MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

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WAR DEPARTMENT,

OFFICE OF THE CHIEF SIGNAL OFFICER,

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

Meteorological data received at this office for the month of March have been carefully examined, and a general summary of the several meteorological elements is given below with accompanying charts. That part of this REVIEW descriptive of the weather conditions of North America during the month of March, 1882, is based upon observations taken at more than seven hundred stations, so distributed as to furnish trustworthy records of atmospheric phenomena occurring in the United States and British America between the twenty-fifth and fifty-fifth parallels of latitude.

In comparing the weather conditions which are the subject of this REVIEW with those of the corresponding period of previous years, the most noticeable features are:

First: the excessive temperature over the mean temperature of March of previous years, in all districts east of the Rocky Mountains, and on the North Pacific coast, where the excess in Oregon and Washington Territory ranged as high as 7° above the mean for the month.

Second: the excess of rainfall in the central Mississippi, the Ohio valley and Tennessee, where the rainfall was greatly in excess during the previous month, thus causing a continuation of the destructive floods in the lower Mississippi river and its tributaries, where the water has risen in many places to a higher stage than ever before known.

Third: the slight excess of rainfall in southern California, which, when considered in connection with the rainfall of the preceding month, is favorable for the agricultural and grazing interests of that region.

In considering that portion of THE REVIEW referring to International Meteorology, the most marked features are the extreme high barometer and unusually cold weather that prevailed in the eastern hemisphere during January, 1880. The chart of areas of low barometer for April, 1880, accompanying this REVIEW exhibits the movements of forty-three barometric minima, or a larger number than previously traced on any other chart of this series.

In preparing THE REVIEW the following data have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty-five Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and ninety monthly journals and one hundred and seventy monthly means from the former, and fifteen monthly means from the latter; two hundred and eighteen monthly registers from Voluntary Observers; fifty-eight monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports through the co-operation of the New York Herald Weather Service; abstracts of Ships' Logs, furnished by the publishers of "The New York Maritime Register"; monthly reports from the local weather services of Iowa, Nebraska and Missouri, and of the Central Pacific railway company; trustworthy newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada, is shown by the isobarometric lines, (in black) upon chart ii. The area of lowest mean pressure occupies the regions northeast of New England and the area of high pressure extends over the southern states and the Rocky mountain regions, as in the preceding month. The barometer has fallen about .05 of an inch in the southern states, where the isobar of 30.10 corresponds with that of 30.15 of February. The pressure has increased .05 of an inch on the North Pacific coast, and has diminished .05 of an inch in southern California.

The low area of 30.00, which was central north of the lake region has apparently moved to the northeast and beyond the limits of the stations of observation. The pressure has remained nearly stationary at the stations between the Mississippi river and the Rocky mountains.

DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Compared with the means of previous years, the pressure is slightly above the normal in the southern states and the lake region. It is also slightly above the normal in southern California, and about .1 of an inch above, on the North Pacific coast. Compared with March, 1881, the barometer is about .3 of an inch higher in New England; from .15 to .25 of an inch higher in the southern states east of the Mississippi, and about .2 of an inch higher in the lake region. On the Pacific coast, the pressure is .1 of an inch higher at San Francisco than in March, 1881.

BAROMETRIC RANGES.

The range of pressure for the present month has varied from .2 of an inch to 1.48 inches, the least range being at Havana, and the greatest range at Alpena. The range of barometer increases with the latitude, and from the coast toward the interior of the continent. In the several districts, the barometric range has been as follows:

New England: 1.42 inches at Burlington; 1.18 inches at Springfield; and .97 of an inch on the summit of Mount Washington.

Middle Atlantic States: 1.17 inches at Williamsport; 1.16 at Washington; and 1.02 inches at Lynchburg.

South Atlantic States: .62 of an inch at Jacksonville; 1.00 inch at Kittyhawk; Florida, .31 of an inch at Key West; .42 of an inch at Punta Rassa; and .54 of an inch at Cedar Keys.

