

dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on 21 dates; between the 55th and 65th meridians on 11 dates; and west of the 65th meridian on 9 dates. Compared with the corresponding month of the last two years the dates of occurrence of fog near the Grand Banks numbered one less than the average; between the 55th and 65th meridians 2 more than the average; and west of the 65th meridian the same as the average. On the dates for which fog was reported near the Grand Banks general storms were approaching from the west, except on the 8th when variable winds and unsettled weather prevailed, and on the 26th with southerly winds and falling barometer. On the dates fog was reported between the 55th and 65th meridians it occurred with the approach or passage to the northward of general storms, save on the 2d when se. winds and unsettled weather prevailed. On the dates fog was reported west of the 65th meridian it occurred with the approach or passage to the northward of general storms, save on the 2d, 3d, and 13th when variable or southerly winds and unsettled weather prevailed in that region. On the 2d to 6th, 10th, 11th, 14th, and 26th dense fog was reported at points along the New England and New York coasts by observers of the Signal Service, its occurrence in each instance attending the presence in the Saint Lawrence Valley or the Lake region of general storms whose influence extended off the coast.

**OCEAN ICE IN AUGUST.**

The table below shows that for August, 1890, ice was reported nearly 3° south and about 5½° east of the average southern and eastern limits of ice for the month, as determined from reports of the last 8 years. The southernmost ice reported for the current month, 3 small icebergs on the 19th in the position

given, was less than 1° farther north than the southernmost ice reported for August, a large iceberg in N. 42° 21', W. 49° 51', in 1887, and the easternmost ice reported for the current month, a flat iceberg on the 6th in the position given, was nearly 1° east of the easternmost ice reported for August, noted in 1887 and 1889. Comparing the current with the preceding month there was a decrease in the aggregate quantity of ice reported over and near the Banks of Newfoundland and along the east coast of Newfoundland. Numerous icebergs were reported in the Straits of Belle Isle and thence eastward to the 49th meridian throughout the month. Compared with the corresponding month of the last 8 years the ice reported for August, 1890, about equalled the average in quantity. The limits of the region within which Arctic ice was reported for August, 1890, 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 August, during the last nine years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
August, 1882	46 50	46 00	August, 1882	46 50	46 00
August, 1883	43 26	51 41	August, 1883	48 00	44 00
August, 1884	43 24	48 44	August, 1884	47 50	43 50
August, 1885	43 48	52 04	August, 1885	48 03	42 45
August, 1886	48 35	48 45	August, 1886	50 00	48 00
August, 1887	42 21	49 51	August, 1887	48 06	40 00
August, 1888	42 21	49 51	August, 1888	51 53	55 00
August, 1889	43 34	48 38	August, 1889	53 00	45 00
August, 1890	42 30	50 21	August, 1890	50 13	39 10
Average	45 06	50 14	Average	49 19	44 42

\* Straits of Belle Isle.

† Isolated field ice in N. 58°, W. 40°.

**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 August, 1890, is exhibited on chart II by dotted isotherms. In the table of Signal Service 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.

The mean temperature was highest from south Nev. southward over extreme southeast Cal. and west Ariz., where it was above 85, and at stations in that region the mean value was above 90. The mean temperature was also above 85 at stations in the lower Rio Grande valley. North of a line traced from the Atlantic coast in latitude about N. 30° westward along the east Gulf coast, thence northwestward to south Kans., and thence southwestward to the middle Rio Grande valley, and in the Gila, lower Colorado, San Joaquin, and Sacramento valleys the mean temperature was above 80. The mean temperature was lowest at elevated stations in west-central Colo., and in the lower Saint Lawrence valley and north Ontario, where it was below 55, and north of a line traced from north New Brunswick westward to northern Wis., thence northwestward to Manitoba, and thence westward to the Pacific coast the mean temperature was below 60. The mean temperature was also below 60 along the Pacific coast north of San Francisco, Cal.

The mean temperature was below the normal, except in eastern Me. and the Canadian Maritime Provinces, at stations on the south New England and New York coasts, over the southeast slope of the Rocky Mountains and thence southward to the

lower Rio Grande valley, over the northern plateau region, and along the immediate Pacific coast between the 33d and 45th parallels. The greatest departures below the normal temperature were noted in the upper Mississippi valley and thence northward to the British Possessions, where they exceeded 3, and the greatest departures above the normal temperature were noted at Sydney, C. B. I., and San Francisco, Cal., where they exceeded 3 and 2, respectively.

