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INTRODUCTION.

The general meteorological conditions which prevailed over the United States during December, 1883, as compiled from the reports from the regular and voluntary observers of the Signal Service, and from the monthly reports of state weather services, are shown in this REVIEW. Descriptions of the storms occurring over the north Atlantic ocean are also given under "north Atlantic storms." On chart ii. are shown the approximate paths of the centres of ten storms which occurred over the north Atlantic during December.

The month was warmer than the average December over nearly the whole of the United States, the exceptions being the extreme northwest, upper lake region, New England, and the northern and middle Pacific coast regions, where it was colder than usual.

Large deficiencies in the average precipitation occurred in the states bordering on the south Atlantic coast, in the northern plateau, and in the north and middle Pacific coast regions; and a large excess occurred in the southern plateau. In other portions of the country the departures of excess and deficiency were not marked.

Eighteen atmospheric depressions, occurring within the limits of the stations of observation, are described under "areas of low barometer." The paths of the centres of fifteen of these are shown on chart i.

The phenomenal sunsets which were so extensively observed during the preceding months continued during December. Under "miscellaneous phenomena" will be found a summary of the reports relating thereto, that have been forwarded by the observers of the Signal Service.

In the preparation of this REVIEW the following data, received up to January 20th, 1884, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-two Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and fifty-six monthly journals, and one hundred and forty monthly means from the former, and fifteen monthly means from the latter; two hundred and sixty-three monthly registers from voluntary observers; forty-nine 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 weather reports from the local weather services of Indiana, Kansas, Nebraska, Ohio, and Tennessee, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The distribution of mean atmospheric pressure for December, 1883, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart iii. The highest, inclosed by the isobar of 30.25, covers portions of the northern, middle, and southern slopes, and middle plateau. The highest barometric means occurring within those regions are, 30.28 at Salt Lake City, Utah, and 30.27 at Cheyenne, Wyoming, North Platte, Nebraska, and Fort Elliott, Texas. An isobar of 30.2 incloses the northern and middle plateau districts and the eastern Rocky mountain slope. Westward of this area of barometric maximum the mean pressures decrease to 30.06 on the north Pacific coast and to 30.07 in southern California. To the eastward of the area of greatest pressure the barometric means fall below 30.15 on the Texas coast, and below 29.95 over the Canadian maritime provinces, while over northern Georgia, western South Carolina, and southeastern Tennessee, the mean pressures exceed 30.2. An isobar of 30.1 is traced from Lake Superior southward to northern Illinois, and thence eastward to the New England coast. North of this isobar the pressures vary in the lake region from 30.02 to 30.1, and in the Canadian maritime provinces and New England from 29.92 to 30.03. The stations reporting the extremes for the entire country are: lowest, Sydney, Nova Scotia, 29.92; highest, Salt Lake City, Utah, 30.28.

Compared with the mean pressure of the preceding month (November), an increase has taken place in the Saint Lawrence valley, upper lake region, and, with a few exceptions, at all stations west of the Mississippi river. The greatest increase occurred in the upper Missouri valley and extreme northwest, where it varies from .15 to .19. In the Canadian maritime provinces, New England, and the districts east of the Mississippi south of the lake region, except in Florida, the mean pressures are lower than for November, the departures being most marked from northern Georgia to southern New Jersey, where they amount to .05. At Key West, Florida, the monthly mean is .07 higher than that for November.

DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Compared with the normal pressure for December, no marked departures have occurred, except on the north Pacific coast, where they range from .07 to .10 above the normal. In the extreme northwest, south Atlantic states, middle Pacific coast, over the eastern Rocky mountain slope, and the western plateau districts the mean pressure is slightly above the normal, the departures varying from .01 to .06. From the Missouri valley eastward to the New England and middle Atlantic coasts, and in southern California, the mean pressure is slightly below the normal, the departures ranging from .01 to .04.

BAROMETRIC RANGES.

The barometric ranges were greatest in New England, where they were unusually large. At Eastport, Maine, the monthly range was 1.86, which, with the exception of 1.90 at Fort Myer, Virginia, in 1878, is the largest that has been reported for December since 1877. The monthly ranges exceeded 1.25 at the most northerly stations from Minnesota westward to

Washington Territory. North of a line extending from the Oregon coast between Roseburg and Portland in a southeasterly direction to central Arkansas, thence northeastward to Lake Huron, and thence southeastward to the Virginia coast, the monthly ranges exceeded 1.00. As usual, they were least in Florida and Arizona, the smallest, .23, occurring at Key West.

In the several districts the monthly barometric ranges varied as follows:

New England.—From 1.42 at Block Island, Rhode Island, to 1.86 at Eastport, Maine.

Middle Atlantic states.—From .88 at Cape Henry, Virginia, to 1.44 at Albany, New York.

South Atlantic states.—From .38 at Jacksonville, Florida, to .86 at Kitty Hawk, North Carolina.

Florida peninsula.—From .23 at Key West, to .32 at Sanford.

Eastern Gulf.—From .51 at Pensacola, Florida, to .79 at Vicksburg, Mississippi.

Western Gulf.—From .81 at Galveston, Texas, to 1.06 at Fort Smith, Arkansas.

Rio Grande Valley.—From .75 at Brownsville, Texas, to .82 at Rio Grande City, Texas.

Ohio valley and Tennessee.—From .67 at Chattanooga, Tennessee, to .93 at Columbus, Ohio.

Lower lakes.—From .92 at Cleveland and Sandusky, Ohio, to 1.23 at Oswego, New York.

Upper lakes.—From .93 at Port Huron, Michigan, to 1.16 at Duluth, Minnesota.

Extreme northwest.—From 1.17 at Saint Vincent, Minnesota, to 1.47 at Bismarck, Dakota.

Upper Mississippi valley.—From .88 at Cairo, Illinois, to 1.23 at Saint Paul, Minnesota.

Missouri valley.—From 1.15 at Leavenworth, Kansas, to 1.38 at Fort Bennett, Dakota.

Northern slope.—From .90 at Cheyenne, Wyoming, to 1.32 at Fort Assinniboine, Montana.

Middle slope.—From .77 on the summit of Pike's Peak, Colorado, to 1.13 at Dodge City, Kansas.

Southern slope.—From .74 at Fort Stockton, Texas, to .89 at Fort Concho, Texas.

Southern plateau.—From .46 at Fort Grant, Arizona, to .62 at El Paso, Texas.

Middle plateau.—.92 at Salt Lake City, Utah.

