

Velocities of thirty to forty-six miles per hour from the north-east were reported on the Atlantic coast during the passage of the storm on the 16th, 17th, and 18th.

VIII.—This area appeared as a slight depression in Colorado on the 15th; it moved into New Mexico on the 16th and there lost its motion of translation, the centre shifting only slightly; it remained nearly stationary until the 18th when, under increasing pressure from the north, it disappeared as a storm-centre. High southerly winds occurred in New Mexico and Texas on the 18th; velocities of thirty-four to thirty-six miles per hour were reported on the east coast of Texas.

IX.—This area appeared north of Dakota on the 17th; moved southward into southern Dakota on the 18th, and thence to the northeast on the 19th, reaching the Saint Lawrence Valley on the 20th. Rain occurred in the Missouri and upper Mississippi valleys on the 18th, and high northwest winds with velocities of twenty-six to thirty-six miles per hour in rear of the storm over the states and territories west of the Missouri. The rain area passed over the Lakes on the 19th, followed by northwest winds with velocities of twenty to thirty-six miles per hour. Rain fell on the New England coast on the 20th, with light winds from the southwest.

X.—This depression appeared north of Montana on the 19th; passed from Dakota to Lake Michigan on the 20th, and thence to and down the Saint Lawrence Valley on the 21st. The only precipitation was light rain on the New Jersey and New England coasts on the 21st. The winds in advance of the storm were light. After the wind had shifted to northwest, velocities of twenty-six to thirty-eight miles per hour were reported for Lake Michigan, and from twenty to twenty-six miles per hour on the lower lakes.

XI.—This low area was central north of Montana on the morning of the 22d; during the day it moved southeastward into Dakota; it passed over Minnesota on the 23d; over the Lake region on the 24th, and reached the Saint Lawrence Valley on the 25th. Light rains occurred in Wisconsin and Michigan on the 23d. On the 24th the rain area included with the above states Illinois, Missouri, and Arkansas. On the 25th general and heavy rainfalls occurred over the Lake region, and local rains in the east Gulf states. Southeast winds with velocities of twenty to thirty-two miles per hour were reported from Lakes Michigan and Huron on the 23d. On the 24th high southerly winds prevailed over the lower lakes. The winds during the night shifted to northwest over the upper lakes, and attained velocities of thirty-two to thirty-six miles per hour; thirty-two miles, from the south, was reported from Eastport, Me., 24th, and thirty-six miles from the north, 25th.

XII.—On the morning of the 25th, when low area number xi was north of the lower lakes, a trough of low pressure extended from the centre southward to South Carolina. A development took place in the southern part of the trough during the day, and the evening map of the 25th showed a storm of considerable energy central on the North Carolina coast. The intensity of this storm increased on the 26th as it passed slowly up the coast. On the 27th the centre was off the New Jersey coast. It moved thence north to the Saint Lawrence Valley on the 28th. On the 29th the centre passed to the southeast across Maine, then recurved and passed to the northeast over Nova Scotia on the 30th. Northeast gales, with heavy rain, prevailed on the middle Atlantic coast on the 26th and 27th, and on the New England coast on the 27th; the winds in the latter district shifting to south as the centre passed over New York to the Saint Lawrence Valley, and to the northwest on the 30th.

XIII.—This depression appeared in Utah on the 27th; during the 28th it moved southeastward to New Mexico, causing high southerly winds in western Texas and southern New Mexico. It continued its southerly course on the 29th. The southerly winds of the 28th had shifted to cold northerly, and general rain and snow occurred in Utah and Colorado. The winds on the Texas coast remained southerly and attained velocities of eighteen to thirty-two miles per hour; they shifted to the north on the 30th; thirty-four miles per hour from the north was the highest velocity reported this date.

