

causing a "norther" on the Texas coast. After the storm-centre had passed and the wind had shifted to the northwest, the weather cleared rapidly, except in the lower lake region, where light snows continued until the 23d. After the centre reached the vicinity of Saugeen, Province of Ontario, its course changed to eastward, and the succeeding report (that of the morning of the 27th) placed the centre on the coast of Maine, near Eastport. The lowest reading of the barometer, 28.99, occurred at Anticosti, Province of Quebec, when this storm was central in that vicinity on the afternoon of the 23d. Severe gales occurred on the middle, south Atlantic, and New England coasts when this storm was central near Saugeen, and they continued from the northwest on the Atlantic coast after the storm had passed to the northeast of the Canadian stations on the 23d and 24th.

As this storm approached from the central Rocky Mountain region, indications of the probable occurrence of severe local storms were issued from the central office, and the following report from the observer at Cairo, Illinois, relative thereto, is given:

Special telegram announcing severe local storm for this district was received at 12.30 p. m. of the 20th, and was immediately posted in all bulletin frames, railroad companies, etc., notified, and the information telegraphed along the lines of the railroads running out of the city. Steamboats were tied up, railroad companies had their locomotives and cars moved to places of safety, river-men made their wharf-boats and barges secure, transfer boats were tied up and abandoned their trips, gardeners who had plants set out had a force of men employed to cover them with earth if the temperature should fall below the freezing point. Fresh southerly to high westerly winds occurred on the 20th, the maximum hourly velocity being forty-four miles per hour from the west at 9.35 p. m. All telegraph wires were in trouble, being mostly blown down, and but one wire could be worked between this city and Saint Louis, Missouri. Captain Taylor, of the "Gus Fowler," states that the rain fell in torrents at Metropolis, thirty-seven miles north of this city. It is estimated by the railroad companies and merchants that thousands of dollars worth of property were saved by the timely warning.

XIV.—This area of low pressure was observed far to the north of Montana on the 22d, and it passed eastward, inclining slightly southward until the centre had passed the Lake region, after which it followed the course of the Saint Lawrence Valley and disappeared to the east of the Atlantic coast after the 26th; it was no time central within the limits of the stations of observation. The area of high pressure which followed immediately to the west caused the barometer to rise rapidly in the Lake region, and brisk to high winds generally occurred at the lake ports, but the weather remained fair, with the exception of light local showers in the Ohio and central Mississippi valleys.

XV.—This disturbance developed south of Texas on the 28th, during which date the rain-area attending this storm had already extended over the Southern States. The barometer was high to the northeast of New England and north of Dakota, and as this storm developed and moved northward to the Ohio Valley it apparently separated the area of high pressure into two distinct areas, one remaining northeast and the second moving southward over the Missouri Valley. The low area moved slowly northward, causing very heavy rains in the Southern States, especially in Alabama, Georgia, and Tennessee. On the morning of the 30th it apparently divided into two separate low areas, one central near Louisville, Kentucky, and the other central near Mobile, Alabama, and heavy rains continued in the Southern States. These two depressions moved slowly northeastward during the succeeding eight hours, and had united over central Kentucky at the midnight report of the 30th. The northerly movement continued during the 31st over the Lake region, the centre passing over Lake Huron. Severe local storms occurred in all districts east of the Mississippi Valley during the 30th and 31st, and the destructive freshets which occurred in the southern rivers were due to the rains attending this depression.

The following notes relative to this storm are taken from reports of Signal Service observers:

Cairo, Illinois: Captains of river steamers state that the high winds and fine snow that occurred during the night of the 30th-31st made it one of the roughest nights ever experienced on the river.

Chattanooga, Tennessee: a heavy rain fell throughout the 31st, the total precipitation, 6.95 inches, being the greatest amount that has fallen in the same time since the establishment of this station in 1879. Brisk to high westerly winds occurred on the 31st, with flurries of snow.

Knoxville, Tennessee: the total rainfall for the thirty-nine and a half hours ending at 8.38 a. m. of the 31st, 6.56 inches, is the heaviest single rainfall on record since the unprecedented rainfall (8.10) of February 24-26th, 1875.

Milwaukee, Wisconsin: a brisk northerly gale occurred on the 31st, accompanied by frequent changes of rain, sleet, and snow at intervals during the day.

Rochester, New York: a severe westerly gale occurred on the 31st, attended by cloudy and rainy weather.

Smithville, North Carolina: a southerly gale began at 9.50 a. m. of the 30th and reached its maximum velocity, forty-two miles per hour, at 7.45 a. m. of the 31st. Considerable damage was done to the fruit blossoms in this vicinity, and the damage throughout the county is estimated at \$5,000. Much praise was bestowed on the Signal Service for the timely warning of the gale, during the prevalence of which five steamers and eleven sailing vessels remained in harbor.

Fort Macon, North Carolina: a heavy southeast gale occurred on the 31st, producing heavy seas; the wind reached a maximum velocity of forty-two miles per hour.

