

sey coast during the 30th. From this position the storm-center assumed a northeast course, and on the 31st was central east of Cape Breton Island. The abnormal southeast course of this low area during the 29th and 30th was apparently due to the presence on those dates of an area of high pressure over the Gulf of Saint Lawrence. On the 30th the storm apparently divided, one part moving north of east over the Saint Lawrence Valley, where it dissipated, and the other passing southeast to northern New Jersey. The lowest pressure noted in connection with this low area was 29.48, at Sydney, C. B. I., the evening of the 31st.

On the 28th rain fell in the central valleys and the Lake region, and very heavy rainfalls occurred in the Gulf and south Atlantic states. On the 29th rain was general in the

central valleys and eastward to the Atlantic coast, very heavy rain falling in the Gulf States and Tennessee. On the 30th rain fell east of the Mississippi River, and during the 31st the rain area passed east of the middle Atlantic and New England states.

On the 26th and 27th, when this low area was forming or approaching over the British Northwest Territory, severe local storms occurred in South Dakota and Nebraska; on the 28th destructive storms were reported in Minnesota, the Dakotas, and Iowa, and southward in the central valleys to north Texas; on the 29th from the middle Mississippi valley over the Lake region, the Ohio Valley and Tennessee, and the middle Atlantic states; and on the 30th in the middle Atlantic states and the lower lake region.

Tabulated statement showing principal characteristics of areas of high and low pressure.

Barometer.	First observed.			Last observed.		Duration.	Velocity per hour.	Maximum pressure change and maximum abnormal temperature change in twelve hours and maximum wind velocity.											
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Station.	Rise.	Date.	Station.	Fall.	Date.	Station.	Direction.	Miles per hour.	Date.		
High areas.	o	o	o	o	o	Days.	Miles.												
I.....	1	48	126	34	76	5.0	23	Calgary, N. W. T.....	.32	1	Sacramento, Cal.....	15	2	Dodge City, Kans.....	se.	44	4		
II.....	5	47	126	40	70	5.0	23	do.....	.54	6	Kansas City, Mo.....	24	7	Chicago, Ill.....	ne.	36	5		
III.....	11	45	126	35	74	5.0	26	Fort Assiniboine, Mont.....	.42	12	Walla Walla, Wash.....	26	10	Pierre, S. Dak.....	nw.	30	13		
IV.....	15	46	125	44	62	7.0	19	Rockliffe, Ont.....	.26	20	Sacramento, Cal.....	17	16	Dodge City, Kans.....	sw.	36	17		
V.....	20	47	126	32	73	7.0	20	Winnipeg, Man.....	.50	23	Qu'Appelle, N. W. T.....	20	22	Pueblo, Colo.....	n.	28	25		
Mean.....						5.8	23		.41			20					35		
Low areas.																			
I.....	1	47	100	49	64	6.0	15	Port Huron, Mich.....	.24	3	Fort Buford, N. Dak.....	12	1	Chicago, Ill.....	ne.	50	3		
II.....	3	46	119	43	65	6.0	27	Calgary, N. W. T.....	.36	3	Knoxville, Tenn.....	12	2	Rapid City, S. Dak.....	nw.	57	5		
III.....	4	25	96	34	93	2.5	12	Galveston, Tex.....	.22	2	Abilene, Tex.....	14	6	Galveston, Tex.....	se.	60	5		
IV.....	7	42	83	47	60	1.5	35	Palestine, Tex.....	.22	2	Abilene, Tex.....	14	6	Bloek Island, R. I.....	n.	36	8		
V.....	10	40	108	50	65	5.5	18	Sydney, C. B. I.....	.40	31	Norfolk, Va.....	8	7	Bismarck, N. Dak.....	ne.	48	12		
VI.....	15	52	100	40	65	4.5	19	Salt Lake City, Utah.....	.30	10	Eastport, Me.....	20	16	Milwaukee, Wis.....	sw.	48	13		
VII.....	21	52	101	50	65	3.5	21	Minnedosa, Man.....	.28	15	Green Bay, Wis.....	15	16	Norfolk, Va.....	sw.	42	15		
VIII.....	28	51	93	46	55	2.5	35	Battleford, N. W. T.....	.42	21	Qu'Appelle, N. W. T.....	16	22	Yankton, S. Dak.....	n.	50	21		
Mean.....						3.8	23	Sydney, C. B. I.....	.46	31	Rapid City, S. Dak.....	16	28	Yankton, S. Dak.....	sw.	50	28		

*4th, wind reached 56 miles per hour from the sw. at Mount Killington, Vt. †15th, wind reached 78 miles per hour from the sw. at Green Mountain, Me.