Northern plateau.—From 1.44 at Dayton, Washington Territory, to 1.56 at Lewiston, Idaho.

North Pacific coast.—From .73 at Roseburg, Oregon, to 1.21 at Olympia, Washington Territory.

Middle Pacific coast.—From .60 at Cape Mendocino, California, to .77 at Sacramento, California.

South Pacific coast.—From .51 at San Diego, California, to .54 at Los Angeles, California.

AREAS OF HIGH BAROMETER.

Nine high areas have traveled across different portions of the country, and are described below. They were all well-marked and extensive. Number iii. produced low temperatures, especially in the Gulf states, where freezing weather was quite general on the 15th and 16th; in the Southern states the lowest temperatures of the month occurred during its movement. In the upper Mississippi valley and upper lake region, the lowest temperatures of the month generally prevailed during the passage of number v. on the 19th. In the lower lake region, middle Atlantic states and New England, number vi. produced the lowest temperatures on the 22d and 23d. Number viii. was accompanied by lowest temperatures in the Missouri valley on the 27th. In Washington, Oregon, Idaho, Utah, Arizona, Montana, Wyoming, Colorado, northwestern Texas, and western portions of Kansas, Nebraska, and Dakota, the minimum temperatures occurred during the presence of number ix. on the 30th and 31st. Number ii. developed in the Rocky mountain region; numbers iii. and vii. came from the Pacific coast; numbers v., vi., viii., and ix. advanced southeastward from the northwest territory.

I.—On the morning of the 1st this high area was central in Wyoming, and during the day moved southeastward, with a pressure slightly above 30.60, or .30 to .40 of an inch above the normal, toward the lower Missouri valley. During the 2d its progress was southeastward. On the morning of the 3d it was central in the upper Ohio valley, with diminished central pressure, and with temperatures slightly below the normal east of the Mississippi valley; the 3d and 4th it passed southeast beyond the middle Atlantic coast. Cautionary off-shore signals were ordered up at Indianola on the 1st, in anticipation of a "norther," but it did not reach the coast, although high northerly winds occurred from the Missouri valley to northern Texas.

II.—During the 3d this high-pressure area formed over the Rocky mountain region, and on the morning of the 4th was central in eastern Wyoming. Its movement on the 4th was eastward toward the lake region. The afternoon of the 5th it was central over Lake Superior, with the pressure about .25 of an inch above the normal. The morning of the 6th it covered the lower lake region and the middle Atlantic states, and later moved eastward over New England and Nova Scotia. Along the coast of Nova Scotia the pressure was about .60 of an inch above the normal on the morning of the 7th, after which it slowly disappeared to the eastward.

III.—The pressure increased in the Pacific coast regions on the 5th; it continued on the 6th, and extended eastward across the Rocky mountain region. On the morning of the 7th it was central in southern Idaho, with the Olympia barometer .51 inch above normal. The 7th and 8th, it extended its influence southeastward to the lower Mississippi valley, but continued highest in Utah; barometer at Salt Lake City, 30.69 inches, or .47 above normal, morning of the 8th. During the 9th, 10th, and 11th, with diminished pressure, it continued almost stationary as a barometric ridge reaching from southern Idaho over Wyoming, eastern Colorado, and western Kansas to northern Texas. The 12th, it apparently withdrew toward Idaho and Washington Territory, during the movement of the low-pressure areas on the Texas coast and from Manitoba southeastward. The 13th, it again moved eastward over Montana, and the 14th, southeastward over the country between the Rocky mountains and Missouri valley; p. m. barometer, 14th, at North Platte, 30.89 inches, or .66 above normal. A "norther" prevailed in Texas on the 14th. During the 15th it passed south over Texas and disappeared. Freezing temperatures accompanied it as far south as the central portions of the Gulf states and western portions of the south Atlantic states on the morning of the 15th; also in the larger portions of Texas and Louisiana, throughout Mississippi, Alabama, Georgia, and the south Atlantic states, and the northern portion of Florida on the morning of the 16th, where it fell about 20° below the normal. In anticipation of the "norther," off-shore signals were ordered to be hoisted at Indianola and Galveston midnight of the 13th, and at Key West morning of the 15th; all were justified.

IV.—Developed from number iii. on the 14th. It was central in Idaho on the 15th, with the temperature about 10° below the normal and the barometer about .50 inch above the normal. On the 16th it moved southwestward toward Oregon, Nevada and Utah, with diminishing central pressure, due to the advance of low-pressure number x., and on the 17th withdrew to western Oregon, where it lost its identity on the 18th.

V.—This area made its appearance on the 17th over the northwest territory, and advanced southeast over Montana and Dakota, following low area number x. On the morning of the 18th the temperature was below the normal from the upper lake region beyond the Missouri valley; 31° below the normal at Moorhead, Minnesota, and —28° at Minnedosa, Manitoba. During the 18th it extended its influence toward the Ohio valley and Texas, but with the highest pressure north of Dakota. On the 19th the highest reached from the upper Mississippi valley eastward over the lake region, with morning minimum temperature of —35° at Pembina, and 37° below nor-

mal at Moorhead. On the morning of the 20th the highest covered the Saint Lawrence valley; barometer above 30.50, or about .50 inch above the normal. During that and the following day it slowly disappeared eastward beyond the Canadian maritime provinces.

VI.—Advanced southeastward over the northwest territory and Manitoba morning of the 21st; minimum temperature at Qu'Appelle, —36°; midnight barometer at Minnedosa, 30.83 inches. The pressure was below the normal, and falling, in the Pacific coast and Rocky mountain regions, and caused this high area to move southeastward over the lake region during the 21st and 22d, with the temperature considerably below the normal from the Missouri valley to the New England and middle Atlantic coasts, and the northern portions of the Gulf states; minimum, —36° and —35° at Fort Garry and Pembina, respectively, or more than 30° below the normal, morning of the 22d. The 23d it passed eastward over New England; highest barometer at Montreal, 30.79 inches, or .65 above normal; minimum temperature from 20° to 30° below the normal; northerly gales were produced along the coast north of Cape Hatteras. During the 24th it disappeared beyond Nova Scotia.

VII.—This high area appeared in California on the 23d, and, with a slight increase in pressure, extended southeastward to Texas on the 24th. Freezing temperature accompanied it in the interior. The 25th, it apparently withdrew toward California during the progress eastward of low area xiv. The 26th, it combined with number viii. and lost its identity.