The following table exhibits, in a concise manner, some of the more prominent characteristics of the low areas:

No.	First observed.			Last observed.		Duration.	Velocity per hr.	Lowest pressure.		Reading.
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	
I.....	1	51	97	43	82	1.0	36.5	1	Saint Vincent, Minn....	Inches. 29.34
II.....	1	41	77	46	58	2.0	25.0	3	Sydney, C. B. I.....	29.34
III.....	1	53	110	45	58	3.0	39.6	1	Calgary, N. W. T.....	29.22
IV.....	4	50	88	45	59	6.0	18.7	10	Sydney, C. B. I.....	29.36
V.....	4	51	118	51	88	2.5	21.7	5	Medicine Hat, N. W. T.	29.32
VI.....	10	41	113	38	78	3.0	25.7	17	Concordia, Kans.....	29.42
VII.....	13	28	97	43	66	5.5	16.7	14	Vicksburg, Miss.....	29.50
VIII.....	15	39	104	35	105	3.5	16.1	17	Fort Stanton, N. Mex.	29.50
IX.....	17	52	101	50	66	2.5	35.0	19	Port Arthur, Ont.....	29.42
X.....	19	51	105	49	68	2.0	39.6	21	Father Point, Quebec.	29.44
XI.....	22	53	108	48	75	3.5	23.2	24	Marquette, Mich.....	29.40
XII.....	25	36	75	47	58	5.0	15.0	26	Norfolk, Va.....	29.20
XIII.....	27	39	113	27	100	2.5	19.6	28	Montrose, Colo.....	29.42
Means.....						3.2	25.6			29.38

NORTH ATLANTIC STORMS FOR APRIL, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during April, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Seven depressions have been traced for April, 1889, of which four were continuations of areas of low pressure which first appeared over the North American continent; two are first charted northwest of the British Isles, and one apparently developed over or northeast of the Bahamas.

Over the western portion of the ocean the weather continued generally unsettled during a greater portion of the month, more especially off the coast of the United States, where severe disturbances attended the passage of areas of low pressure numbers iv, vii, and xii. Over mid-ocean relatively fair weather prevailed, and the periods of stormy weather, which extended from the 4th to 8th, 16th to 19th, 23d, 29th, and 30th, were not marked by gales of unusual violence. Over the east-

ern part of the ocean, and in the vicinity of the British Isles, low barometric pressure and gales of varying force were reported from the 3d to 14th, 20th to 24th, and 26th to 30th, the severest storms occurring during the first and the latter part of the third decades of the month.

As compared with the corresponding month of previous years the storms of the north Atlantic during April, 1889, were deficient in number, the average number traced during the last six years being 9.2. The lowest barometric pressure was reported south or southwest of the British Isles on the 6th, 8th, and 30th, when readings falling to about 29.20 (742) were noted. Over mid-ocean the lowest pressure, about 29.60 (752), was reported on the 7th, while over the western part of the ocean the minimum readings reported during the passage of the more important depressions varied from 29.30 (744) to 29.50 (749).

The following are brief descriptions of the depressions traced during April, 1889:

1.—This depression appeared northwest of Ireland on the 3d, to which position it had apparently advanced from the

northwestward. Moving south of east the storm-centre disappeared over the British Isles during the 4th, attended by pressure falling below 29.30 (744) and fresh and strong north to west gales westward to the twentieth meridian.

2.—This depression was a continuation of low area ii which advanced eastward from the middle Atlantic coast during the night of the 1st-2d, attended by pressure falling to about 29.60 (752) and fresh to strong gales. By the 3d the storm-centre had advanced to south of Newfoundland, where the barometer fell below 29.50 (749) and strong to whole gales were reported. Moving rapidly east-northeast the storm was central on the 4th in about N. 52°, W. 33°, with an apparent decrease in energy, from which position it passed eastward, and on the 5th was located in about N. 52°, W. 15°. Reports indicate that during the succeeding twenty-four hours the storm-centre recurved westward to the twentieth meridian, and thence moved south of east to the French coast by the 7th, after which its course cannot be traced with reports at hand. From the 5th to 7th gales of pronounced strength prevailed off the west-central coast of Europe under the influence of this depression, and on the 6th the pressure fell below 29.20 (742) west of the southern part of Ireland.

3.—This depression was a continuation of low area iii, and apparently moved from the vicinity of Nova Scotia to south of the eastern extremity of Newfoundland, where it was central on the 5th, whence it recurved southwestward to the forty-second parallel by the 6th, attended by moderate to fresh gales. By the 7th the centre of disturbance had moved east-northeast to N. 50°, W. 34°, and thence passing rapidly eastward disappeared south of the British Isles by noon, Greenwich time, of the 8th. Following the passage of this depression low barometric pressure and unsettled weather prevailed over and near the British Isles until the 14th.