At stations in the west part of the upper lake region and the northern part of the upper Mississippi valley, and at Lenoir, N. C., the mean temperature was the lowest, and at stations on the N. C. and middle Cal. coasts, and in the lower Rio Grande valley, the mean temperature was the highest reported for August.

**DEVIATIONS FROM NORMAL TEMPERATURE.**

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for August 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 August, 1890; (4) the departure of the current month from the normal; (5) the extreme monthly mean for August, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1890.	(4) Departure from normal.	(5) Extreme monthly mean for Aug.			
						Highest	Year.	Lowest	Year.
Arkansas.									
Lead Hill	Boone	77.8	8	78.3	+ 0.5	81.0	1886	75.5	1882
California.									
Sacramento	Sacramento	71.5	37	66.8	- 4.7	76.0	1866	66.2	1887

Deviations from normal temperature—Continued.

State and station.	County.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1890.	(4) Departure from normal.	(5) Extreme monthly mean for Aug.			
						Highest.	Year.	Lowest.	Year.
<i>Connecticut.</i>									
Middletown	Middlesex	74.2	18	67.8	- 6.4	73.0	1870	65.9	1861
<i>Florida.</i>									
Merritt's Island	Brevard	81.1	8	81.6	+ 0.5	83.8	1883	78.8	1889
<i>Georgia.</i>									
Forayth	Monroe	78.8	16	78.5	- 0.3	82.4	1878	73.2	1885
<i>Illinois.</i>									
Peoria	Peoria	75.5	34	73.3	- 2.2	80.5	1881	70.1	1866
Riley	McHenry	68.8	34	65.2	- 3.6	73.4	1867	64.1	1885
<i>Indiana.</i>									
Vevay	Switzerland	75.0	24	71.6	- 3.4	80.7	1881	69.9	1875
<i>Iowa.</i>									
Cresco	Howard	69.2	17	63.9	- 5.3	72.6	1881	63.1	1885
Monticello	Jones	70.1	36	66.7	- 3.4	77.1	1861	64.3	1863
Logan	Harrison	73.6	16	70.4	- 3.2	79.6	1881	68.2	1875
<i>Kansas.</i>									
Lawrence	Douglas	75.4	22	73.7	- 1.7	83.4	1874	71.1	1884
Wellington	Sumner	76.6	11	79.2	+ 2.6	82.6	1881	70.1	1884
<i>Louisiana.</i>									
Grand Coteau	Saint Landry	81.6	7	79.5	- 2.1	83.6	1883	78.9	1889
<i>Maine.</i>									
Orono	Penobscot	65.3	20	64.8	- 0.5	67.5	1881	63.1	1874
<i>Maryland.</i>									
Cumberland	Alleghany	69.8	31	69.8	0.0	75.7	1871, '72	63.6	1866
<i>Massachusetts.</i>									
Amherst	Hampshire	67.3	54	67.1	- 0.2	71.6	1872	63.5	1866
Newburyport	Essex	66.9	12	66.8	- 0.1	69.5	1882	65.3	1889
Somerset	Bristol	71.6	18	71.8	+ 0.2	75.0	1877	68.6	1874
<i>Michigan.</i>									
Kalamazoo	Kalamazoo	69.4	13	67.2	- 2.2	73.0	1881	63.8	1885
Thornville	Lapeer	69.6	13	65.6	- 4.0	74.5	1881	64.7	1885
<i>Minnesota.</i>									
Minneapolis	Hennepin	68.1	25	64.1	- 4.0	72.3	1881	63.8	1885
<i>Montana.</i>									
Fort Shaw	Lewis & Clarke	64.8	20	64.7	- 0.1	69.8	1882	53.7	1873
<i>New Hampshire.</i>									
Hanover	Grafton	65.8	44	64.6	- 1.2	70.4	1881	59.2	1885
<i>New Jersey.</i>									
Moorestown	Burlington	72.0	27	70.9	- 1.1	76.1	1864	68.1	1883
South Orange	Essex	70.8	19	69.5	- 1.3	74.5	1877	68.1	1883, '89
<i>New York.</i>									
Cooperstown	Otsego	65.6	36	63.6	- 2.0	71.5	1877	61.0	1861
Palermo	Oswego	66.9	30	65.2	- 1.7	71.6	1877	61.6	1885
<i>North Carolina.</i>									
Lenoir	Caldwell	73.4	17	70.0	- 3.4	77.0	1877	70.0	1890
<i>Ohio.</i>									
N'th Lewisburgh	Champaign	70.7	58	72.3	+ 1.6	75.0	1880	64.0	1876
Wauson	Fulton	69.4	20	67.7	- 1.7	74.8	1872	63.0	1870
<i>Oregon.</i>									
Albany	Linn	65.5	12	67.8	+ 2.3	68.7	1888	62.5	1881
Eola	Polk	64.9	20	64.3	- 0.6	68.6	1870	61.2	1881
<i>Pennsylvania.</i>									
Dyberry	Wayne	64.2	22	63.0	- 1.4	68.3	1872	58.4	1866
Grampian Hills	Clearfield	67.6	26	66.1	- 1.5	73.1	1881	62.1	1866
Wellsborough	Tioga	66.0	11	62.2	- 3.8	71.3	1881	62.2	1890
<i>South Carolina.</i>									
Statesburgh	Sumter	77.0	9	74.1	- 2.9	79.7	1881	73.5	1889
<i>Tennessee.</i>									
Austin	Wilson	78.7	19	76.1	- 2.6	84.6	1881	75.8	1889
<i>Texas.</i>									
New Ulm	Austin	82.4	18	82.5	+ 0.1	84.4	1873	79.4	1879, '82
<i>Vermont.</i>									
Strafford	Orange	67.6	17	65.9	- 1.7	72.6	1884	63.9	1885
<i>Virginia.</i>									
Birdsneast	Northampton	76.6	22	75.3	- 1.3	80.1	1877, '78	65.3	1871
<i>Washington.</i>									
Fort Townsend	Jefferson	61.4	17	61.0	- 0.4	64.3	1874	58.9	1876
<i>Wisconsin.</i>									
Madison	Dane	69.1	18	66.0	- 3.1	72.2	1878	64.2	1885