East Gulf States: .65 of an inch at Port Eads; .79 of an inch at Montgomery.

West Gulf States: .75 of an inch at Castroville; .99 of an inch at Shreveport; 1.01 inches at Little Rock; and 1.14 inches at Fort Gibson.

Ohio Valley and Tennessee: .83 of an inch at Knoxville: .91 of an inch at Memphis; 1.01 inches at Cincinnati; and 1.16 inches at Pittsburg.

Lower Lake Region: 1.24 inches at Toledo to 1.40 inches at Oswego.

Upper Lake Region: 1.17 inches at Chicago to 1.35 inches at Duluth; and 1.48 inches at Alpena.

Upper Mississippi Valley: 1.08 inches at St. Louis; and 1.27 inches at St. Paul.

Missouri Valley: 1.29 inches at Leavenworth to 1.30 inches at Yankton.

Extreme Northwest: 1.30 inches at Moorhead to 1.38 inches at Ft. Buford.

Northern Slope: 1.17 inches at Fort Keogh to .76 inch at Cheyenne; 1.11 inches at Fort Assinaboine and .78 of an inch at Helena.

Middle Slope: .81 of an inch at Denver; and 1.05 inches at Dodge City.

Southern Slope: .66 of an inch at Stockton; and .96 of an inch at Ft. Sill.

Northern Plateau: 1.17 inches at Umatilla to .92 of an inch at Fort Missoula.

Middle Plateau: .89 of an inch at Salt Lake; and .88 of an inch at Winnemucca.

Southern Plateau: .34 of an inch at Fort Grant to .57 of an inch at Prescott.

North Pacific Coast: 1.05 inches, at Portland.

Middle Pacific Coast: .67 of an inch at San Francisco to .81 of an inch at Red Bluff.

South Pacific Coast: .30 of an inch at Campo to .57 of an inch at Yuma.

AREAS OF HIGH BAROMETER.

Nine well-defined areas of high barometer appeared within the limits of the Signal Service stations during the month of March, 1882. They were first observed in the Rocky mountains, near the northern boundary of the United States, or on the north Pacific coast. Numbers i., ii., iii., vi., and ix. passed directly to the eastward and north of the Signal Service stations, while the general course of numbers iv., v., vii. and viii. was to the southeast and toward the south Atlantic coast.

I.—The 7 a. m. telegraphic report of the 2d indicated that this area of high barometer was central near Deadwood, and the 11 p. m. report of the same date showed that it was moving slowly eastward, the region of greatest pressure being near St. Vincent. From this point, the course of the centre was directly to the east as far as the St. Lawrence valley, where it disappeared rapidly in advance of low area number ii. Generally clear weather prevailed in the districts east of the Mississippi during the 3d, and the temperature fell below freezing in the lake region and below zero in Manitoba.

II.—The midnight report of the 4th showed the barometer to be above the normal at all stations west of the Mississippi river, and on the morning of the 5th the pressure had increased to .4 of an inch above the normal at stations in Washington Territory, Oregon and Dakota. This area passed from the north Pacific, over British Columbia, and was central near Fort Assinaboine on the afternoon of the 5th, the highest barometer then reported being 30.66.

On the morning of the 6th the temperature had fallen to —12° at Fort Garry, with a pressure of 30.61, but the centre of this area continued to the westward and near Fort Buford, where the barometer had risen to 30.73. During the 6th and 7th this area passed over the northern portion of the United States with increasing pressure near the centre, attended by cold northerly winds in the lake region and violent northeast gales on the New England coast. At the 7 a. m. report of the 8th, the barometer had risen to 30.80 at Parry Sound and the temperature was below freezing as far south as Virginia. Cold northerly winds and light snow were reported in Indian Territory and northern Texas, where the winds were slowly shifting to easterly in the southwest quadrant of this area. The barometer continued unusually high on the New England and Middle Atlantic coasts until the morning of the 9th, when the winds shifted to southeast and southwest, indicating that this area moved to the southeast after passing the coast line.