4.—This depression apparently developed over or near the Bahamas and its centre is first located in about N. 28°, W. 70°, under date of the 5th. By noon, Greenwich time, of the 6th the storm-centre had moved northeastward to south of Bermuda, after which it probably recurved to the northwest and united with low area iv which was central off the North Carolina coast on the 7th. Reports do not indicate that this depression possessed marked energy; the minimum pressure ranged from 29.70 (754) to 29.80 (757), and moderate to fresh gales prevailed during the 5th and 6th.

5.—This depression was a continuation of low area iv which advanced eastward from the North Carolina coast during the 6th, and moved slowly east and northeast to the forty-fifth parallel east of Nova Scotia by the 10th. From the 6th to 9th this depression occasioned severe and destructive gales along the middle Atlantic and New England coasts, attended by considerable loss and damage to shipping and property. From the 11th to 14th, inclusive, the centre of disturbance apparently moved to northern Newfoundland and recurved southwestward over the Gulf of Saint Lawrence to the vicinity of Cape Breton Island by the 13th, and thence to the east coast of Newfoundland by the 14th, after which it passed east-northeast and disappeared north of the British Isles after the 18th, attended throughout by moderate to fresh gales.

6.—This depression was a continuation of low area x, which advanced eastward over the Gulf of Saint Lawrence during the night of the 21st-22d. On the morning of the 22d the centre of depression was apparently located on the northwest coast of Newfoundland, after which it passed north of east and disappeared north of the region of observation, without evidence of marked strength.

7.—This depression first appeared northwest of Ireland on the 27th, having advanced to that locality from the northwest. By the 28th it had passed to the north coast of Ireland, whence it recurved southwest to the fiftieth parallel by the 29th, after which it moved eastward, and at noon, Greenwich time, of the 30th was central off the southern extremity of Ireland. This depression possessed considerable energy throughout, and ap-

parently augmented in strength during the period for which its track is charted.

FOG IN APRIL.

The following are limits of fog-areas on the north Atlantic Ocean during April, 1889, as reported by shipmasters:

Date.	Entered.			Cleared.			Date.	Entered.			Cleared.								
	Lat. N.	Lon. W.	W.	Lat. N.	Lon. W.	W.		Lat. N.	Lon. W.	W.	Lat. N.	Lon. W.	W.						
1	40	34	70	36	40	32	71	28	14-15	43	50	48	50	44	42	50	10		
1-2	40	50	60	30	40	40	71	30	16-17	Off Cape	Hatteras.	Off Cape	Henry.	40	27	71	00		
2	44	54	49	09	44	42	49	56	17-18	40	52	67	09	40	27	71	00		
2	41	18	66	44	40	47	67	18	17-18	38	12	72	08	37	08	75	22		
2	42	40	56	32	44	30	54	55	18-19	41	38	68	18	Off Boston	Harbor	40	27	72	10
2-3	37	10	74	40	37	02	75	40	18-19	41	30	63	12	42	18	70	17		
2-3	43	18	63	00	43	10	65	10	18-20	42	13	60	48	42	18	(*)			
4	42	25	50	20	42	15	51	38	19-20	40	37	69	34	42	20	61	20		
4-5	43	38	47	40	42	10	56	00	19-20	41	57	59	40	42	22	67	28		
4-5	44	37	48	31	42	52	52	36	19-20	42	54	54	37	41	48	56	55		
5	43	23	65	08	43	53	66	35	20-21	42	47	50	22	39	36	68	54		
5	47	33	45	19	46	21	47	45	20-21	Sandy	Hook.	42	42	42	60	07			
5	43	28	48	09	42	43	51	07	20-22	43	40	48	30	42	03	57	16		
5-6	42	38	46	30	42	32	51	00	21-22	42	05	49	26	42	12	55	38		
5-6	44	14	46	09	42	24	51	42	21-22	42	55	49	23	42	12	55	38		
8-9	42	57	54	07	42	42	58	48	26	46	31	53	21	46	31	54	00		
9	41	56	49	30	42	10	48	30	26-27	40	55	67	11	40	25	69	36		
9	40	50	60	31	41	48	61	30	26-28	46	48	51	04	48	50	63	50		
9	41	50	52	10	42	30	48	06	27	41	50	60	14	41	31	63	19		
9	38	40	69	20	38	49	69	49	27	42	50	69	45	Boston.					
9-10	43	55	47	20	43	04	55	02	27-28	42	48	58	36	41	03	66	20		
9-10	43	30	53	30	42	00	61	00	27-28	41	45	58	20	41	26	59	09		
10-11	46	00	44	00	45	20	48	30	27-28	45	15	59	00	Halifax,	N. S.				
10-11	48	00	42	40	45	57	48	35	27-29	43	57	48	47	42	39	59	42		
12	42	45	61	40	43	08	62	10	28	43	00	58	30	42	04	61	30		
13	40	25	70	30	40	19	69	05	28-30	43	02	47	39	41	52	57	10		
12-13	44	41	57	22	44	36	58	59	28-30	43	40	47	35	45	00	65	00		
13	42	48	58	10	42	50	56	52	28-30	45	00	54	12	43	01	66	09		
13	42	35	50	30	42	08	52	20	29-30	42	25	55	02	41	15	63	03		
13-14	46	17	46	14	44	54	51	38	29-30	45	38	41	40	42	58	51	50		
13-14	43	15	55	59	44	05	61	32	29-30	41	20	65	30	40	30	70	04		
14	43	27	48	51	42	46	52	14	30	45	02	44	47	43	15	51	00		