108; Tipton, Pa., 107; Payette, Idaho, Princeton, Mo., Glendive, Mont., Fort Seldon, N. Mex., Fort Bennett and Millbank, S. Dak., and Haskell, Tex., 106; Fort A. Lincoln, N. Dak., 105; Lead Hill, Ark., Bennet and First View, Colo., Atwood and East Peoria, Ill., and Fort D. A. Russell, Wyo., 104; North Lewisburgh, Ohio, 103; several stations in Iowa, Cameron, La., Adrian, Mich., and Albany, Oregon, 102; Pellville, Ky., and Vaiden, Miss., 101; Eastman and Louisville., Ga., Angola and Huntingburgh, Ind., Madison Barracks and Marshland, N. Y., and Fort Walla Walla, Wash., 100.

At the following named stations of the Signal Service the maximum temperature for the current month was as high or higher than previously reported for August during the respective periods of observation: La Crosse, Wis., 18 years, 96, the same as 1887; Dubuque, Iowa, 18 years, 99, the same as 1887; Huron, S. Dak., 10 years, 102, 2 above 1886; Colorado Springs, Colo., 6 years, 96, 2 above 1889; Salt Lake City, Utah, 17 years, 100, the same as 1875; Astoria, Oregon, 7 years, 83, 3 above 1886; and Portland, Oregon, 19 years, 96, 2 above 1885. Among extremely high temperatures reported at regular stations of the Signal Service for August of preceding years are: 118 at Fort McDowell, Ariz., in 1886; 116 at Phoenix, Ariz., in 1883; 115 at Yuma, Ariz., in 1879; 111 at Fresno, Cal., in 1888; 110 at Red Bluff, Cal., in 1878; and 110 at Umatilla, Oregon, in 1882. Among high temperatures reported for August by United States Army post surgeons and voluntary observers are: 126 at Volcano Springs, Cal., in 1889; 121 at Fort Boise, Idaho, in 1871; 119 at Fort Mojave, Ariz., in 1875; and 115 at Fort Lapwai, Idaho, in 1882.

The lowest temperature reported by a regular station of the Signal Service was 30, at Saint Vincent, Minn., on the 22d. The minimum temperature was below 40 in north New England, the northern part of the upper lake region, in the Red River of the North and upper Missouri valleys, from Wyoming southward over west-central Colo. to north N. Mex., and in parts of the middle and northern plateau regions. The minimum temperature was highest along the west Gulf coast, where it was above 70, and it reached 70 at Titusville and Key West, Fla. The reports of United States Army post surgeons and state weather service and voluntary observers show the following minimum temperatures in states and territories where temperature falling to or below 32 was reported: 24 at Alma, Colo., and Bonanza, Idaho; 29 at Pioche, Nev.; 30 at Ewart, Lathrop, and Roscommon, Mich., Fort Pembina, N. Dak., and Greenwood, Wis.; 31 at Coolidge, N. Mex., Fort D. A. Russell, Wyo., and Webster, S. Dak.; and 32 at Berlin Mills and Berlin Falls, N. H.