III.—This developed in the region north of Dakota, where it was central at the midnight report of that date. It moved rapidly to the southeast during the 10th and 11th, following the general course of the Missouri valley and passing over the southern states as an area of 30.40, attended by cold, fair weather. The barometer fell slowly at stations on the south Atlantic coast on the 12th, with southeast to southwest winds as this area disappeared to the eastward.

IV.—This probably developed in the Missouri valley during the 11th, but its centre could not be located on the tri-daily charts until midnight of the 12th, when the barometer was highest at Huron, Dakota. During the 13th, the area extended over the states of the Mississippi and Ohio valleys. On the 14th, it apparently divided; one portion passing from Tennessee northeastward over the lake region, while there was a slight increase of pressure on the South Atlantic coast. The barometer continued high in the districts on the South Atlantic coast until the 15th, when the area which passed northward over the lake region, disappeared to the eastward.

V.—The morning report of the 15th indicated the advance of this area from British America and the reports received during the 14th, from stations on the Pacific coast, indicate that it developed in the higher latitudes, east of the Rocky Mountains.

During the 15th and 16th, the barometer continued high in the northern districts of the United States. This area passed to the eastward with increasing pressure at the centre until it reached the St. Lawrence valley, when its course changed to the northeast. The following reports were received at midnight of the 17th: Father Point, barometer, 30.74; Anticosti, 30.76. The northeast winds at stations on the Atlantic coast and in the St. Lawrence valley, show that this area continued its easterly course after passing to the east of the maritime provinces.

VI.—This appeared in the Northwest, when the storm, traced as low area number vi, was central in Michigan on the 17th, but it passed to the east, north of the lake region, without causing any marked change of pressure within the limits of the United States. The lowest temperatures observed occurred on the morning of the 19th. St Vincent reporting —8° at the morning observation, and Moorhead reporting —8° as the minimum for that date. This area of high pressure did not reach the Atlantic coast, but disappeared rapidly in advance of low area number vii.

VII.—An extended area of cold, dry air appeared over the regions west of the 100th meridian on the 20th, the barometer reading, on that date from .3 to .4 of an inch above the normal at stations in Utah, Idaho, Oregon and Washington Territory. This area continued central in Utah or western Colorado, but a second area of high pressure was observed in Texas, where the rapid increase of pressure caused a severe norther on the Texas coast; the wind reached a velocity of fifty-three miles per hour at Indianola, and thirty-nine miles at Galveston between the 7 a. m. and 3 p. m. reports of the 21st. During the 22d the pressure increased over the southern states, where the barometer continued high until the 23rd, with fair weather and winds shifting to the south and west.

VIII.—Although first referred to as central in the Upper

Missouri valley on the 23d, this area probably extended over the North Pacific coast and British Columbia. The temperature fell from 20° to 30° in the northwest on the 23d, as the pressure increased rapidly in that region. The following minimum temperatures were reported at 7 a. m. of the 24th:

St. Vincent, —25°; Fort Garry, —24°; Moorhead, —20°; St. Paul, —5°.

During the 24th this area passed over the Ohio valley to the middle Atlantic coast, attended by cool, fair weather in all districts east of the Mississippi river.

IX.—This appeared in Manitoba at midnight of the 29th, advancing in a southeasterly direction. On the morning of the 30th the temperature had fallen from 20° to 30° at stations in Iowa, Michigan, Wisconsin and Minnesota. This area passed to the eastward over the lake region, causing the barometer to rise to 30.50 in New England and the Middle Atlantic states. The temperature fell about 20° in these districts and 30° in the St. Lawrence valley. After reaching the coast, the course appeared to change from east to southeast, and when last observed, at midnight of the 30th, the isobar of 30.50 extended from Boston to Norfolk, with northwest winds in New England, and southeast winds in the Middle Atlantic states.

AREAS OF LOW BAROMETER.