VIII.—During the night of the 25th it advanced southward over the northwest territory and Manitoba, with minimum temperature of —37° at Qu 'Appelle and Fort Garry on the morning of the 26th. During the day it rapidly extended southward in rear of low area xiv. and in front of low area xv., and on the morning of the 27th it appeared as an extensive barometric ridge, reaching from Texas beyond Minnesota, with the pressure slightly above normal. The temperature fell considerably below the normal—at Moorhead, Minnesota, 43° below, or to —34°. On the 27th and 28th it moved southeastward over the Southern states, with freezing weather in the northern portions of the Gulf and south Atlantic states. On the 29th it remained stationary in the south Atlantic states, and disappeared eastward on the 30th in advance of low area xvi.

IX.—On the 28th, increasing pressure and falling temperature in the northwest territory and Manitoba indicated the approach of a high area. Its progress southward was impeded on the 29th by low area xvi., but the pressure also increased in the Pacific coast regions, and continued increasing on the 30th from the Pacific coast to the upper lake region; during the 31st it extended its influence to the western Gulf coast, where a severe "norther" began in the evening. At midnight the barometer at Qu 'Appelle was 30.99 inches, or more than .60 above the normal.

AREAS OF LOW BAROMETER.

The following table gives the latitude and longitude in which the centres of the several areas were first and last located, and the average hourly velocity of movement:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I.	51 30	96 00	47 00	58 00	30.5
III.	36 00	102 30	48 00	87 00	29.1
V.	51 00	95 30	45 30	60 00	31.2
VI.	52 00	107 00	43 00	75 00	40.0
VII.	48 00	97 30	47 00	59 00	23.7
VIII.	27 00	96 30	30 30	93 00	15.0
IX.	54 00	110 00	47 00	60 00	48.4
X.	51 00	107 30	51 30	67 30	43.8
XI.	31 00	97 00	33 30	86 30	27.5
XII.	39 30	71 00	46 30	58 00	35.4
XIV.	40 30	114 30	44 30	60 00	41.0
XV.	49 30	125 00	49 00	61 00	48.8
XVI.	48 30	125 30	51 00	98 00	37.5
XVII.	42 00	112 00	42 30	82 00	25.8
XVIII.	28 00	97 30	30 30	88 30	17.5

Mean hourly velocity, 33.0 miles.

Out of eighteen low areas, the tracks of the centres of fifteen are shown on chart i. The paths of three, numbers ii., iv., and xiii., were too far north to permit locating them. Along the Gulf and southern portions of the south Atlantic and California coasts no severe storms were experienced during the month. Number xv. was unusually severe from northern California and the north Pacific coast to Montana; also from the lakes and middle states northeastward beyond the Gulf of Saint Lawrence. In the lake region numbers i., vii., x., and xiv. were also very severe. Number ix. was an extremely dangerous storm along the New England coast, as the northeasterly gales were accompanied by heavy snow.

The display of signals at the lake stations ceased after the 15th, excepting Milwaukee, Ludington, Grand Haven, and Saint Joseph, on Lake Michigan.

I.—During its progress eastward it was accompanied by very light rains and snow in the lake region, Saint Lawrence valley, New England, and the northern portion of the middle Atlantic states, and light rains and snow in the Canadian maritime provinces. The southerly winds in its advance were only fresh to brisk, but the steep gradient between it and high area number i. produced high northwesterly winds in its rear from the Missouri valley eastward over the lake region to the Atlantic coast north of Cape Hatteras, which at places increased to gales. Maximum hourly wind-velocities: Yankton, nw., 34; Mackinaw City, nw., 36; Marquette, w., 40; Grand Haven, nw., 53; Erie, nw., 30; Kitty Hawk, n., 44; Delaware Breakwater, nw., 43; Block Island, n., 44; Eastport, nw., 39; Mount Washington, nw., 90 miles. Lowest barometer at Sydney, Cape Breton, morning of the 3d, 29.05 inches, or .91 below the normal. In the Ohio valley and Missouri the temperature rose from 20° to 30° above the normal on the 1st. Cautionary signals were ordered up at all lake stations and along the New England and North Carolina coasts, and off-shore, from New York to Cape Henry, on the 1st; warnings were also sent for the Canadian stations in the lake region, Saint Lawrence valley, and maritime provinces; they were very generally justified, as shown by the above velocities.

II.—This disturbance was scarcely felt within the limits of the Signal Service stations, and its path has not been charted. Its centre passed eastward over Manitoba on the 2d and 3d, thence north of the lake region, the 4th, and to the mouth of the Saint Lawrence on the 5th. Very light local rains or snow accompanied it from the lake region and Ohio valley eastward. No signals were ordered and not any high winds occurred.

III.—Falling barometer and increasing southeasterly winds along the Pacific coast on the 2d indicated the approach of a disturbance. During the 3d generally light rains fell in California, and at night in Arizona. The barometer at San Francisco fell to 29.76 inches, or .45 below the normal. The 4th, clearing weather followed in California, but light rains continued in Arizona, with high winds at places. During the 5th the rain-area extended eastward over the western Gulf states and the Missouri valley, but partly as snow from Colorado to western Dakota; the centre of the depression was in the northwestern corner of Texas at midnight; high winds were reported from western Texas. As it moved northeast toward the upper lakes, threatening weather, with rain, prevailed from the Gulf coast to the upper lakes, Minnesota and the Missouri valley, but changing to snow from Dakota and Minnesota to Colorado; also high winds and gales, especially in its western half. In the morning the barometer at Dodge City fell to 29.67 inches, or .58 below the normal. As it passed into Canada on the 7th, rainy weather accompanied it from the Gulf coast to the lake region, generally changing to snow from the Missouri valley to the upper lakes. During the 8th rain fell in the Atlantic states; a light "norther" was produced on the Texas coast in connection with high area iii. Maximum velocities: Cape Mendocino, se., 64; Prescott, s., 30; Fort Concho, sw., 42; West Las Animas, nw., 44; Keokuk, se., 36; North Platte, w., 36; Duluth, nw., 36; Grand Haven, sw., 32; Erie, s., 32; Buffalo, sw., 36; Indianola, sw., 32, and n., 36 miles. At midnight of

the 5th signals were ordered for lake stations from Duluth to Cleveland, and the afternoon of the 6th for the remaining stations on lakes Erie and Ontario, and warnings sent for the Canadian stations in the lake region and Saint Lawrence valley; they were well justified, but were lowered too soon along Lake Ontario morning of the 8th.