At the following named stations of the Signal Service the minimum temperature for the current month was as low or lower than previously reported for August during the respective periods of observation: New York City, 20 years, 51, the same as 1885; Philadelphia, Pa., 20 years, 51, the same as 1885; Baltimore, Md., 20 years, 51, 1 below 1874; Washington City, 20 years, 49, 1 below 1874; Lynchburgh, Va., 20 years, 47, 3 below 1887; Southport, N. C., 15 years, 58, the same as 1883; Savannah, Ga., 20 years, 63, the same as 1879; Jacksonville, Fla., 19 years, 64, the same as 1889; Key West, Fla., 20 years, 70, the same as 1889; Galveston, Tex., 20 years, 70, the same as 2 or more years; Chattanoga, Tenn., 12 years, 56, 1 below 2 or more years; Memphis, Tenn., 20 years, 58, 1 below 1887; Nashville, Tenn., 20 years, 54, 1 below 1883; Indianapolis, Ind., 20 years, 46, 2 below 1885; Cincinnati, Ohio, 20 years, 51, the same as 1885; Pittsburgh, Pa., 20 years, 45, 1 below 1887; Erie, Pa., 18 years, 47, the same as 1887; Cleveland, Ohio, 20 years, 46, the same as 2 or more years; Sandusky, Ohio, 14 years, 48, the same as 1882; Escanaba, Mich., 20 years, 34, 4 below 2 or more years; Grand Haven, Mich., 20 years, 42, the same as 1875; Springfield, Ill., 12 years, 48, the same as 1885; Yankton, S. Dak., 18 years, 41, the same as 1886; Colorado Springs, Colo., 6 years, 44, 1 below 1888; Fort Grant, Ariz., 11 years, 54, 1 below 1882; Wilcox, Ariz., 7 years, 44, 4 below 1888.

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported by a regular station of the Signal Service was 110, at Yuma, Ariz., on the 29th. The maximum temperature rose to or above 100 in the lower Rio Grande valley, from north Texas northward over the Dakotas, from southern Nev. southward over southeast Cal. and west Ariz., over parts of the middle and northern plateau regions, and in the Sacramento and San Joaquin valleys. The lowest maximum temperature, 65, was reported at Eureka, Cal.; and the maximum temperature was 68 at Point Reyes Light, Cal., and Tatoosh Island, Wash., and below 80 at stations on the southeast New England coast. The reports of United States Army post surgeons and state weather service and voluntary observers show the following maximum temperatures in states and territories where temperature rising to or above 100 was reported: Volcano Springs, Cal., 120; Gove City, Kans., 119; Fort Mojave, Ariz., 112; El Dorado Canyon, Nev., 110; Saint George, Utah, Guthrie, Ind. T., and several stations in Nebr.,

### RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of Signal Service data. The greatest monthly ranges of temperature occurred in the Dakotas, where they exceeded 60, whence they decreased eastward to less than 30 on the southeast and extreme east coasts of New England, southeastward and southward to less than 20 over extreme southern Florida and along the east and west Gulf coasts, southwestward to less than 40 over the southern plateau and on the extreme south Pacific coast, and westward to 20 on the coast of north California, and to less than 30 on the extreme north Pacific coast.

### FROST.

The night of the 15-16th frost injured vines, buckwheat, potatoes, and corn at Canton, Saint Lawrence Co., N. Y. On the 7th light frost, the first frost of the season, occurred at Saint Vincent, Minn. On the 18th light frost was reported in north Michigan, and the first light frost of the season occurred at Sault de Ste. Marie, Mich. On the 19th light frost was reported in the Dakotas. On the 20th light frost was reported in central and northeast Wisconsin and in east upper Michigan. On the 22d heavy frost, the first of the season, occurred at Saint Vincent, Minn., and light frost was reported at Marshall, Minn.; heavy frost occurred at Saint Lawrence, S. Dak., injuring corn; the first light frost of the season occurred at Huron, S. Dak., and at Moorhead, Minn. On the 23d the first light frost of the season occurred at Grand Haven and Detroit, Mich., and frost injured buckwheat and tender plants at Manton, Mich. On the 24th light frost caused slight damage to vegetation at Alpena, Mich., and light frost was reported in some parts of Pennsylvania. On the 31st light frost was reported at Sault de Ste. Marie, Mich.