Ten areas of low barometer appeared within the limits of the Signal Service stations during the month, sufficiently well defined to render it possible to locate the centre of depression at each telegraphic report, from the date of first appearance until the disturbance finally passed beyond the station of observation. On chart number i will be found the tracks of the centres of areas of low barometer for the month of March, 1882. The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First Observed.		Last Observed.		Average h'rly velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	°	°	°	°	
No. I.	49	80	44	60	26.6
II.	41	114	43	64	27.6
III.	28	95	46	59	44.1
IV.	48	83	43	62	39.1
V.	46	103	37	75	33.3
VI.	47	122	50	66	37.8
VII.	55	127	45	75	34.8
VIII.	56	95	49	67	38.1
IX.	55	100	51	63	40.0
X.	57	112	48	63	26.7

The mean latitude of the above storm-tracks is about 10° north of the mean latitude of the storm-tracks of March, 1881. Numbers ii., vi., vii. and x. probably passed from the Pacific coast in a southeasterly direction to the points where first located. Number iii. developed in the gulf, south of Texas, and all the others were first observed in the Northwest.

I.—This storm passed from the southwest during the last of the previous month, causing violent winds in the lake regions and heavy rains in the southern states. On the morning of the 1st, it was central north of Lake Huron. From this point the movement was directly eastward, while the depression extended southward over the Middle Atlantic states and New England, with a rapid increase of gradient in the eastern quadrants, attended by dangerous east to south winds at stations on the Atlantic coast north of Wilmington, N. C. The storm increased in violence during the night of the 1st, the low area apparently dividing into two distinct depressions, one of which passed down the St. Lawrence valley, while the other passed from the Middle Atlantic coast northeastward over Nova Scotia during the 3d and 4th, where it disappeared as a severe storm.

Cautionary signals were ordered in advance of this storm at stations north of Cape Henry, and were fully justified by the violent winds which followed. Very heavy rain fell near the centre of disturbance as it passed to the St. Lawrence valley and Nova Scotia. This storm increased in energy as it advanced, and the barometer, at the centre, when last observed on the 4th, had fallen to 29.16 at Halifax, N. S.

The following abstracts from logs of vessels, probably show the progress of this storm during its passage eastward over the ocean: 4th, in 40° 32′ N., 67° 40′ W., s. s. "Egypt," w.n.w., moderate gale, squally; 40° 35′ N., 62° 10′ W., s. s. "Persian Monarch," fresh s,e. to w. gale, heavy head sea; 5th, in 40° 31′ N., 65° 35′ W., s. s. "Persian Monarch," fierce gale, tremendous sea.

II.—This depression was central in Colorado on the midnight of the 3d, but the telegraphic reports of the 2d, indicate that it developed west of the Rocky mountains. The barometer was high on the California coast on the 2d and 3d, and rain or snow prevailed in Washington Territory, Idaho, Oregon and Utah. The depression became unusually well-defined as it passed to the eastward over Kansas, the isobar of 29.70 forming a circle, the diameter of which was about 300 miles. By the midnight report of the 4th the centre of disturbance had reached St. Paul, Minnesota, where the barometer had fallen to 29.42, accompanied by southeasterly gales. Heavy snow was reported at Moorhead, Bismarck and Huron, Dakota, where the winds were from northeast to northwest, with velocities ranging from thirty-eight to forty-three miles an hour. The centre remained near St. Paul on the morning of the 5th; the gradient and winds having increased in the western quadrants of the storm. The advance of a high-area from the northwest on this date was attended by a decided fall in temperature in Dakota, Minnesota, Nebraska and Kansas. High winds continued in the upper lake region during the 5th, followed by clearing and cool weather after the winds had veered to westerly. The centre of this storm passed over Lake Superior, moving in a northeasterly direction. At midnight the course changed to the east, and during the 6th it crossed the St. Lawrence valley near Montreal and passed over New England, causing rain in the Middle Atlantic states, and snow in New England and the lake regions. The observer at Quebec reported: heavy snow and easterly gale.