NORTH ATLANTIC STORMS FOR JULY, 1891 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of depressions that appeared over the west part of the north Atlantic Ocean during July, 1891, are shown on Chart I. These paths have been determined from international 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."

Generally fine weather prevailed over the north Atlantic Ocean during the month, and no storms of marked severity occurred along the trans-Atlantic steamship routes. In July of preceding years storms of marked strength have seldom been encountered in the middle latitudes of the north Atlantic Ocean, the most destructive storms of the month generally occurring in the tropical or sub-tropical regions.

July, 1891, opened with low pressure from coast to coast. A storm which was central south of Nova Scotia June 30th was located over the Grand Banks, with central pressure about 29.60 (752), whence it moved northeast over the Grand Banks, and passing eastward between latitude north 50° and 55° disappeared north of the British Isles after the 6th. This storm was the most important noted for the month, and on the 5th and 6th, when central west of the British Isles, it was attended with pressure falling to about 29.50 (749) and fresh gales. On the 6th and 7th a storm, low area I, was central over the Gulf of Saint Lawrence, and by the morning of the 8th had united with low area IV, which advanced along the New England coast to the Gulf of Saint Lawrence during the 8th. Advancing northeastward over Newfoundland this storm

disappeared north of the region of observation by the 9th. On the morning of the 9th a storm which was a continuation of low areas II and III, was central off the middle Atlantic coast, whence it moved northeast and apparently dissipated south of Nova Scotia. From the 10th to the 12th a barometric depression of slight depth which had apparently advanced from the east Gulf moved northeastward off the south Atlantic coast, with fresh to strong gales. During the second decade of the month low pressure prevailed over mid-ocean, and the pressure was low over the British Isles from the 16th to the 20th. The morning of the 16th a storm which was a continuation of low area V was central near Anticosti Island, Gulf of Saint Lawrence, whence it passed north-northeast and disappeared north of the region of observation after the 17th. On the 26th a storm, low area VII, was central over the west part of the Gulf of Saint Lawrence, whence it apparently moved southward over Nova Scotia by the morning of the 27th, in which region it apparently disappeared. The evening of the 30th a storm, low area VIII, was central off the New Jersey coast, whence it moved northeast and the morning of the 31st was central east of Cape Breton Island.

FOG IN JULY.

The limits of fog-belts west of the 40th meridian, as reported by shipmasters, are shown on Chart I by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on 21 dates; between the 55th and 65th meridians on 12 dates; and west of the 65th meridian on 10 dates. Com-

pared with the corresponding month of the last 3 years the dates of occurrence of fog east of the 65th meridian numbered 3 less than the average; west of the 65th meridian the dates of fog numbered one more than the average.

The fog reported along the trans-Atlantic routes west of the 40th meridian, and at Weather Bureau stations along the New England and middle Atlantic coasts, generally attended the advance or passage of general storms.

OCEAN ICE IN JULY.

The table below shows that for July, 1891, ice was reported about $\frac{1}{2}^{\circ}$ north and about 5° west of the average eastern and southern limits of Arctic ice for the month as determined from reports of the last 8 years. The southernmost ice reported was a large iceberg observed on the 28th, and the easternmost ice reported was a large iceberg noted on the 7th in the positions given in the table. The ice reported was confined to the regions lying between the southeast Newfoundland coast and the 48th meridian, and from the 50th meridian through the Straits of Belle Isle. Numerous large icebergs and heavy pack ice were reported in the Straits of Belle Isle throughout the month. Compared with the corresponding

month of previous years the ice reported for the current month was deficient in quantity. The positions of icebergs and field ice reported for July, 1891, are shown on Chart I by ruled shading.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for July during the last 8 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
July, 1883.....	42 42	49 57	July, 1883.....	46 47	45 44
July, 1884.....	46 24	50 02	July, 1884.....	48 36	46 28
July, 1885.....	42 14	48 30	July, 1885.....	48 00	44 00
July, 1886.....	42 59	49 18	July, 1886*.....	45 52	34 30'
July, 1887.....	43 30	50 05	July, 1887.....	52 04	41 16
July, 1888.....	46 30	54 00	July, 1888.....	47 40	50 10
July, 1889.....	44 49	47 45	July, 1889.....	45 59	40 00
July, 1890.....	41 25	47 39	July, 1890.....	50 08	38 45
July, 1891.....	43 16	49 45	July, 1891.....	47 02	48 00
Mean.....	43 45	49 19	Mean.....	48 00	42 59

* An iceberg and field ice. † On the 10th a small piece of ice was reported in N. 48° 33', W. 24° 11'.