Over the eastern part of the country light frost was reported

as far south as north-central Va. on the 24th; in the central valleys to east-central Ill. on the 23d and 28th; generally in the Dakotas and Minn. on the 22d, and in the upper lake region on the 23d; to north-central Colo. on the 26th; in north-east Nev. from the 22d to 25th; and to extreme north-central Cal. on the 31st. Compared with the preceding month the southern limit of frost for August, 1890, was slightly farther south in the Atlantic coast states. No frost was reported in the central valleys in the preceding month. In the plateau region the southern limit was about the same for each month.

The damaging frost of the 15-16th in Saint Lawrence Co., N. Y., was about one month earlier; the heavy frost of the 22d at Saint Vincent, Minn., was about 10 days earlier; that of the 22d at Saint Lawrence, S. Dak., was about 2 weeks earlier; that of the 23d at Manton, Mich., and that of the 24th at Alpena, Mich., was about one week earlier than the average date of first killing frost in the respective localities.

### TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for August, 1890:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
Boston, Mass.	66.0	59.5	6.5	63.9	68.9
Canby, Fort, Wash.	66.5	63.6	2.9	64.7	58.6
Charleston, S. C.	86.8	80.1	6.7	84.7	79.8
Eastport, Me.	53.2	50.1	3.1	52.1	61.4
Galveston, Tex.	88.0	85.0	3.0	86.6	82.6
Key West, Fla.	89.2	83.8	5.4	86.2	81.8
Portland, Oregon	72.0	67.0	5.0	69.9	65.9

### PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for July, 1890, as determined from the reports of nearly 2,000 stations, is exhibited on chart III. In the table of Signal Service data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation 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 precipitation is below the normal and subtracting when above.

The heaviest precipitation reported was 15.39, at Sarcoxie, southwest Mo., and Mount Washington, N. H., and the precipitation exceeded 10.00 in north-central Mass., western W. Va., northeast N. C., central Miss., southeast La., southwest Tenn., west-central Ark., southeast Kans., and central Wis. At scattered stations in the Pacific coast states and the plateau region no precipitation was reported, and less than 0.50 fell along the Pacific coast (save on the Washington coast, where it exceeded 2.00), over a greater part of the northern and middle plateau, in southern Mont., southwest N. Dak., northwest S. Dak., the lower Rio Grande valley, southern Ark., and northwest Kans.

Over the central and eastern parts of the country large excesses and marked deficiencies in precipitation occurred in small areas, and in many instances the rainfall was unusually heavy in a portion of a state, while in other parts of the state and at neighboring stations it was deficient. Over the northern plateau and thence southeastward over N. Mex. and southern Tex., and on the middle and extreme south Pacific coasts the rainfall was deficient, while from the Cal. coast between San Diego and San Francisco eastward over the west part of the middle plateau and the west and south parts of

the southern plateau, and along the immediate north Pacific coast it was in excess of the average for August. The greatest excess in precipitation occurred in west-central Ark., where it exceeded 8.00, and at Fort Smith, Ark., 9 years record, the rainfall for the month was 4.63 greater than previously reported for August. In the middle Saint Lawrence valley the excess was 5.91 at Montreal and 4.18 at Quebec; and on the south-central coast of Nova Scotia, along the immediate Atlantic coast from Norfolk, Va., to Atlantic City, N. J., and in the Mississippi Valley from Vicksburg, Miss., to Cairo, Ill., it was more than 3.00. The greatest deficiency in precipitation occurred on the Ga. and east-central and extreme western Fla. coasts, where it was more than 4.00; and the deficiency exceeded 2.00 at stations on the south New England coast, along the south Atlantic and Fla. coasts, and in the lower Rio Grande, upper Mississippi, and middle Missouri valleys. At the following-named stations the precipitation was the heaviest reported for August during the respective periods of observation: Mount Washington, N. H., Strafford, Vt., Statesburgh, S. C., Fort Smith, Ark., Cheyenne, Wyo., Colorado Springs, Colo., Fort Thomas and Wilcox, Ariz., and Keeler, Cal. At Sacramento, Cal., trace of rainfall fell, and trace is the greatest amount of rainfall reported at that station for August. At Red Bluff and San Francisco, Cal., no precipitation occurred, and no precipitation was reported for August of several preceding years.

Considered by districts, the average percentage of the normal in districts where the precipitation was in excess for August, 1890, was about as follows: north Pacific coast, 157 per cent.; Ohio Valley and Tennessee, 140 per cent.; southern plateau, 127 per cent.; middle Atlantic states, 124 per cent.; middle-eastern slope of the Rocky Mountains, 121 per cent.; west Gulf states, 118 per cent.; and lower lake region,