Cautionary off-shore signals were displayed in advance of this storm at stations on the Atlantic coast north of Delaware Breakwater. The following maximum velocities were reported: Boston, 42, n.w.; Sandy Hook, 44, n.w.; Point Judith, R. I., gale; New Shoreham, 42, n.w. Cautionary signals were also displayed at Grand Haven, Milwaukee and Ludington, the stations on the lakes where signals are continued during the winter months.

When this depression reached the New England coast the barometer at the centre read 29.74, or .45 of an inch higher than the lowest reading, when the centre was near St. Paul. This storm left the New England coast near Eastport on the 7th, moving directly east. On the 9th, the s. s. "City of Brussels" reports, in lat. 43° 56′ N., long. 42° 42′ W., fresh w.n.w. gale and high sea.

No III.—This is the only storm occurring during the month, which developed south of the 30th parallel of latitude. A severe norther occurred in Texas on the 7th, the temperature falling below freezing in northern Texas, with light snow. The barometer continued high at all stations in the gulf states, with north to east winds, until the morning of the 8th, when the cyclonic movement of the winds indicated the advance of this depression. Heavy rains fell in the gulf states and in Tennessee on the 8th, as the storm centre moved up the Mississippi valley with increasing energy. The area of rainfall extended over the Ohio valley, and snow or rain was reported from the lake region and upper Mississippi valley. The course of the storm was northerly until the centre reached St. Louis, where its course changed to the northeast, the storm passing over the southern portion of the lake region with great violence, causing dangerous winds and heavy rains in the southern quadrants, and snow in the northern quadrants of the storm.

After reaching the upper St. Lawrence valley, the course of

the storm changed to easterly, and passed over New England on the 10th, with a pressure of 29.50 at the centre, followed by n.w. gales on the Atlantic coast.

Cautionary signals had been displayed in advance, at stations, between Macon and Sandy Hook on the 8th, and were ordered for stations on the New England coast on the 9th. The following maximum velocities were reported: Hatteras, 40 s.w.; Breakwater, 48 s.w.; Sandy Hook, 38 w.; Newport, 34 n.w.

This storm was last observed as central near Sydney, where the barometer had fallen to 29.34 at the afternoon report of the 10th; but the barometric gradient had decreased and the light winds reported from stations in the maritime provinces indicated that the storm had lost much of its energy.

On the 10th, the s. s. "Oder" in lat. 41° 59′ N., long. 62° 52′ W., reports moderate w.s.w. gale, rough sea.

IV.—This depression was first observed in the lake region on the morning of the 12th, and probably developed in British America, west of Manitoba. It passed over the St. Lawrence valley with increasing energy during the 12th, attended by light snow in the lake region, New England, and the northern part of the Middle Atlantic states. The barometer fell at the centre as the depression moved to the eastward, the lowest reading being 29.10, which was reported from Sydney on the 13th. Northerly gales occurred on the Atlantic coast at stations north of Savannah, after the centre had passed to the east of the coast line.

Cautionary signals were ordered at stations on the coast between Hatteras and New York, on the 12th, and "Off-Shore" signals were ordered for these stations at midnight of the 13th.

The following maximum wind velocities were reported during this display: Breakwater, 50 miles n.w.; Chincoteague, 46 n.w; Cape Henry, 44 n.w.; Sandy Hook, 40 n.

The following reports furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean.

On the 13th s. s. "New York" in lat. 34° 40′ N., long. 75° 15′ W., 29.65, w.s.w., gale, dark heavy clouds. 14th, in 37° 20′ N., 74° 50′ W., 30.15, n.n.w., hard gale, clear.

Ocean data from other sources as follows:

On the 16th, s. s. "Gallia" in lat. 44° 40′ N., long. 44° 25′ W., s.w. to n.w., fresh gale, high sea. 16th, s. s. "England" in lat. 42° 41′ N., long. 45° 11′ W., heavy gale, heavy head sea.