Atlanta, Georgia: the heavy rains that occurred during the last few days of the month ended during the night of the 31st, and the damage by the resulting floods has never before been equalled in this part of the country. The rain was succeeded by high winds which reached a maximum velocity of thirty miles per hour on the 31st.

Savannah, Georgia: a heavy thunder-storm occurred during the early morning of the 31st, accompanied by high winds. Severe storms and floods were reported throughout the state, and great damage was done to crops.

Jacksonville, Florida: a severe gale and thunder-storm occurred on the 31st, the wind reaching a maximum velocity of thirty-four miles per hour from the west. No damage was reported.

Cedar Keys, Florida: a severe thunder-storm passed over this station on the 31st, moving from west to east, accompanied by intense lightning, heavy rain, and a decided fall in temperature, the wind reaching a maximum velocity of thirty-two miles per hour.

The following table gives the latitude and longitude in which the centre of each area was first and last observed, and the average hourly velocity:

Low areas.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	0 /	0 /	0 /	0 /
II.....	25 00	101 00	48 00	57 00	25.0
III.....	39 00	105 00	33 00	76 00	27.0
IV.....	53 00	105 00	42 00	67 00	30.0
V.....	34 00	102 00	33 00	74 00	34.0
VI.....	53 00	113 00	50 00	72 00	31.0
VII.....	41 00	109 00	48 00	62 00	40.0
VIII.....	47 00	96 00	44 00	85 00	20.0
IX.....	38 00	75 00	46 00	59 00	34.0
X.....	47 00	105 00	42 00	63 00	32.0
XI.....	54 00	114 00	52 00	83 00	35.0
XII.....	47 00	113 00	43 00	89 00	44.0
XIII.....	38 00	124 00	50 00	62 00	28.0
XIV.....	54 00	109 00	50 00	63 00	26.0
XV.....	28 00	95 00	47 00	80 00	25.0

NORTH ATLANTIC STORMS DURING MARCH, 1886.

[Pressure in inches and millimetres; wind-force by Beaufort scale.]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data, received at this office up to April 20, 1886.

Of the ten depressions traced during the month, five, viz., numbers 1, 4, 6, 7, and 9, are continuations of storms which entered the Atlantic from the North American continent; number 2 is a continuation of an area of low pressure which was central in the ocean near W. 25°, N. 50°, at the close of February; numbers 3 and 10 originated in the mid-Atlantic; and numbers 5 and 8 appeared in the vicinity of the Bermudas. The general direction of movement of these storms was north-easterly and easterly, with exception of number 8, which is

traced from its appearance in N. 35°, W. 70°, northward to N. 40°.

Many of these storms were accompanied by extremely low pressures, barometer readings below 29.00 (736.6) being reported on thirteen days of the month. Vessels over the ocean experienced a continuation of gales and squalls accompanied by high seas up to the 25th of the month, after which the long continued area of low pressure was replaced by an advancing area of high pressure south of the fortieth parallel.

The following abstract of the log of the s. s. "Karo," E. Smith, commanding, exhibits the stormy, rough, and unsettled character of the weather prevailing during the larger part of the month: "Left Gibraltar February 25th and had fair weather, with squalls and light rains at times, until March 3d, in N. 36° 50', W. 27° 7', when strong gales began from wsw., increasing to a whole gale, with rain, at midnight. 4th, whole gale wsw., with very high seas, veered to w. and moderated at night; N. 40° 00', W. 30° 00' at noon. 5th, in N. 37° 23', W. 33° 15', at noon, fresh to strong breeze from sw., increasing at midnight to a whole gale. 6th, in N. 37° 56', W. 36° 18', whole gale from the w., moderating to strong gale, with very high seas. 7th, in N. 38° 14', W. 39° 22', at noon, strong gale increasing to whole gale, veered to wnw. on the 8th, in N. 38° 45', W. 42° 2', and continued all day; lowest barometer was 29.34 (745.2), at 4 p. m. 9th, strong gale from n., moderated in the afternoon. 10th, in N. 39° 36', W. 48° 1', strong gale from sw. veered to wsw. and n., then to ese. and moderated. 11th, in N. 40° 6', W. 51° 50', fresh se. wind backed to nw. and blew a gale with hurricane force; shipped great quantities of water. 12th, in N. 40° 19', W. 54° 3', whole gale from ne., with tremendous seas, and barometer falling until 4 p. m., when it had reached 29.04 (737.6); gale backed to nw. and continued with fury all day. 13th, in N. 40° 30', W. 57° 4', strong gale wsw., increasing to whole gale and backed to sw. on the 14th, in N. 40° 32', W. 57° 32', and continued all day with very high seas, barometer 29.14 (740.1) at midnight. 15th, strong gale veered to ne. and then backed to nw. and moderated in the afternoon. 17th, in N. 42° 2', W. 64° 20' (noon) whole gale began at 7 a. m.; very high seas from nw., backed to ne. at 8 a. m., and thick snow at noon, lowest barometer was 29.54 (750.3) at noon.

