seaboard, but this is pretty well defined, and, from present indications, was, in all probability, a most severe storm. Originating probably within the area of heavy rains on the Pacific coast, (see MONTHLY WEATHER REVIEW for January, low barometer area No. IX,) it afterwards moved across the eastern half of the United States and western portion of the Atlantic with great rapidity, its progressive velocity, from 8 a. m. to 3 p. m. of the 1st, while traversing Tennessee and North Carolina, averaging 75 miles per hour. In its journey eastward it was marked by a gradually falling barometer and by severe gales, the pressure at the centre of depression, while the storm was over the United States, being about 29.80, while over the central Atlantic it fell to about 29.50 and over the British Isles to about 28.90. On the coast of the Atlantic States the wind reached a velocity of 56 miles per hour at Cape May; in 39 N., 74 W., brig *Atlas* experienced a furious gale, heavy sea and intense cold, during which the vessel became completely iced up; in 41 N., 54 W., steamer *Rheola* had hurricane with heavy seas sweeping decks. Over mid-ocean the winds decreased somewhat, but as the storm approached the British Isles it was again attended by violent winds. Over the North American continent and western portion of the Atlantic this depression was followed by a period of high barometer and low temperature, which in duration and severity, is almost without precedent. In regard to this, within the limits of the United States and Canada, attention is asked to the description of high areas and to the chapters on *Temperature* in the January and February REVIEWS, while in regard to Central America the following despatch, dated Panama, February 24, 1881, will be read with interest:—"The 10th of February will be remembered in Guatemala as the occasion of a frost, the heaviest within the memory of man, occasioning damage the like of which has no record in the history of the country since its conquest by the Spaniards. Ice formed in many places * * * ; leaves and tender shoots of coffee trees were shrivelled and discolored and sugar canes killed * * *. The amount of damage is estimated to be between one and two millions of dollars. The cold wave seems to have come from the north, apparently traversing the Cordilleras through Mexico and leaving evidences of its effect in various parts of that country before reaching Guatemala." In advance of these high pressures NE'y high winds and gales were experienced over the western portion of the Atlantic, and at the Bermudas cold weather, with rain or hail squalls, prevailed from the 4th to the 8th, the minimum thermometer at Gibb's Hill Light station on the morning of the 7th registering 51°, which is the lowest temperature experienced at this place, according to the records at hand, since February, 1879. Areas Nos. III and V appear to have originated in or about mid-ocean on the 8th and 13th, respectively. During the passage of No. III over the British Isles the barometer at Mullaghmore fell to 28.48, and on the 13th, (see area No. V,) the barometer on board S. S. *Belyenland*, in 49° N., 25° W., fell to 29.00 during a SW. gale, force 10 Beaufort scale. On the 14th high pressures set in over northern Europe, and apparently formed a barrier to the eastward progress of storm-areas from the Atlantic over the British Isles. By the 20th the barometer had increased to 30.9 over Sweden and northern Russia and the area of high pressure gradually spread eastward, reducing the pressure over the British Isles for the week ending Feb-