V.—On the 13th, the barometer fell to 29.57 at Olympia, and 29.63 at Portland, Oregon, with rain and snow on the North Pacific coast. This depression probably developed in the Upper Missouri valley on the 14th; while a second depression was central on the Pacific coast, north of Oregon. The 3 p. m. telegraphic report of the 14th, indicated the southeasterly course of this storm, which was then central north of Yankton, enclosed by the isobar of 29.70. Pressure increased at the centre during the 14th, and when the storm reached the lake region, the lowest isobar enclosing the centre was 29.90; which had taken the form of an elongated ellipse with the longer axis in a northwest direction. The pressure continued to increase at the centre during the 15th, when the storm passed eastward over the Ohio valley, and the barometric gradient decreased, with a corresponding loss of energy, until the disturbance passed east of the coast line near Norfolk. After the winds shifted to northerly on the Middle Atlantic coast they increased in force, with a rapid increase of pressure.

VI.—The barometer fell at stations on the Pacific coast during the 15th, with winds shifting to southerly at all stations south of Oregon. This depression was central north of Washing Territory on the morning of the 16th; at the morning report of that date, the winds had shifted to northerly at Portland and Olympia, with the barometer ranging from 29.62 to 29.66. The midnight report of the 16th indicated that this depression had passed eastward to the Upper Missouri valley, and the morning report of the 17th, showed a well defined depression of 29.60 central near Fort Sully; southeasterly winds, with threatening weather and rain prevailed in the Mississippi valley from the gulf coast northward to Lake Superior. This storm moved to the southeast until it crossed the Mississippi river, near Davenport, on the 18th, and then moved to the northeast over the lake region. The pressure increased at the centre after the disturbance reached the St. Lawrence valley, and the barometric gradient was slight in the eastern quadrants, although easterly gales occurred on the morning of the 19th, in the Gulf of St. Lawrence.

This storm lost much of its energy before passing beyond the maritime provinces, but it was followed on the 19th, by heavy snow and sleet in New England and Canada.

Cautionary signals were ordered in advance of this storm at all stations on the lakes, east of Marquette, and at all stations on the Atlantic coast, north of Fort Macon.

The following maximum velocities were reported: Mackinaw, 60 miles; Alpena, 36; Milwaukee and Rochester, 35; Point Judith, gale; Provincetown, 32; Eastport, 30.

The following reports furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean. On the 18th, s. s. "Celtic," in lat. 41° 02′ N., long. 69° 44′ W., s.e., strong gale, threatening and rain; barometer fell from 30.20 to 29.70, with sea running very high; 18th, s. s. "City of New York," in lat. 41° 00′ N., long, 61° 28′ W., n.n.w. to s.e., light winds to strong gale and very high sea. 19th, in lat. 40° 18′ N., long. 67° 41′ W., s.e. to w.n.w., strong gale to light airs; at 6 a. m. to 10.30 a. m., dense fog; 21st, s. s. "Britannic," in lat. 46° 34′ N., long, 38° 15′ W., w. to s.s.w., fresh wind to strong gale. 22d, in lat. 44° 09′ N., long. 44° 10′ W., strong w. gale and very high sea. 23d, in lat. 42° 53′ N., long, 50° 58′ W., s. to w.n.w., moderate to strong wind.

VII.—This storm, like the preceding one, developed west of the North Pacific coast where it appeared on the 19th. It moved rapidly during the 19th, from Washington Territory to western Nebraska. On the 20th, it was central near Omaha as a severe storm, and was moving slowly to the eastward with increasing barometric gradient and with a cyclonic movement of the winds within its limits. This storm also crossed the Mississippi river near Davenport, and during the 20th, the central area became extended in a southeast and northwest direction, the lowest barometer reading 29.49, at Chicago. At the morning report of the 21st, the barometer at Port Huron reached 29.49, and this storm continued with great violence over the entire lake region, where the barometer was low, but the pressure was increasing rapidly in the Upper Mississippi and Lower Ohio valleys. Heavy snow occurred in Michigan, Wisconsin and Minnesota on the 20th and 21st. The afternoon report of the 21st indicated the presence of two depressions in the lake region, one central near Rochester and one near Saugeen, both forming a part of this general disturbance which was then elliptical in form, the longer axis pointing east and west. The midnight report of the 21st, placed the centre of this disturbance north of and near Toronto, Canada, the two minor depressions having united. The central area retained its elliptical form. Snow continued in New England, Ohio valley and lake region during the 22d, followed during the night by clearing weather and high northwest winds on the coast. This storm passed east of the New England coast on the 22d.