IV.—The southern edge of this storm was felt on the 4th in the north Pacific coast region where threatening and rainy weather prevailed, with high southerly winds on the coast. The 5th, it rapidly moved eastward over the northwest territory and Manitoba, causing high southerly winds. During the 6th it probably combined with the extensive low area iii. then moving northeast toward the upper lake region. Its track has not been charted. Maximum velocities: Fort Canby, s., 44; Fort Assinniboine, sw., 28; Medicine Hat and Fort Garry, s., 30 miles.

V.—On the 8th this disturbance advanced southeast over the northwest territory and Manitoba. Light local rains fell on the 9th in the upper lake region, and the 10th partly as snow in the lower lake region, New England, and Saint Lawrence valley. High winds were occasionally reported: Milwaukee, nw., 32; Buffalo, w., 48; Father Point, ne., 30; Delaware Breakwater, w., 37; Block Island, nw., 31 miles. Cautionary signals were ordered, morning of the 10th, for Lakes Erie and Ontario and the New England coast, and off-shore signals in the afternoon for the New York, New Jersey, Delaware, and Virginia coasts; they were justified, excepting along the New England coast only partly so. High winds occurred night of the 9th and 10th along Lakes Michigan and Huron, for which signals had not been displayed.

VI.—This storm was first observed evening of the 9th as advancing southeast over the northwest territory, accompanied by high southerly winds. The 10th, it passed east over Manitoba; the 11th, southeast to northeastern New York, with brisk to high westerly winds and light local rains or snow, then quickly disappeared eastward. High winds: Grand Haven, w., 29; Buffalo, w., 42; Ottawa, se., 30; Delaware Breakwater, n., 32; Kitty Hawk, ne., 38 miles. At midnight of the 10th signals were displayed along the upper lakes; morning of the 11th, along the lower lakes, and afternoon, along the New England coast; off-shore along the New Jersey coast afternoon of the 11th. Excepting for the New England coast, they were fully justified.

VII.—High southerly winds and falling barometer heralded the approach of this storm on the 11th in the northwest territory and northern Montana. The 12th, it moved southeast toward Lake Superior, with increasing southwesterly winds in the lake region. In the Missouri and upper Mississippi valleys the temperature rose from 20° to 40° above the normal. During the 13th high winds were general in the lake region, and in connection with low area viii., threatening and rainy weather prevailed from the lakes to the Gulf. On the 14th it passed over the mouth of the Saint Lawrence, with rain from the eastern Gulf and Atlantic coasts to the lakes and Saint Lawrence valley, but partly as snow in the two last-mentioned sections; high winds were general throughout the lake region, Saint Lawrence valley, New England, and middle Atlantic states; lowest barometer at Father Point 29.16 inches, or .82 below the normal. It disappeared eastward on the 15th. Maximum velocities: Qu'Appelle, s., 30; Fort Assinniboine, sw., 30; Duluth, n., 36; Marquette, nw., 32; Milwaukee, n., 39; Sandusky, nw., 40; Rochester, nw., 35; Block Island, sw., 30, and nw., 44; Delaware Breakwater, nw., 46; Kitty Hawk, ne., 42; Mount Washington, nw., 88 miles. On the morning of the 12th signals were ordered up along Lakes Superior and Michigan, and in the afternoon along Lakes Huron, Erie, and Ontario, and warnings sent for the Canadian stations along the lakes and Saint Lawrence valley. Morning of the 13th signals were ordered for the New England coast, and in the afternoon off-shore for the New Jersey coast; midnight, warnings were sent for stations in the Canadian maritime provinces; morning of the 14th, signals for the Virginia and North Carolina coast. They were very generally justified.

VIII.—Falling barometer, increasing easterly winds, and threatening weather with light local rains on the Texas coast, on the morning of the 12th, indicated the presence of a disturbance off the coast. During the 12th and 13th it moved northeastward, accompanied by rainy weather in the Gulf states. On the latter date it lost its identity by being merged into the extensive low-pressure existing over the country from the Mississippi valley to the Atlantic coast, caused by low area vii., then moving eastward north of the lake region. High winds were reported from Indianola only, viz., e., 27 miles. Cautionary signals were ordered up on the morning of the 12th at Indianola and Galveston, but justified as to velocity at the former only.

IX.—As shown on the chart, the centre of this disturbance moved rapidly southeastward on the 15th from the northwest territory over Dakota, accompanied by light snows. During the 16th it was accompanied by generally light snow from Tennessee and the Missouri valley eastward to New England, with occasionally high winds; afternoon barometer at Indianapolis, 29.58 inches, or .54 below normal. The 17th, it traveled with extraordinary rapidity northeast along the coast; the central pressure continued decreasing, and at midnight the Sydney barometer fell to 29.09 inches, or .85 below the normal; heavy snow and northeasterly gales prevailed in its northern half. Maximum velocities: Fort Assinniboine, sw., 26; Yankton, n., 32; Ludington, ne., 30; Erie, n., 38; Cape Henry, nw., 40; Block Island, ne., 36; Eastport, n., 31; Father Point, ne., 35 miles. Signals were displayed on Lake Michigan morning of the 16th; afternoon, along the coast from North Carolina to Rhode Island; midnight, from Massachusetts to Maine. They were partly justified along Lake Michigan, New Jersey, and southern New England, and justified in the other sections.

X.—The night of the 16th this storm quickly passed southeastward from the northwest territory to Dakota. The 17th, the morning barometer at Bismarck read 29.40 inches, or .83 below the normal; snow fell from the Missouri valley to the lakes; high winds accompanied it, which at places in its western half increased to gales on account of the steep barometric gradient. On the 18th and 19th it disappeared to the northeastward, with high southwesterly winds along the middle Atlantic and New England coasts and the Saint Lawrence valley, and northwesterly in the lake region. Maximum velocities: Fort Assinniboine, sw., 36; Fort Custer, nw., 72; Cheyenne, nw., 40; Yankton, nw., 38; Duluth, w., 36; Milwaukee, nw., 33; Sandusky, w., 56; Buffalo, w., 40; Kitty Hawk, ne., 36; Delaware Breakwater, sw., 44; Eastport, s., 28; Mount Washington, nw., 70; Father Point, nw., 40; Ottawa, w., 35 miles. Cautionary signals were ordered, morning of the 17th, for Lake Michigan, and warnings sent at midnight for Canadian stations along the lakes and Saint Lawrence valley; morning of the 18th, from Virginia to southern New England, and continued from previous storm for remaining New England coast stations; midnight of the 18th, for North Carolina coast. All were fully justified.