(\*) 17 miles east of Fire Island Light-House.

Fog at Saint John's, N. F., 2d, 10th, 19th, and 20th, and out to sea, 29th.

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on nineteen days, as compared with seventeen days for March, 1889, and twenty-two days for April, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported on eighteen days, as compared with twelve days for March, 1889, and six days for April, 1888. To the westward of the sixty-fifth meridian fog was reported on sixteen days, as compared with seven days for March, 1889, and thirteen days for April, 1888. Compared with the preceding month there has been a general increase in fog frequency west of the fortieth meridian, the increase being most marked to the westward of the sixty-fifth meridian. It will also be observed that fog was more frequently encountered than in the corresponding month of 1888, except over and near the Grand Banks. Over and near the Banks of Newfoundland the development of fog during the month attended the approach or passage of areas of low pressure, save on the 20th and 21st, when high barometer and south to east winds prevailed in that region. Between the fifty-fifth and sixty-fifth meridians fog was reported with areas of low pressure central off the coast of the United States or over or near Nova Scotia or the Gulf of Saint Lawrence, except on the 20th and 21st, when variable and southerly winds and falling barometer were reported. West of the sixty-fifth meridian fog was noted attending the presence off the coast of the United States, or the passage to the northward of areas of low pressure, except on the 20th and 21st when falling barometer and variable and southerly winds were shown.

OCEAN ICE IN APRIL.

In April, 1889, Arctic ice was reported about three degrees north and two degrees west of the average southern and eastern limits of ice for the month, as determined from reports of the preceding six years. Compared with the average for the month there was a large deficiency in the quantity of icebergs and field ice reported over and near the banks of Newfoundland for April, 1889.

The following positions of icebergs and field ice reported are shown on chart i by ruled shading:

18th.—S. S. "La Bretagne," N. 43° 57', W. 50° 20', two small bergs.

23d.—S. S. "Glenrath," N. 46° 00', W. 59° 32', field ice about five by one miles in extent.

24th.—S. S. "Lake Superior," N. 46° 55', W. 46° 57', one moderate sized and two small bergs. S. S. "Damara," N. 48° 17', W. 44° 51', a plateau-shaped berg; passed eight bergs during the day. S. S. "Ansterlitz," N. 47° 42', W. 46° 12', one berg about three hundred feet high and one-half mile long, wedge shaped, and a number of large floes. S. S. "Nova Scotian," N. 48° 31', W. 49° 08', one large berg and a large quantity of broken ice.

25th.—S. S. "Circassian," N. 49° 12', W. 44° 00', several bergs. S. S. "Oregon," N. 49° 15', W. 44° 41', one small berg; N. 48° 19', W. 47° 22', a large and a small berg; N. 48° 08', W. 47° 53', a large berg. Mr. Jno. Higgins, observer at Saint Johns, N. F., reported a large iceberg off the Narrows. S. S. "Palestine," N. 47° 40', W. 43° 50', a berg about one hundred by fifty feet.