Cautionary signals were ordered at 5 p. m. of the 20th at stations in the lake region and on the Atlantic coast, between Cape Henry and New York. At midnight of the same day signals were ordered at stations on the Atlantic coast north of New York.

The following maximum velocities indicate the force of this storm in the several districts: Milwaukee, 44 miles; Sandusky, 44 miles; Buffalo, 46 miles; Rochester, 53 miles; Cape May, 40 miles; Sandy Hook, 32 miles; Breakwater, 37 miles; New Shoreham, 36 miles.

The following report, furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean:

On the 23d, s. s. "City of Montreal," in 40° 59′ N., 55° 25′ W., wind s. to w.n.w., fresh gale and beam sea, to moderate wind and heavy sea.

Ocean data from other sources: 22d, s. s. "Holland," in lat. 41° 46′ N., long. 54° 51′ W., strong n.w. to s.w. gale, heavy s.s.w. sea, ship rolling heavily. Same date, s. s. "Vaderland," in lat. 40° 15′ N., long. 55° 22′ W., heavy w. gale, high sea; Same date, s. s. "Britannic," in lat. 44° 09′ N., long. 44° 10′ W., strong w. gale, very heavy sea. 23d, s. s. "Holland," in lat. 41° 30′ N., long. 57° 56′ W., s.s.w. gale, high confused sea. Same date, S. S. "Elbe," in lat. 40° 53′ N., long. 55° 58′ W., strong s.w. to n.w. gale, high head sea.

VIII.—This depression probably developed in British Columbia, but did not appear in the northwest until midnight of the 22d, when the barometer was lowest in Manitoba. It passed rapidly toward the upper St. Lawrence valley on the 23d with increased energy, the barometer having fallen to 29.72 by midnight of the 23d, when the disturbance was central near Kingston. High northwest winds occurred in the lake regions on the 23d, attended by fair weather and temperature below freezing. The morning report of the 24th showed a change in direction to the northeast. The centre of disturbance was advanced to FatherPoint, where the barometer had fallen to 29.53. South to west gales were reported from the St. Lawrence valley on the 24th, with heavy snows, and with temperature below zero at Rockliffe. The afternoon report of the 24th showed an increase of barometric gradients in the southern quadrants of this storm, the centre being located east of Father Point, where the pressure was 29.30. By midnight the area of lowest pressure had passed to the east of the maritime provinces, where the barometer was rising with westerly gales. At the same report the wind at the summit of Mount Washington attained a velocity of 82 miles, northeast; the afternoon report from Mount Washington on the same day, gave the wind as 112 miles, north.

Cautionary signals were ordered at stations on the upper lakes and Atlantic coast, at the afternoon report of that date.

The following maximum velocities were reported: Sandy Hook, 40 miles, n.w.; Breakwater, 36, n.w.; Buffalo, 38, s.w.; Milwaukee, 36, w.; Alpena, 36, n.w.; Shoreham, 36., n.w.

The following reports, furnished through the co-operation of "The New York Heard Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean. On the 26th, s. s. "Arizona" in lat. 41° 26′ N., long. 60° 34′ W., fresh gale, latter part, snow-squalls, winds s.s.w. to n.n.w. 27th, s. s. "Adriatic" in lat. 43° 32′ N., long. 41° 55′ W., moderate gale, squally, heavy head sea, wind s.w. to n.w. 28th, in lat. 41° 28′ N., long. 47° 30′ W., moderate gale during day, winds west.