The very severe weather off the Atlantic coast of the United States from the 21st to the 25th is exhibited by the log of the s. s. "Ugglan," J. B. Godd, commanding: "March 21, in N. 33° 30', W. 70° 28', strong gale began from w. at 4 p. m., varying from w. to sw., and continued with very rough and high seas until 8 a. m. of the 22d, then moderated; but at 11 p. m. strong gale set in again from w., veered to nw. on 23d, with increasing force, and continued until noon of the 24th, when it blew with hurricane force from nw. by n., in N. 36° 41', W. 69° 27', and was attended by squalls of snow and hail."

The low pressures which prevailed over the ocean were pushed westward on the 11th by an area of high pressure from the European continent, which extended to the meridian of W. 20° and continued until the 14th. An area of high pressure entered the ocean from the coast of the United States on the 14th, and on the 15th had advanced eastward to the sixtieth meridian, after which date the pressure again fell and on the 17th was below 30.00 (762.0) over the whole north Atlantic, except on the borders of the United States. With these two exceptions the pressure over the ocean remained for the most part continuously low until the 25th, when the pressure south of the fortieth parallel had risen above 30.00 (762.0). This area of rising pressure extended northward on the following days, and at the close of the month prevailed over the whole ocean.

The following are brief descriptions of the depressions charted:

1.—This was a continuation of low area number viii described in the February REVIEW. On February 28th it passed into the ocean south of Newfoundland, and on the 1st of March at 7 a. m. its centre was apparently as far east as the forty-ninth meridian, vessels to the southeast of this position having south-

westerly gales and pressures varying between 28.83 (732.3) and 29.00 (736.6). Its influence on this date extended eastward to the thirty-fifth meridian, as is indicated by the following report by Captain W. Pearce of the s. s. "Egypt": "In N. 47° 55', W. 35° 50', at 4.50 a. m. the wind set in from wsw. with hurricane force, and backed to se., moderating at 4.55 a. m., with pressure at 29.32 (744.7). This peculiar disturbance of the atmosphere was attended by very vivid lightning and very thick clouds." On the 2d the centre of the storm backed to the westward, and remained without making further progress until March 6th. During this period vessels southward to the thirtieth parallel experienced violent northwesterly gales, and over the ocean east of the fortieth meridian strong easterly winds prevailed.

The following reports exhibit the severity of the storm:

Capt. A. G. Braes, of the s. s. "State of Nebraska," reports a whole gale, force 10 to 11, in N. 42° 10', W. 58° 20', at 6 p. m., March 2d, with pressure down to 28.72 (729.5), weather unsettled, with confused sea swell; at 7 p. m. wind shifted to north and blew very hard for about six hours, with thick sleet and snow; mast-heads, yard-arms, and stays covered with St. Elmo's lights. The s. s. "Blagdon," Thos. Dunn, commanding, in N. 51° 36', W. 43° 30', on March 2d, had barometer 29.00 (736.6) and wind from the nw. a whole gale, accompanied by terrific squalls and very heavy seas. S. S. "City of Berlin," F. S. Land, commanding, in N. 42° 10', W. 57° 40', had barometer 28.80 (731.5) at 1 a. m. on the 3d, with wind blowing a strong gale from the ne. and veering through the s. to the nw. during the day. The ship "Rembrant," J. W. McGilbery, commanding, in N. 36°, W. 70°, on the 3d, experienced a nw. gale of hurricane violence, with furious squalls and gusts and rough seas. Capt. Geo. S. Locke, of the s. s. "Muriel," reports: "At 2 a. m. on the 2d, in N. 34°, W. 69°, wind hauled from nnw. to nw., blowing with great violence and increasing until noon, when it blew a hurricane with very high sea; ship kept before it at full speed; at 4 p. m. again blowing with terrific violence, with occasional squalls which had hurricane force, accompanied by hail and rain." The s. s. "Werra," R. Bussius, commanding, in N. 43° 15', W. 51° 45', on the 3d, had barometer ranging from 28.70 (729.0) to 28.80 (731.5), but no strong winds nor heavy swell. A telegram from Bermuda, dated the 5th, reports: "A fearful gale, just moderated, has been blowing with all the violence of a hurricane for eight days without intermission."

At 7 a. m. (75th meridian time) of the 6th the storm-centre, which from the 1st to the 5th made no eastward progress, had advanced northeastward to the forty-fifth meridian; from that date it maintained a steady progress to the northeast, and after the 9th passed beyond the field of observation to the northward.

The following reports of the 8th indicate no abatement, but rather an increase in the intensity of the storm, pressures ranging from 28.30 (718.8) to 28.40 (721.3) being observed with reliable barometers:

The s. s. "Zeeland," L. de Smet, commanding, in N. 50° W. 28° 30', had pressure 28.36 (720.3), at 4 p. m., Greenwich time, accompanied by violent southerly gale of force 10 and very heavy seas. Capt. John Harrison of the s. s. "Assyrian Monarch," in N. 48° 13', W. 28° 50', reports: "Barometer 28.30 (718.8) at 11 a. m. with southerly wind of force 11, veering to w.; storm came on very rapidly, with a tremendous cross sea which was running in all directions when the barometer was at its lowest; had to keep ship before the wind until it veered into wsw., then hove to, using oil to great advantage." The s. s. "Pollux," M. Mullinkroot, commanding, in N. 49° 13' W., 27° 50', had pressure 28.60 (726.4), at 1 p. m., with wind of force 11, setting in from the se. and veering to sw. The s. s. "De Ruyter," I. I. Brarens, commanding, in N. 46° 52', W. 32° 22', had pressure 28.60 (726.4), at 9 a. m., Greenwich time, with wind blowing a whole gale, very heavy squalls and increasing seas. The s. s. "Island," W. Skjöldt, commanding, reports: "Very heavy cross sea, in N. 50° 40', W. 35° 36', at 9.38

a. m., barometer fell to 28.29 (718.5) at 6.11 p. m., when the wind suddenly veered to west, blowing with hurricane force, accompanied by tremendous high sea."

Capt. R. P. Moore, of the s. s. "Siberian," reports as follows: "March 8, encountered a very severe gale commencing in the se. and veering to sw., increasing in violence; at sw. the wind fell away to nearly a calm, with heavy rain, and suddenly chopped into nw. and blew with hurricane force for ten hours; barometer 28.37 (720.6) at 2 p. m., in N. 50° 52', W. 31° 00'; experienced a continuation of very heavy gales from the 8th to the 15th (W. 31° to W. 60°.) In all cases the gale set in from se. and veered to sw., increasing in force and blowing steady from sw. for from four to six hours; then chopping into the nw. and blowing very hard, accompanied by terrific squalls and hail."

2.—This was a continuation of the ocean storm number 11, described in the February REVIEW. Rains, and pressures ranging between 29.50 (749.3) and 29.65 (753.1) indicated its centre near N. 49°, W. 9° on the 1st, with a movement to the eastward, and on the second it is charted on the coast of France.

3.—This storm appeared on the 3d in N. 45°, W. 30°, where the pressure had fallen to 29.08 (738.6), with increasing pressures to the northward and westward and high gales to the southward. The gale experienced on this date by the s. s. "Karo," in N. 36° 50', W. 27° 7', was apparently due to this depression. On the 4th the centre had moved northeastward to N. 49°, W. 20°, vessels to the eastward having southeasterly winds, and on the 5th the storm-centre is charted off the northwest coast of France, where pressures of 29.07 (738.4) and 29.11 (739.4) were reported by vessels in N. 50°.

4.—This was a continuation of low area number iv described under "Areas of low pressure" in this REVIEW. On the morning of the 9th it passed into the ocean north of N. 40° and then moved rapidly eastward. At 11.30 p. m. the s. s. "Thornholm," W. Holmes, commanding, in N. 40°, W. 54° 51', had pressure 29.55 (750.6) and wind blowing a whole gale. On the 10th the centre is charted near W. 51°, where the pressure had fallen from 29.75 (755.6) on the 9th to 29.50 (749.3), and a nw. gale, of force 11, was reported by the ship "City Camp," in N. 40° 46', W. 53° 20', at 8.27 a. m. From this position the storm moved northeastward with decreasing pressure at the centre.

The following reports exhibit the character of the accompanying weather:

The s. s. "Assyrian Monarch," in N. 46° 50', W. 37°, had pressure 29.30 (744.2) at midnight of the 10th, with wind blowing a whole gale from sw. to nw. during the preceding twelve hours, accompanied by vivid lightning to the sw., and leaving a very heavy cross sea. The s. s. "De Ruyter" reports: "Wind began to blow at 10 p. m. with hurricane force from the ssw., lightning in the west, with heavy rain; at 2 a. m., Greenwich time, of the 11th, while in N. 44° 56', W. 37° 50', blowing with hurricane force from the west, accompanied by thunder and lightning, with heavy rain, and barometer reading 29.64 (752.8). St. Elmo's light was seen on the yards." On the 11th the progress of the depression was checked by an area of high pressure over Europe which extended westward to the meridian of W. 20°; on the 12th the centre is charted in N. 49°, W. 37°, where the pressures ranged between 29.18 (741.2) and 29.25 (742.9), showing a decided fall in pressure to the west of the position of the centre on the 11th. Gales of storm-force prevailed south of the track of the depression, accompanied by heavy rains. During the 12th the storm resumed its eastward course, but with decreasing energy, until off the west coast of Ireland on the 14th the lowest pressure reported was 29.60 (751.8).

5.—This storm appeared on the 10th north of the Bermudas, where vessels reported gales of storm-force and pressures ranging between 29.44 (747.3) and 29.65 (753.1); from this position it moved northeastward, with falling barometer. On the 11th the ship "Charles S. Whitney," in N. 37° 34', W. 62° 30', had

pressure 29.24 (742.7) and mne. gale, of force 9, with heavy rain and lightning, the yard-arms being covered with balls of fire. The storm continued northeastward with uniform velocity until the 13th, after which date its further course cannot be traced (owing to the absence of reports) eastward of its position near the thirty-ninth meridian on that date.