26th.—S. S. "Hungaria," N. 45° 40', W. 47° 20', a large berg. S. S. "Slavonia," N. 46° 01', W. 47° 35', a berg about one

hundred feet high and four hundred feet long. S. S. "Palestine," N. 46° 54', W. 46° 30', two bergs about one hundred and fifty by sixty feet.

27th.—S. S. "Lake Superior," off Bird Rocks, several narrow strips of ice.

29th.—S. S. "Roman," N. 47° 16', W. 43° 11', a moderate sized and two small bergs.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for April during the last seven years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
April, 1883	40 49	52 06	April, 1883	48 00	43 00
April, 1884	41 26	48 46	April, 1884	45 25	43 34
April, 1885	41 40	49 50	April, 1885	44 10	39 41
April, 1886	40 51	46 39	April, 1886	47 43	30 11
April, 1887	40 02	50 04	April, 1887	48 00	38 18
April, 1888	41 33	50 00	April, 1888	47 40	49 00
April, 1889	43 57	50 20	April, 1889	47 16	43 11

\* Isolated iceberg.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for April, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

In April, 1889, the mean temperature was highest over the southern extremity of Florida, along the immediate Gulf coast west of the Mississippi River, in the lower Rio Grande Valley, and at stations in the Colorado Valley south of the thirty-sixth parallel, where the values were above 70°, the highest mean reading, 76°.0, being reported at Rio Grande City, Tex. The mean temperature was lowest in the lower Saint Lawrence Valley, and on the north shore of Lake Superior, where it was below 35°, the lowest mean value, 34°.0, being noted at Father Point, Québec. The mean temperature was below 40° north of a line traced from Manitoba east-southeast over the upper Lakes, and thence eastward over the Saint Lawrence Valley and central New Brunswick.

Over a greater portion of the country the month was warmer than the average April, the only stations reporting mean temperature below the normal being confined to limited areas which embraced Florida and the immediate south Atlantic and east Gulf coasts, southern Texas, and the south and southeast shores of Lake Michigan. The greatest departures above the normal were noted at stations in the British Possessions north of Dakota and Montana, where they amounted to 10°. The departures above the normal were more than 5° over a greater portion of the Rocky Mountain regions, in the upper Missouri and Red River of the North Valleys, and along the west coast of the Gulf of Saint Lawrence. Along the Pacific coast the mean temperature averaged from 2° to 3° above the normal. In the localities where the temperature for the month was below the normal the departures were small.

Considered by districts, the greatest average departure above the normal temperature occurred in the extreme Northwest, where it was 6°.6; in the middle plateau region the

average departure above the normal was 5°.6; on the north Pacific coast 4°.9, and in the southern plateau region 4°.7. The smallest average departures above the normal were shown in the south Atlantic and east Gulf states, where they amounted to but 0°.5. The only districts showing average departures below the normal were the Florida Peninsula and Rio Grande Valley, where the means averaged 2°.4 and 0°.8, respectively, below the April normal.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.		Below normal.	
Minnedosa, N. W. T.	10.0	Key West, Fla	2.9
Bismarck, Dak	7.9	Rio Grande City, Tex	2.0
Chatham, N. B.	7.0	Cedar Keys, Fla	1.9
Helena, Mont.	6.2	Savannah, Ga.	1.6
Salt Lake City, Utah	6.2	Grand Haven, Mich	0.6

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for April, 1889; (4) the departure of the current month from the normal; (5) and the extreme monthly means for April during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of April.	(2) Length of record.	(3) Mean for April, 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for April.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°	°	°	°
Lead Hill	Boone	61.8	7	63.1	+1.3	65.3	1888	56.7	1884
California.									
Sacramento	Sacramento	59.3	36	58.6	-0.7	63.3	1857	54.6	1880
Colorado.									
Fort Lyon	Bent	51.6	19	54.3	+2.7	57.1	1885	43.9	1874
Connecticut.									
Middletown	Middlesex	45.4	22	48.7	+3.3	50.9	1865	38.3	1874
Florida.									
Merritt's Island	Brevard	69.4	6	60.0	-9.4	74.9	1885	60.0	1889
Georgia.									
Forsyth	Monroe	64.8	15	66.7	+1.9	68.8	1888	61.0	1875
Illinois.									
Peoria	Peoria	52.3	33	54.9	+2.6	57.9	1878	40.6	1857
Riley	McHenry	44.5	33	46.5	+2.0	52.2	1856	35.5	1874