IX.—This depression was first observed in British America, north of Dakota on the 24th, but its centre could not be located on the tri-daily charts until the midnight report of that date, when the barometer was lowest near Fort Garry. From this point the course of this storm was almost due south, until reaching central Iowa, where, after a slight movement to the east during the eight hours following the afternoon report of the 25th, its course changed to the southwest, and at the following report its centre was located in Kansas. During the 26th this storm moved over the lake region developing great energy, the barometer falling to 29.30, the lowest isobar being elliptical in form, the longer axis pointing to the northeast. This storm was followed by a secondary depression in the lower Mississippi valley on the 27th, which disappeared in advance of a high area from the northwest and a norther on the Texas coast. When this storm was central north of Lake Ontario dangerous westerly winds continued in the lake region and on the Atlantic coast, as far south as Jacksonville. The barometer fell to 29.13 at Father Point at midnight of the 27th, with wind s.w., fifty-five miles, and to 29.12 at Anticosti, with light southeast winds. At the last report the wind at Father Point was w., thirty-three miles.

Cautionary Signals were ordered for stations on Lakes Erie, Michigan and Huron at 4 p. m. of the 25th, and for stations on the Atlantic coast to New York on the morning of the 26th; and for stations between New York and Boston, at midnight of the 26th. Cautionary Signals for Eastport, Portland, Oswego and Rochester, were ordered on the morning of the 27th.

The reports show that this was one of the most severe storms of the season, especially over the maritime provinces. The following maximum velocities were reported at Signal Service Stations: Hatteras, 48, s.w.; Kittyhawk, 47, s.w.; Cape May, 44, s.; Breakwater, 48, s.; New Shoreham, 44, s.w.; Rochester, 36, n.w.; Sandusky, 36, s.w.; Provincetown, 37, s.w.

The following report, furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm, during its passage to the eastward over the ocean:

On the 27th, s. s. "Bothnia" in lat. 42° 03′ N., long. 57° 50′ W., strong breeze with squalls and high head sea; wind northwest.

X.—This depression was at no time within the limits of the stations of observation, but passed to the east, north of the United States, first appearing north of Dahota on the 28th. The course of the storm changed to the southeast after reaching the longitude of the lake region, and the disturbance became violent over Lakes Michigan and Superior, the wind reaching a velocity of forty-one miles at Milwaukee on the 29th. The gradient increased rapidly in the south and west quadrants of this storm as it moved to the northeast down the St. Lawrence valley and disappeared on the 31st, attended by violent gales at Father Point, Anticosti and other stations in the northeast.

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of the REVIEW. The former is published for January, 1880, and continues the series of that chart begun in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean," previously furnished this office through the courtesy of Prof. Dr. G. Newmayer, Director of the German Marine Observatory, has not been received for the month of January, 1880, and therefore was not used in the preparation of the present chart, as in the previous month. Chart v. is prepared for the month of April, 1880, and continues the series of that chart, begun in November, 1877.

Chart iv. shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of January, 1880, over the northern and at certain isolated stations in the southern hemisphere. The pressure is generally high, and is considerably above the average. There are two areas of comparatively low pressure, the most decided occupying Iceland and the southern part of Greenland, lowest mean reading, 29.58 at Stykkisholm; the least important, central over or near British Columbia, lowest mean reading, 29.90 at Olympia.

The position of the former low area is nearly a constant feature o that part of the Arctic regions where for the past three years the mean pressure has not risen above 30.00, except as follows: April, 1877, Godthaab, 30.02; May, 1877, Stykkisholm, 30.04; August, 1877, Godthaab, 30.06; November, 1878, Stykkisholm, 30.06; December, 1878, Stykkisholm, 30.10.

There are five decided areas of barometric maxima for the month, distributed as follows: In central Asia, 30.70; in central Mexico, 30.40; in eastern France and western Germany, 30.40; in the Middle Atlantic states, 30.20; in 35° N., 60° W., 30.20. The high pressure over central Europe appears to result from an extension northeastward of the barometric maxima prevailing in the vicinity of the Azores and Maderia Islands and thence to the south and west along parallel 30° N.