6.—This was a continuation of low area number ix, described in this REVIEW. Its influence began to be felt on the ocean on the 13th, when vessels off the coast of the United States had pressure about 29.50 (749.3), and sw. gales, of force 9, were reported off Hatteras eastward to the sixty-seventh meridian. On passing into the ocean on the 14th the low area increased in energy; pressures below 29.00 (736.6) were reported by vessels south of the Banks, and high southerly and westerly gales prevailed from the coast eastward to the forty-ninth meridian.

The following reports are selected as illustrating the severity of the storm:

The s. s. "Siberian," Capt. R. P. Moore, commanding, experienced a gale setting in from the sw. on the 13th, with barometer falling to 28.97 (735.8) at 12 noon of the 14th, in N. 42° 46', W. 57° 12'; the wind then increased to storm-force, veering to w. and nw., and was accompanied by terrific squalls, mountainous seas, and heavy rain and hail squalls. The s. s. "Zeeland," at 5 a. m. of the 14th, had strong s. by w. gale, very high sea and rain squalls; from 3 to 7 p. m. gale increased to force 10, and barometer fell to 29.02 (737.1), in N. 42° 57', W. 55° 30', accompanied by terrible high and confused seas. The s. s. "Assyrian Monarch" had pressure 28.95 (735.3), at 11.30 a. m. of the 14th, in N. 42° 10', W. 52° 50', with westerly gale of storm-force. Similar reports were also made by the s. s. "Arizona" in N. 41° 34', W. 62° 36'; s. s. "Dorset," N. 41° 40', W. 61° 30'; s. s. "Assyria," in N. 42° 14', W. 65° 10'; s. s. "Rhaetia," in N. 44° 10', W. 51°; s. s. "St. Laurent," barometer 28.81, in N. 43° 27', W. 54° 52'; s. s. "State of Indiana," in N. 44° 16', W. 45° 47'; s. s. "Cairo," westerly gale of storm-force in N. 35° 21', W. 56° 56'; the s. s. "Edam," pressure 28.89, gale of storm-force, in N. 47° 50', W. 43° 20', and the s. s. "De Ruyter," in N. 43° 26', W. 50° 30'. In its progress eastward, the storm lost a portion of its intensity and on the 15th is charted in W. 46°, the lowest pressures reported being between 29.15 (740.4) and 29.25 (742.9). On the 16th the centre is charted in N. 47° W. 38°, where the pressure had fallen to 29.12 (739.6), as reported by the s. s. "Ems," and northerly gales of force 9, prevailed to the westward, with pressure increasing to 30.00 (762.0) at the fiftieth meridian. On the 17th a remarkable development of energy is manifested by pressures ranging from 28.80 (731.5) to 29.00 (736.6) between W. 32° and 44°.

The following are a portion of the special reports received:

The s. s. "Polynesia," A. Kühn, commanding, experienced a gale setting in from the nw. at noon of the 16th, with force 9, and increasing until evening, when it attained a force of 11; the barometer continued to fall until 9 a. m. of the 17th, when it reached 28.80 (731.5), in N. 44° 36', W. 43° 42'. The s. s. "Servia," H. Mackay, commanding, in N. 47° 36', W. 38° 00', had pressure 28.98 (736.1) at 4 p. m. of the 17th, with fresh easterly gale. The s. s. "Caledonian," A. Forshaw, commanding, in N. 35° 36', W. 23° 21', had strong gale with terrific squalls on the 17th, with barometer at 29.38 (746.2) at 8 a. m. Equally low pressures continued on the 18th in the same locality, but with decreasing winds. Thus the "Westernland," with pressure 28.69 (728.7), had a gentle breeze. This absence of high gales was due to the prevalence of low pressures over the whole Atlantic, except upon the coast of the United States, and the consequent absence of any steep gradients. The s. s. "Scandinavian," John Park, commanding, in N. 47° 49', W. 30° 38', had pressure 28.75 (730.2) at 10 a. m. of the 18th; oil bags were put out to lessen the high, rough sea. After the 19th this storm does not seem to have existed as a distinct depression, but was apparently merged into the advancing depression number 7.

7.—This was a continuation of low area number x described in this REVIEW. This storm entered the ocean between the 7 a. m. observations of the 16th and 17th, and on the latter date was central near N. 40°, W. 60°, where the pressure was about 29.75 (755.6), and northerly gales prevailed in W. 65°. On the 18th the centre is charted in W. 48°, vessels to the ne. reporting ne. winds and pressures 29.00 (736.6). The s. s. "Waesland," T. Ueberweg, commanding, in N. 40° 49', W. 62° 19', had high confused sea on the 17th, with thunder and lightning and heavy rain squalls. On the 19th and 20th the pressure over mid-ocean continued below 29.00 (736.6), the winds near the centre of the depression being generally light. The progress made during the 19th was small, and on the morning of the 20th the centre is charted in W. 41°. The course of movement was steadily northeast, and on the 22d the centre had reached W. 25°, where pressures to the southward ranged between 29.15 (740.4) and 29.30 (744.2). After this date it passed northward beyond the field of the present observations.