XI.—During the progress of number x. on the 17th, a barometric trough formed, which extended southwestward to New Mexico and Texas. On the 18th a distinct depression developed in Texas and moved eastward, accompanied by light rains from the eastern Gulf coast to Tennessee. On the 19th it produced rain from the eastern Gulf coast to New Jersey, and snow from Arkansas northeast over the Ohio valley to New England; on the coast, between Cape Hatteras and Cape Cod, high northeasterly winds. Maximum velocities: Indianola, sw., 35 and ne., 36; Delaware Breakwater and Block Island, ne., 32; Sandy Hook, ne., 36 miles. Signals were ordered up at Indianola and Galveston on the morning of the 18th; also along the New England coast and New Jersey, and continued up, from the preceding low, along the North Carolina coast. They were only partly justified along the Texas and northern New England coast, but justified otherwise. The warnings sent out for the Canadian maritime stations, afternoon of the 19th, were not justified as to velocity, although heavy snow fell in Nova Scotia.

XII.—This disturbance appeared off the New Jersey coast, morning of the 21st. High northeast backing to northwest winds prevailed on the coast from New Jersey northeastward to Cape Cod, and in Nova Scotia, and snow fell in the middle Atlantic states, New England, and Canadian maritime provinces. Lowest barometer at Sydney, 29.38 inches, or .58 below normal. Maximum velocities: Sandy Hook, nw., 42: Block Island, nw., 46; Mount Washington, nw., 92 miles. Signals were not ordered for this storm.

XIII.—The centre of this low area moved east, to the north of the Signal Service stations, and could not be charted. Snow accompanied it in the lake region on the 20th and 21st, and high westerly winds on the latter date. Maximum velocities: Grand Haven, w., 29; Mackinaw City, nw., 32; Saugeen, sw., 42; Buffalo, w., 46; Rochester, w., 40 miles. No signals were ordered. Although the storm was not severe on Lake Michigan, yet it was sufficiently so to justify signals if they had been displayed.

XIV.—For several days previous to the 21st the pressure had been generally below the normal in the Pacific coast regions, with light local rains which on the 20th extended to Arizona. The 21st, rain was general from the Pacific coast to Utah and Arizona. The barometer reached its minimum at Portland, Oregon, 29.67 inches, or .37 below the normal, and next morning was .36 inch below the the normal at Salt Lake City. During the 22d it passed southeast over Utah and Colorado. Threatening weather with rain prevailed from Arizona and Utah to the Gulf states, Tennessee, and lower Ohio valley, but with snow and increasing easterly winds from the Missouri valley to the upper lake region; the central pressure continued diminishing. The 23d, morning barometer at Leavenworth, 29.74 inches, or .51 below normal. The rain-area reached the Atlantic coast, but mostly as snow in New England, middle Atlantic states, lake region, and upper Mississippi and Missouri valleys; in the lake region severe gales occurred. During the 24th a secondary depression developed on the middle Atlantic coast, but by midnight the two had reunited southeast of Maine. The 25th, a slight depression, which had been left in the Gulf states the 24th, passed northeast off the middle Atlantic and southern New England coast, followed by clearing weather. Maximum velocities: Indianola, s., 31; Milwaukee, se., 46; Mackinaw City, e., 41; Erie, se., 44; Rochester, s., 40; Sandy Hook, n., 37; Block Island, se., 36; Provincetown, se., 32 miles. Afternoon of the 22d, signals were ordered for Lake Michigan, and at midnight, from North Carolina to New York; afternoon of the 23d, along the New England coast. Warning was also sent for the Canadian lake stations on the 22d, and for those in the Saint Lawrence valley and maritime provinces on the 23d. All were well justified, excepting those in northern New England which were only partly justified.

XV. After the previous storm had left the north Pacific coast, the barometer continued below the normal in that region, with rainy weather. During the 24th the pressure diminished very rapidly; barometer at Olympia 29.49 inches, or .50 below normal; heavy rains and southerly gales prevailed in the middle and north Pacific coast regions, as the centre passed eastward over British Columbia. Its movement southeast was very rapid on the 25th, with light snows from the upper Missouri valley to upper Michigan; at Fort Assinniboine the barometer fell .73 inch below the normal. Two distinct depressions developed on the 26th and reunited later; snow prevailed from the Missouri valley to the upper lake region, with high winds and gales. During the 27th and 28th it developed great energy; at Chatham, New Brunswick, the barometer fell to 28.55 inches, or 1.42 below the normal; gales occurred from the lower lakes and middle Atlantic coast northeastward to the Gulf of Saint Lawrence; heavy rains fell in its southeastern half and heavy snow in its northwestern half. From New England north and eastward, it was the most severe storm of the month. Maximum velocities: Cape Mendocino, se., 60; Fort Canby, sw., 48; Portland, Oregon, s., 34; Spokane Falls, sw., 48; Fort Custer, w., 72; Cheyenne, nw., 36; Duluth, nw., 38; Grand Haven, s., 33; Indianola, n., 34; Macon and Hatteras, nw., 40; Rochester, nw., 40; Sandy Hook, nw., 56; Cape May, w., 61; Barnegat City, nw., 59; Block Island, nw., 55; Eastport, s., 30 and nw., 37; Yarmouth, Nova Scotia, w., 50; Father Point, ne., 60; Mount Washington, s., 74 and nw., 132 miles. Cautionary signals were ordered to be displayed on Lake Michigan on the afternoon of the 25th, and warning, sent for the Canadian lake stations at night. On the afternoon of the 26th off-shore signals were ordered for the Texas coast for a "norther," as high area viii. was rapidly extending southward toward the Gulf in the rear of this low. On the 27th signals were also hoisted along the coast from North Carolina to Maine, and at night, warnings sent, although late, for stations in the Canadian maritime provinces. The signals were fully justified.

XVI.—On the 26th the barometer again fell very suddenly in the north Pacific coast region, with rainy weather and high southerly winds; lowest barometer at Olympia, 29.38 inches, or .61 below the normal. During the 27th the storm-centre quickly crossed the northwest territory and Manitoba, accompanied by snow and gales thence south over Montana. Maximum velocities: Portland, Oregon, s., 28; Olympia, s., 28; Fort Assinniboine, sw., 48; Fort Custer, w., 36; Medicine Hat, s., 60; Minnedosa, nw., 40 miles.