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

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for July, 1891, 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 Weather Bureau. The figures opposite the names of the geographical districts in the column for mean temperature and departure from the normal show, respectively, the average 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 Weather Bureau represents the mean of the maximum and minimum temperatures.

At stations on the Southern Pacific Railroad, in the east part of San Diego county, Cal., and at Furnace Creek, Death Valley, Cal., the mean temperature was above 100. The mean temperature was above 90 in adjoining parts of Arizona and southeast California, and was above 80 in Florida, southern Georgia, along the immediate east Gulf coast, in Louisiana, Texas, extreme southern New Mexico, southern and western Arizona, in California south of the 37th parallel, except along the coast, and in the San Joaquin and Sacramento valleys. The mean temperature was lowest at elevated stations in central Colorado, where it was below 50, and it was below 60 in extreme eastern and western Nova Scotia, the lower Saint Lawrence valley, over the north part of the upper lake region, in Manitoba, and along the immediate Pacific coast north of San Francisco, Cal.

DEPARTURES FROM NORMAL TEMPERATURE.

The mean temperature was generally above the normal from Alberta and British Columbia southward over the Pacific coast states, and from the southern plateau region over the Rio Grande Valley. It was also slightly above the normal in the lower Saint Lawrence Valley. Over the middle plateau region, and from the eastern slope of the Rocky Mountains to the Atlantic coast from southern Florida to Nova Scotia, the mean temperature was below the normal. The greatest departure above the normal temperature was noted in the Sacramento Valley, where it exceeded 2, and the greatest departure below the normal temperature occurred in the Lake region, the Missouri, upper Mississippi, and upper Ohio valleys, and in the western part of the middle and south Atlantic states, where it exceeded 5.

TEMPERATURE, JANUARY TO JULY.

For the period January to July, inclusive, the mean temperature averaged above the normal in the middle Atlantic and New England states, the Lake region, extreme northwest, and over the northern plateau region; elsewhere it was deficient. In the Lake region, the extreme northwest, and over the northern plateau the excess was about 1. On the northeast and middle-eastern slopes of the Rocky Mountains and over the middle and southern plateau regions there was a deficiency of about 2, and at Key West, Fla., in the west Gulf states, the Missouri Valley, and on the southeast slope of the Rocky Mountains the deficiency was about 1.

PERIODS OF HIGH TEMPERATURE.

Exceptionally high temperature prevailed in Washington and Oregon from the 22d to the 24th, and this condition extended over California on the 24th, and during the 24th and 25th the temperature was the highest ever reported at a number of stations in the Pacific coast states.

PERIODS OF LOW TEMPERATURE.

From the 7th to 10th exceptionally cool weather prevailed from the Mississippi Valley eastward to the middle Atlantic and North Carolina coasts; the temperature being 2 to 5 lower than previously reported for the season. The morning of the 18th the temperature was 2 to 10 below the mean in all districts lying east of the Rocky Mountains, except Maine. On the 27th the lowest temperature on record for the season was noted in western New York, northwestern Pennsylvania, and northern Ohio, where the temperature was 1 to 4 below the lowest previously reported for the third decade of July.

YEARS OF HIGHEST MEAN TEMPERATURE IN JULY.

The mean temperature for the current month was the highest ever reported for July at Sacramento, Los Angeles, and San Diego, Cal. In the middle Mississippi and Ohio valleys, the lower lake region, Pennsylvania, New York, and New Jersey the highest mean temperature for July occurred in 1887, when the mean was 4 to 5 above the normal, and in the upper lake region in 1878, when the mean was 3 to 5 above the normal.

YEARS OF LOWEST MEAN TEMPERATURE IN JULY.

The current month was the coolest July on record from the Red River of the North Valley and the middle-eastern slope of the Rocky Mountains eastward to the Atlantic coast north of