8.—This was a slight depression central on the morning of the 20th between the Bermudas and Cape Hatteras, where the pressure ranged between 29.50 (749.3) and 29.60 (751.8). Its intensity is exhibited by the report of the bark "Eugenie," J. Foley, commanding: "In N. 34° 55', W. 75°, strong gale began from ese. to ssw. at 8 p. m., with very high seas; at noon of the 21st, in N. 39°, W. 72° 47', increased again to strong gale from s., with very heavy squalls." The storm moved northward with falling barometer, and at 7 a. m. of the 21st is charted off the coast, in N. 40°, where the pressure ranged from 29.3 (744.2) to 29.4 (746.7).

9.—This depression is a continuation of low area number xiii described in this REVIEW. It reached the coast of Maine at 7 a. m. of the 22d, and vessels to the southeast reported pressures ranging from 29.23 (742.4) to 29.55 (750.6). On this date vessels south of the Banks had strong se. gales and heavy rain. On the 23d high westerly gales prevailed from the coast eastward to W. 60°, and as far south as the thirtieth parallel.

The following reports exhibit their severity: The bark "Heinrich Bauer," W. P. R. Fretwurst, commanding, in N. 30° 30', W. 69° 9', encountered a strong gale setting in from the sw. increasing to storm-force, with rain and very high seas; veering to nwn. on the 24th, in N. 31° 34', W. 68° 43', it blew a terrific storm, accompanied by very rough sea. The ship "Prince Lucien," John Clegue, commanding, in N. 31° 13', W. 68° 00' reports a fresh gale set in from w., with cloudy weather, on the 24th, increasing to strong nwn. gale at night, with terrific squalls and very high seas.

The centre of the low area passed into the ocean on the 23d and on the 24th is charted in W. 41°, pressures to the southward ranging about 29.30 (744.2). The storm-centre moved northeastward, and at 12 noon, Greenwich time, of the 25th had reached N. 55°, W. 32°, near which the pressure was reported at 29.08 (738.6), generally light winds and fair weather prevailing over the steamer lanes. The storm thereafter apparently continued northward beyond the region of observation.

10.—This storm originated near N. 48°, W. 32°, on the 26th and moved rapidly northeastward to the west coast of Ireland. The following vessels report its passage: the s. s. "Picqua," in N. 40° 57', W. 24° 16', on the 26th, encountered a strong nw. gale, increasing to a whole gale, with very high seas and terrific squalls; continued through the 27th, accompanied by thunder and lightning. The s. s. "Virginian," M. Fitt, commanding, in N. 50° 34', W. 10° 18', on the 27th, had fresh increasing to strong sw. gale, with rain and sleet. On the 28th the lowest pressures reported were off the north coast of Ireland, and ranged between 29.45 (748.0) and 29.70 (754.4). After this date the centre of the disturbance was probably beyond the limits of the chart, but its influence is apparent in the high westerly gales that prevailed on the 29th and 30th about the fiftieth parallel from the coast as far west as the meridian of W. 40°. Diminished pressures over this region on the 30th indicate the presence of a new depression of

increased energy to the northward. High westerly gales, due to this new development, continued through the close of the month as far west as the twenty-fifth meridian.

The following reports describe the character and severity of this disturbance:

The s. s. "Umbrian," Wm. McMickan, commanding, had gale beginning on the 27th from the sw. and continued from the w. and nw. until April 1st, reaching the force of 9 to 11; in N. 50° 30', W. 23°, the pressure fell to 29.50 (749.3) at midnight March 29th; a high, dangerous cross sea prevailed; position on April 1st, N. 46°, W. 40°. The s. s. "Milanese," John Trinick, commanding, in N. 48° 19', W. 12°, on the 27th, had fresh gale from wsw., with high sea, increasing to strong gale, veering to nw. at night; barometer 29.71 (754.6) at noon; 28th, in N. 47° 45', W. 15° 15', sw. wind increased to strong gale, with heavy rain; veered to nw. in the afternoon, with high seas and heavy squalls at night; moderated at noon on the 29th, in N. 46° 59', W. 18° 23', but at 10 p. m. increased to fresh wsw. gale and to strong gale at midnight; 30th, in N. 46° 36', W. 21° 23', strong wsw. gale, with high seas, veered at 10 a. m. to nw., with heavy squalls, increased in afternoon to whole gale, with very heavy squalls and high seas; on the 31st gale increased at 7 p. m. to storm-force, with high seas, ship rolling heavily and shipping large quantities of water; 10 p. m. strong lightning and heavy rain; barometer at noon of 31st was 30.26 (768.6). The s. s. "Martello," F. E. Jenkins, commanding, experienced these gales from March 30th to April 1st, blowing from s. to w.; on the 31st, at noon, in N. 49° 45', W. 8° 20', pressure fell to 29.44 (747.8); on April 1st wind increased to strong gales, and was attended by very heavy squalls and hail.