XVII and XVIII.—After the previous low area had passed eastward the pressure was left considerably below the normal in the Rocky mountain region on the 27th. From that, low area xvii. developed over Idaho and Utah, and moved southeastward during the 28th to Kansas; barometer at Salt Lake City, .38 inch below normal. The 29th, low area xviii. began to form in the southern extremity of the barometric trough, over New Mexico and Texas; threatening weather with generally light rains prevailed from the western Gulf states to Missouri. The 30th and 31st they gradually disappeared, as shown on the chart, but at midnight of the latter date threatening weather with rain was general from the Gulf and Atlantic coasts to the Ohio valley, and with snow in New England, the lake region, and Missouri valley. High winds: Fort Stockton, se., 31; Indianola, n., 36 miles. Cautionary signals were ordered for Lake Michigan on the 29th, but only partly justified. Warning was sent, morning of the 30th, for the Canadian stations on Lakes Erie and Huron.

NORTH ATLANTIC STORMS DURING DECEMBER, 1883.

[*Pressure expressed in inches and in millimetres; wind-force by scale of* 0—10.]

Chart ii. exhibits the tracks of the principal atmospheric depressions that have moved over the north Atlantic ocean during December, 1883. The location of the various storm-centres has been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels in the north Atlantic, and from other miscellaneous data received at this office up to January 22d, 1884. The observations used are in general simultaneous, having been taken each day at 7 h. 0 m., a. m. Washington, or 0 h. 8 p. m., Greenwich, mean time.

Ten depressions have been sufficiently defined to admit of an approximation of their paths. Of these, numbers ii., viii., ix., and x. are probably continuations of storms which originated in the United States; of the remaining depressions, numbers i. and v. exhibited considerable storm-energy, the latter being especially severe along the coasts of Nova Scotia and Newfoundland. The eastward movement of the disturbances appears to have been somewhat checked by the presence of an area of high-pressures, which, during the greater part of the month, occupied the ocean from the European coasts westward to the forty-fifth meridian.

The following are descriptions of the depressions charted:

I.—This disturbance apparently developed south of the thirtieth parallel during the closing days of November. Numerous vessels between N. 25° and 30°, and W. 60° and 70°, reported strong gales during the 28th, 29th, and 30th. The following reports are given as indicating the severity of the storm on the

30th: the bark "Dunsinane," in N. 28° 30′, W. 67° 00′, had a heavy ne. to nw. and w. gale, lasting eight hours, during which she had decks swept, bulwarks stove, and split several sails; the brig "Wm. Mason," in N. 26° 24′, W. 70° 50′, encountered a heavy nw. gale, in which she lost and split sails; the brig "Elviva," in N. 29° 30′, W. 70° 00′, reported a hurricane from s. backing to se., ne., and n.; vessel lost several sails. On December 1st the disturbance was near Bermuda; on that date, the bark "Loreley" was dismasted in a hurricane off Bermuda; the bark "Sampo," in N. 34°, W. 64°, lost spars and had bulwarks damaged; the ship "Regina" was abandoned in N. 39°, W. 58°, the vessel having been rendered a total wreck by the fury of the gale. The only barometric observations recorded by vessels near the centre of disturbance on the 1st are those of the s. s. "Orinoco" and the bark "E. D. Bigelow." The former, in N. 35° 50′, W. 68° 20′, reported barometer 29.78 (756.4), wind nw., force 4, heavy cross sea from e; the "E. D. Bigelow," in N. 39° 29′, W. 63° 40′, reported barometer 29.62 (752.3), wind gusty and veering to se., then backing to nne., and blowing a hard gale with violent squalls. During the 1st the disturbance moved northeastward, and on the 2d it was central near the banks of Newfoundland, causing strong gales along the coasts. The s. s. "Devon," on the Banks, reported a heavy nw. gale, in which the barometer fell to 28.83 (732.3). Captain T. L. Weiss, commanding the s. s. "Llandaff City," reported: 2d, 7 h. 30 m., Greenwich time, wind ese., force 7, barometer 29.2 (741.7), rainy weather, sea rising; 11 h. 30 m., barometer 28.5 (723.9), wind se., force 7, fog and rain (ship's position, about N. 44° 48′, W. 51° 45′); 12 h. 30 m., wind shifted to sw., and gradually hauled to w., and decreased to force 6; 16 h. 30 m., barometer 29.0 (736.6), wind w., misty, wet weather. The s. s. "Lord Gough," E. M. Hughes, commanding, in N. 47° 16′, W. 50° 00′, on the 2d reported: noon (Greenwich mean time), barometer falling rapidly and wind increasing, weather threatening; 3.30 p. m., sudden shift of wind from ese. to sw., force 8, with heavy rain, barometer 28.82 (732.0); the barometer rose as rapidly as it had previously fallen and the weather moderated. On the 2d all vessels between N. 45° and 50° and near the fiftieth meridian reported strong easterly and southeasterly gales with rainy weather and high sea. By the 3d the depression appears to have filled up, the pressure being 30.0 (762.0) and above, over the ocean east of the fortieth meridian on that date.

II.—This was probably a continuation of the depression charted as low area i., chart i. On the morning of the 3d, the disturbance was off the coast of Nova Scotia, attended by strong northwesterly gales in the southwest quadrant, and moderate southerly and southwesterly gales to the eastward of the centre. Captain H. Schoonhoven, commanding the s. s. "Daniel Steinmann," reported: "December 3d, 8 a. m. (Greenwich time), a storm sprang up from wsw., barometer 29.38 (746.2); 1 p. m., wind wsw., force 9; 6 p. m., wind wnw., force 7, barometer 29.58 (751.3), snow and hail; 11 p. m., wind decreasing to force 6, sky clearing, (ship's position at noon, N. 42° 53′, W. 61° 33′)." On the 4th the region of least pressure was transferred to about N. 47°, W. 47°. On that date the s. s. "Schiedam," J. L. A. d'Harnecourt, commanding, reported: "N. 46° 04′, W. 48° 42′, during the night had fine se. wind with clear sky, but falling barometer; at 9.19 a. m., the wind suddenly, and without any previous signs, shifted to west and increased, accompanied by light rain, and lower temperature; the barometer, at the time of the shift of the wind, read 29.51 (749.5)." Captain Cochrane, commanding the s. s. "The Queen," in about N. 47° 21′, W. 44° 43′, reported as follows: "At noon, (Greenwich mean time) of the 4th, wind sw. dense fog, barometer 29.57 (751.3), the wind suddenly shifted to nw., and freshened to a fresh gale, clearing off the fog; the barometer then began to rise and the wind backed to w., with high w. and sw. sea, and snow squalls at intervals." Moderate to strong northwesterly gales continued over the region west of the fiftieth meridian as the pressure increased in rear of the depression. On the 5th the disturbance was near N. 50°, W. 39°, the pressure having increased to 29.7 (754.4); during the day the depression appears to have filled up, and by the following day it had disappeared, the atmospheric pressure over mid-ocean having become uniform.

III.—During the 5th a slight depression passed over the Gulf of Saint Lawrence, and on the morning of the 6th it was probably central near Cape Breton island. During the day it passed northeastward and was dissipated before reaching the thirty-fifth meridian, where an area of high-pressure prevailed. The following report is furnished by Captain S. R. Hill, commanding the s. s. "Surrey": December 7th, 15 h. Greenwich time, strong breeze and hard squalls from ssw., barometer 30.2 (767.1), wind increasing in force to a moderate gale, with hazy weather; 19 h., 30.1 (764.5); 20 h. 30 m., barometer 29.88 (758.9), wind suddenly shifted to wnw., the barometer then began to rise and at 23 h. it read 30.15 (765.8); the gale began to abate at 7 h. on the 8th, when the barometer read 30.46 (773.9). Ship's position at noon of the 7th, N. 48° 21′, W. 43° 32′.

IV.—The pressure, which for several days had been high over the British Isles and western Europe, began to give way during the 10th, and by the 11th a depression appeared to the northwestward of the British Isles. This disturbance was probably identical with the one which caused the destructive gale that occurred over the British Isles on the 11th and 12th. The structural damage was very great, shipping in the harbors and on the coasts suffered severely, and several persons were killed or injured.

V.—This disturbance appeared near the banks of Newfoundland on the 10th; it moved slowly north-northeastward and probably combined with low area v. of chart i., which had passed over the Canadian maritime provinces during the 11th. Captain W. H. Trant, commanding the s. s. "Venetian," reported: 10th, in N. 44° 23′, W. 56° 20′, barometer 29.72 (754.9), wind variable; during the twenty-four hours the wind veered twice around the compass by north and east, and settled to west at noon. On the 11th the wind and sea began to increase, with heavy rain and slight sea-swell from n., barometer falling. At 3 p. m. the barometer read 29.32 (744.7); 6 p. m., 29.07 (738.4); 8 p. m., 29.02 (737.1); midnight, 29.00 (736.6), at which time it was blowing a steadily increasing gale from sse. to ssw., with high cross sea and thick, misty weather. By morning of the 12th the storm-centre was probably near N. 50°, W. 48°; the pressure had decreased to 28.9 (734.0), and the winds in the eastern quadrants had attained the force of a violent gale. Captain Trant, of the s. s. "Venetian" reported, 2 a. m. of the 12th, barometer 28.9 (734.0), which was the lowest reading during the gale, wind sw., heavy gale, with high ssw. sea; 8 a. m., same weather, with violent squalls; noon, weather moderating, wind wsw. (ship's position from noon of 11th to noon of 12th, N. 45° 40′, W. 50° 30′, to N. 47° 30′, W. 45° 30′). The depression moved rapidly northeastward and on the 13th it was to the northward of the fifty-fifth parallel and near W. 27°. The lowest reported pressure was 29.61 (752.1), wind wsw., force 6, cloudy, observed in N. 54° 00′, W. 29° 38′, on board the s. s. "Sardinian," J. E. Dutton, commanding. The s. s. "Japanese," also encountered this storm on the 13th; that vessel reported a hurricane at 2 a. m. in N. 56° 46′, W. 24° 12′, with fearfully high seas, which washed completely over the vessel, destroying boats, bulwarks, and doing much damage to deck fittings. Strong northwesterly gales were reported by vessels on the fiftieth parallel and between W. 30° and 50°; the disturbance continued its northeasterly course, and by the 15th it was a deep depression, 29.2 (741.7), central north of Scotland.

VI.—This depression moved over Canada and the Gulf of Saint Lawrence on the 15th, and was central off the southern coast of Newfoundland on the 16th, causing strong breezes to moderate gales along the coasts. Its eastward movement appears to have been checked by an area of high-pressures which existed near the forty-fifth meridian.

VII.—By the morning of the 21st the pressure over the ocean

between W. 40° and 20° was about 29.8 (756.9), being a decrease of .5 inch during the preceding twenty-four hours. By the 22d the decrease had extended to the British Isles, and a well-defined centre of disturbance was north of Scotland.

VIII.—This was a continuation of low area xii. of chart i. On the 22d the disturbance was central off the eastern coast of Newfoundland, attended by moderate to strong southerly gales to the eastward of W. 50° and heavy northwesterly and westerly gales over the region west of that meridian. Captain Freeth, commanding the s. s. "British Princess," reported, in N. 47° 19′, W. 50° 6′, barometer 28.73 (729.7), wind w., force 9. Captain P. Urquhart, commanding the s. s. "Lord Clive," reported as follows: "22d, 4 a. m., ship's time, (7.41 a. m., Greenwich time), in N. 46° 35′, W. 55° 10′, barometer 29.11 (739.4), having fallen one inch in the previous eight hours, wind se., force 10, snow and rain; 6 a. m., (9.42 a. m., Greenwich time) position N. 56° 03′, W. 55° 25′, barometer 28.78 (731.0), wind nw., blowing a hurricane, with terrific squalls; the wind shifted suddenly from s. to wnw., nw., and nnw., the barometer at once beginning to rise. It blew for about one and a half hours at hurricane force, after which it began to moderate; at noon (3.45 p. m., Greenwich time) the barometer read 29.51 (749.5), wind wnw., force 8, with snow squalls and high cross sea." The s. s. "Helvetia," J. W. Rogers, commanding, furnishes the following:

Date.	Time.	Barometer.		Wind.		Remarks.
		Inches.	Mill.	Direction.	Force 0–10	
22.....	—— a. m....	.....	.....	sse.	.....	Wind hauling by west to south at 2 a.m.
22.....	3.48 a. m....	29.24	742.7	s. by w.	8	Squalls of force 9; heavy rain.
22.....	4.50 a. m....	29.05	737.9	s. by w.	.....	
22.....	5.51 a. m....	28.95	735 3	s. by w.	8	
22.....	6.52 a. m....	28.87	733.3	ssw.	.....	Squalls of force 9, and heavy rain.
22.....	7.10 a. m....	28.87	733.3	ssw.	7	
22.....	7.25 a. m....	28.89	733.8	wsw.	7	
22.....	7.53 a. m....	28.91	734.3	.....	.....	Clearing and moderating.
22.....	9.13 a. m....	.....	.....	wnw.	7	
22.....	9.53 a. m....	29.20	741.7	wnw.	.....	
22.....	12.08 p. m....	29.30	744.2	w. by n.	7	N. 43° 58′, W. 57° 42′.