The s. s. "Palestine," W. Whiteway, commanding, had moderate gale from w. on the 29th, in N. 51° 13', W. 13° 06', with hail and rain, increasing to strong nw. gale at noon; 30th, in N. 51° 11', W. 16° 32', strong gale from sw., with heavy squalls of rain and hail, and barometer 29.72 at noon; 31st, in N. 51° 6', W. 20°, strong w. gale, with heavy rain and hail and high seas, barometer 30.04 (763.0) at noon. The s. s. "Waldensian," D. James, commanding, encountered nw. gale, with hard squalls and high seas, on the 28th, in N. 53°, W. 14° 17', which continued blowing with force of a fresh to strong gale until April 1st; at 8 p. m. of the 28th barometer fell to 29.61 (752.1); 29th, in N. 52° 27', W. 17°, had rising barometer followed by falling barometer on the 30th, when the pressure reached 29.53 (750.0) at 4 p. m., near N. 52°, W. 20°; on the 31st wind backed from nw. to ne., and the pressure fell to 29.40 (746.7) at midnight, near N. 51° 30', W. 24°.

Additional reports from vessels in the vicinity of N. 47°, W. 25°, show the development of a storm of hurricane violence during the night of the 31st, in which the barometer fell below 28.70 (729.0). The description of this disturbance will be given in the April number of this REVIEW.

OCEAN ICE.

On chart i are also exhibited the positions at which icebergs and field ice have been observed during March, 1886. These positions are obtained from reports furnished by shipmasters, and from trustworthy data published in the "New York Maritime Register" and other newspapers. During this month the easternmost icebergs were reported in W. 44° 40', N. 47° 20'. Compared with the chart for the preceding month (February, 1886), it will be seen that the eastern limit of the ice region has not materially changed, while the southern limit has advanced southward nearly two degrees.

The amount of ice observed was considerably less than is usual in the month of March.

Icebergs and field ice were reported, as follows:

March 4th.—S. S. "Blagdon," Thos. Duun, commanding, passed through field ice in N. 47° 40', W. 52° 28', extending about twenty-five miles in length.

6th.—S. S. "Blagdon," in N. 44° 50', W. 59° 10', encountered another heavy field of ice, extending about fifty miles; was fourteen hours steaming through it.

12th.—S. S. "Durham City," in N. 44° 30', W. 59° 16', fell in with heavy field ice, extending as far as the eye could reach; at 1.20 p. m. the ice was so heavy that the steamer's course was turned to the southeast to clear it.

15th.—S. S. "Edam," J. H. Taat, commanding, observed icebergs in N. 47° 20', W. 44° 40'; s. s. "Toledo" passed a large iceberg in N. 45° 24', W. 47° 30'.

16th.—S. S. "Wells City," T. L. Weiss, commanding, in N. 45° 30', W. 47° 20', passed a large iceberg.

17th.—S. S. "Newfoundland" reports the bays of Newfoundland full of Arctic ice; also saw icebergs outside of Saint John's; steamed for ten hours through Gulf ice.

24th.—S. S. "Republic," P. J. Irving, commanding, in N. 44° 20', W. 49° 02', passed several small pieces of ice; air temperature, 34° Fahr.; water temperature, 33° Fahr.

27th.—S. S. "British Queen," R. Wills, commanding, in N. 45° 13', W. 57° 36', passed large quantities of field ice.

The s. s. "Geiser," at New York, March 22d, reports that navigation between Norwegian ports was very difficult on account of ice.

The following table shows the comparison of the iceberg limits between March, 1886, and the same month of the four preceding years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
	° /	° /		° /	° /
March, 1882	42 30	50 00	March, 1882	46 30	46 00
March, 1883	41 46	49 48	March, 1883	48 40	43 03
March, 1884	41 20	54 06	March, 1884	45 00	40 15
March, 1885	40 55	49 04	March, 1885	45 57	43 15
March, 1886	40 20	49 02	March, 1886	47 20	44 40

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during March, 1886, eight reports concerning storms encountered by vessels in the Atlantic west of the forty-fifth meridian; five messages were sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for March, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures with the departures from the normal, for the various stations of the Signal Service.

In the lower lake region, New England, middle Atlantic states, and in the upper Mississippi and Ohio valleys, the mean temperatures for March, 1886, have differed but slightly from the normal. In the upper lake region and extreme northwest the month has been warmer than the average, the departures being most marked in the last named district, where they range from 2° to 6°. In all other districts the mean temperatures are below the normal, the departures being greatest in the central and southern Rocky Mountain regions, where they vary from 4° to 6°; in the west Gulf states the mean temperatures are from 3°.8 to 4°.9 below the normal.

The following are some of the most marked departures from the normal:

Above normal.		Below normal.	
Moorhead, Minnesota	6.0	Denver, Colorado	6.2
Saint Vincent, Minnesota	4.5	Salt Lake City, Utah	5.4
Fort Buford, Dakota	3.0	Winnemucca, Nevada	5.3
Detroit, Michigan	3.0	Fort Thomas, Arizona	4.6
Escanaba, Michigan	2.6	Galveston, Texas	4.6
Alpena, Michigan	2.1	Fort Grant, Arizona	4.5
Port Huron, Michigan	1.9	Prescott, Arizona	4.5

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for March for a series of years, the mean temperature for March, 1886, and the departures from the normal:

Station.	County.	Normal temperature for March.	Number of years.	Mean temperature for Mar., 1886.	Departure.
<i>Arkansas.</i>					
Lead Hill	Boone	48.8	4	46.4	- 2.4
<i>California.</i>					
Fall Brook	San Diego	54.5	7	52.6	- 1.9
Sacramento	Sacramento	54.6	20	52.6	- 2.0
<i>Connecticut.</i>					
Middletown	Middlesex	33.5	28	34.0	+ 0.5
New Haven	New Haven	35.1	100	34.4	- 0.7
<i>Dakota.</i>					
Webster	Day	23.9	3	28.6	+ 4.7
<i>Illinois.</i>					
Anna	Union	45.0	11	43.8	- 1.2
Mattoon	Cole	37.6	6	40.5	+ 2.9
Riley	McHenry	29.9	25	30.2	+ 0.3
Sycamore	De Kalb	31.6	5	31.6	0.0
<i>Indiana.</i>					
Lafayette	Tippecanoe	36.1	7	37.8	+ 1.7
Vevay	Switzerland	42.8	21	43.3	+ 0.5
<i>Iowa.</i>					
Crusco	Howard	25.4	10	26.1	+ 0.7
Monticello	Jones	32.4	32	30.2	- 2.2
<i>Kansas.</i>					
Independence	Montgomery	44.9	15	43.1	- 1.8
Wellington	Sumner	42.8	8	42.1	- 0.7
Yates Centre	Woodson	37.3	6	40.5	+ 3.2
<i>Maine.</i>					
Belfast	Waldo	29.8	27	28.5	- 1.3
Bridgton	Cumberland	27.7	11	27.0	- 0.7
Gardiner	Kennebec	29.4	50	28.8	- 0.6
Orono	Penobscot	26.8	18	26.9	+ 0.1
<i>Maryland.</i>					
Fallston	Harford	38.2	16	39.4	+ 1.2
<i>Massachusetts.</i>					
Amherst	Hampshire	32.6	49	33.8	+ 1.2
Cambridge	Middlesex	33.9	64	32.7	- 1.2
Fitchburg	Worcester	30.5	30	30.4	- 0.1
Lowell	Middlesex	32.8	10	32.8	0.0
New Bedford	Bristol	35.0	74	33.5	- 1.5
Somerset	Bristol	34.0	16	35.1	+ 1.1
Springfield	Hampden	32.7	19	34.4	+ 1.7
Williamstown	Berkshire	30.4	33	30.2	- 0.2
Worcester	Worcester	33.5	48	31.2	- 2.3
<i>Nevada.</i>					
Carson City	Ormsby	40.1	7	38.7	- 1.4
<i>New Brunswick.</i>					
Saint John	Saint John	27.4	26	27.2	- 0.2
<i>New Hampshire.</i>					
Concord	Merrimac	36.5	18	32.1	- 4.4
Haver	Grant	27.2	25	27.6	+ 0.4
<i>New Jersey.</i>					
South Orange	Essex	36.0	16	37.7	+ 1.7
<i>New York.</i>					
North Volney	Oswego	28.2	19	30.3	+ 2.1
Palermo	Oswego	28.0	33	28.2	+ 0.2
Plattsburg Barracks	Clinton	25.6	17	26.4	+ 0.8
<i>Ohio.</i>					
Wauseon	Fulton	32.3	16	34.5	+ 2.2
<i>Pennsylvania.</i>					
Dyberry	Wayne	29.0	22	31.2	+ 2.2
Wellborough	Tioga	31.8	5	36.0	+ 4.2
<i>South Carolina.</i>					
Stateburg	Sumpter	53.3	6	53.1	- 0.2
<i>Texas.</i>					
New Ulm	Austin	62.9	14	58.7	- 4.2
<i>Vermont.</i>					
Lunenburg	Essex	25.8	38	25.2	- 0.6
Strafford	Orange	26.3	12	25.9	- 0.4
<i>Virginia.</i>					
Bird's Nest	Northampton	46.2	18	46.8	+ 0.6
Dale Enterprise	Rockingham	48.3	6	44.7	- 3.6
Variety Mills	Nelson	44.1	9	43.5	- 0.6
Wytheville	Wythe	42.6	22	42.4	- 0.2
<i>West Virginia.</i>					
Helvetia	Randolph	39.1	10	38.6	- 0.5

* From the "Bulletin of the New England Meteorological Society."

The following notes in connection with this subject are furnished by voluntary observers:

California.—Fall Brook, San Diego county: the highest mean temperature for March during the past eight years was 58°.8, in 1888, and the lowest, 47°.8, in 1880.

Iowa.—Monticello, Jones county: the maximum temperature that has occurred in any March for a period of thirty-two years was 78°.0, in 1864, and the minimum, 14°.0, in 1873.

Kansas.—Wellington, Sumner county: the maximum temperature that has occurred in March during the past eight years was 82°.0, in 1881, and the minimum, 0°.0, in 1880.

Yates Centre, Woodson county: the maximum temperature for March, 1886, 86°.3, is the highest for March during the past seven years; the highest temperature previously recorded in March in this time was 78°.5, and this has been exceeded three times during the past month.