On the 23d the region of least pressure was near N. 51°, W. 40°; the s. s. "State of Nebraska," A. E. Braes, commanding, reporting in N. 50° 23′, W. 37° 36′, barometer 29.25 (742.9), wind w. by s., force 8, hail squall. Moderate to fresh southerly and southwesterly gales were reported by vessels between the meridians of W. 35° and 20°. On the 24th the disturbance having apparently moved by a southeasterly course, was near N. 49°, W. 34°, where the barometer read 29.25 (742.9). During the 25th, 26th and 27th, the depression remained nearly stationary between N. 48° to 51°, and near the thirty-second meridian, the central pressure having increased to 29.6 (751.8) on the 26th, followed on the 27th by a slight decrease. By the 28th the depression had ceased to exist, having been replaced by an area of high-pressure which was spreading over the ocean.

IX.—This was probably a continuation of the disturbance charted as low area xiv. of chart i. It passed off the New England coast during the 24th, and was central east of Nova Scotia on the 25th. The s. s. "Abyssinia," in N. 41° 06′, W. 66° 56′, had a moderate se. to sw. gale with snow squalls; and the s. s. "Mareca," in N. 41° 30′, W. 60° 00′, reported a heavy gale with very high sea. The depression moved east-northeastward to about N. 46°, W. 42°, where the pressure ranged from 29.5 (749.3) to 29.7 (754.4). It continued its northeastward course during the 26th, and united with depression number viii. on the 27th; the lowest barometer reading on that date was reported by the s. s. "Oregon," H. C. Williams, commanding, 29.48 (748.8), wind variable, force 1, drizzling rain, followed by a moderate gale from nnw.

X.—This was a continuation of low area xv. of chart i., and was probably the most severe storm of the month. It was attended by very heavy northwesterly gales along the Atlantic coast north of Hatteras, and caused much damage to shipping. It passed over Canada and the Gulf of Saint Lawrence during the 28th, the pressure near the centre, when over the Gulf, being below 29.00 (736.6). The following reports indicate the severity of the gale after reaching the ocean:

Captain Malet, commanding the s. s. "Marengo," reported: "27th, midnight, wind hauling to s., barometer 29.22 (742.2); 2 a. m. of 28th, calm, barometer 29.02 (737.1); 2.30 a. m., wind freshening from westward, force 7, with heavy rain; 4 a. m., fresh gale of force 7, high w. by s. sea; 7.15 a. m., wind shifted to wnw., strong gale of force 9; 8 a. m., heavy w. gale of force 10, barometer 29.12 (739.6), rising." (Ship's position about N. 41° 10′, W. 68° 20.′)

Captain Perry, commanding the s. s. "Britannic" reported: "December 27th, at noon in latitude 44° N, longitude 56° 26′ W., light breeze from sse., fine weather, barometer 30.35 (770.9), temperature of the air 38°, water, 40°. At midnight the barometer read 29.96, (761.0); at 6.30 a. m. of the 28th, sudden squall of hurricane force, lasting five minutes, rain at intervals, wind increasing and backing from ssw. to sse.; at 8 a. m. the wind hauled to sw. and increased; at 8.30 another terrific squall with rain set in; at 10 a. m., barometer 29.2 (741.7), heavy gale and high sea with terrific squalls; noon, barometer 29.27 (743.4), rising, wind w.; 3 p. m., wind wnw., fierce gale. The same weather continued, with rising barometer, until midnight, when it began to moderate. At noon of the 29th, in N. 40° 40′, W. 67° 00′, barometer read 29.65 (753.1), wind nw., moderating."

The s. s. "Lake Manitoba," Wm. Stewart, commanding, reported: "4 p. m. of the 28th, barometer 30.05 (763.3), fresh sse. wind with rain; 7 p. m., barometer 29.81 (757.2), strong s. by e. gale, heavy cross sea from wsw. and sse., constant rain. At 4 a. m. 29th, barometer 29.26 (743.2), moderate sw. gale, very heavy sea; same weather continued until midnight, when the barometer read 29.36 (745.7), rising rapidly, fresh wnw. gale." (Ship's position, N. 45° 0′, W. 53° 24′ to W. 57° 30′).

Captain C. Steencken, commanding the s. s. "Habsburg," furnishes the following report of observations made during the gale:

Date.	Hour.	Barometer.		Wind.		Remarks.
		Inch.	Mill.	Direction.	Force 0–10	
28.....	4 a. m.....	29.58	751.3	s.	.....	Increasing wind and sea.
28.....	8 a. m.....	29.14	740.1	s.	7–9	N. 42° 25′, W. 61° 32′.
28.....	Noon.....	29.18	741.2	.....	.....	High w. sea.
28.....	4 p. m	29.16	740.7	wsw.	9–10	Increasing wind and sea.
28.....	8 p. m.....	29.20	741.7	wsw.	10	Squally; heavy sea.
28.....	Midnight...	29.35	745.5	w.	10	Hurricane.
29	4 a. m.....	29.42	747.3	.....	.....	
29 ...	8 a m.....	29.56	750.8	wnw.	9	Decreasing; ship's position, N. 41° 29′, W. 63° 52′.
29.....	Noon...	29.78	756.4	nw.	9	

Captain Robinson, commanding the s. s. "Canada," reported: "28th, 3 h., N. 46° 00′, W. 46° 12′, weather clear, barometer 30.28 (769.1), falling rapidly; at 11 h. it was blowing a gale of force 9, with ugly, threatening appearance and heavy, breaking sea; at 17 h., heavy rain with lightning in the wsw., wind s, force 7; at 23 h., barometer 29.32 (744.6), wind ssw., force 6. On the 29th at 3 h., the wind suddenly shifted to wnw., force 7, barometer slowly rising."

Captain McMickan, commanding the s. s. "Galilia," also reported strong sw., w., and nw. gales, with very high sea and much thunder and lightning during the 29th and 30th, vessel between N. 43° 09′, W. 53° 42′, and N. 42° 09′, W. 58° 13′. On the 30th the storm-centre was probably near N. 51° W. 44°, the s. s. "Switzerland," W. A. Beynon, commanding, reported barometer 29.45 (748.0), wind w. by n. force 4, having shifted from s. by e., force 8. On the 31st the depression appeared to be filling up, the lowest reported pressures over mid-ocean ranging from 29.65 (753.1) to 29.8 (756.9).

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States