the 7th and 8th a storm of moderate strength moved north of east from mid-ocean in high latitudes and disappeared beyond the region of observation after the 8th. On the 9th a storm which had apparently advanced from northwest of Bermuda was central between Bermuda and the Grand Banks, whence it moved to south of the Grand Banks by the 10th, after which it recurved northward over the east edge of the Grand Banks, and after the 11th united with a depression which had advanced from Nova Scotia during the 11th and morning of the 12th. By the 13th this storm had moved rapidly north of east to the 25th meridian, after which it disappeared beyond the region of observation. On the 14th and 15th a disturbance occupied the ocean west of the Bay of Biscay and the Spanish Peninsula. On the morning of the 12th a storm of considerable strength was central south of Nova Scotia, whence it moved to north Newfoundland by the 13th, and north of east to the 40th meridian by the 14th, after which it passed south of east, and apparently disappeared over the Bay of Biscay after the 15th. On the evening of the 16th a storm appeared off the south Atlantic coast, to which position it had apparently advanced from the southeast. During the 17th this storm moved northward along the south and middle Atlantic coasts, and on the morning of the 18th was central southwest of Nova Scotia, with pressure below 29.30 (744). By the morning of the 19th the storm was central over north Newfoundland, with pressure below 28.80 (731), whence it moved northeastward to the 50th meridian by the 20th, without an appreciable loss of energy. By the 21st the storm had moved north of east to about the 33d meridian, after which it disappeared north of the region of observation. On the 16th a storm appeared over mid-ocean, and moved southeastward to the 50th parallel in about W. 23° by the 17th, and by the 19th was apparently central west of Ireland, where pressure 29.20 (742) was reported. The storm apparently remained in that region during the 19th, after which it disappeared beyond the region of observation, having apparently passed southeast of the British Isles. On the 23d a storm was central northeast of Newfoundland, to which position it had advanced from the Gulf of Saint Lawrence. By the 24th the storm had moved rapidly eastward to about the 25th meridian, after which it recurved to the northward and disappeared north of the region of observation. This storm was apparently deflected to the northward by high pressure over and south of the British Isles. On the 24th a storm was central north of Newfoundland, having advanced from the Saint Lawrence Valley, whence it moved east and south of east to about the 23d meridian by the 27th, after which it apparently recurved northward under the influence of high pressure to the eastward. On the morning of the 27th a storm was central off the New England coast, to which position it had advanced from the middle Atlantic coast, whence it moved northeast over the Gulf of Saint Lawrence by the 28th, after which date it disappeared north of the region of observation. This storm exhibited marked energy on the 27th and 28th. On the morning of the 30th a storm was central south of Newfoundland, having advanced eastward over New England and Nova Scotia, and by the morning of the 31st the storm-centre had moved to northeast of Newfoundland, where a moderate display of energy was shown.

OCEAN ICE IN DECEMBER.

The only Arctic ice reported was a large iceberg in N. 49° 39′, W. 47° 50′, on the 13th. The Strait of Canso was reported full of ice on the 27th. In December, 1882, 1883, 1884, 1886, and 1888, no Arctic ice was reported near Newfoundland and the Grand Banks. In 1885 several icebergs were observed off the Newfoundland coast the latter part of the month. In 1887 a small iceberg was reported in N. 46° 10′, W. 47° 28′ on the 26th, and a small iceberg in N. 48° 20′, W. 48° 40′ on the 28th.

FOG IN DECEMBER.

The limits of fog-areas west of the 40th meridian, as determined by reports of shipmasters, are shown on chart I by dotted shading. East of the 55th meridian fog was reported on 3 dates. No fog was reported west of the 55th meridian. Compared with the corresponding month of the last 3 years the dates of occurrence of fog near the Grand Banks in December, 1890, was 2 less than the average. The average number of foggy days between the 55th and 65th meridians in December, as shown by reports of the last 3 years is 4, and west of the 65th meridian the average number is 3. On the dates fog was reported near the Grand Banks for the current month, the 11th, 28th, and 29th, it occurred with the approach of general storms from the westward. On the 3d, 6th, 17th, and 26th, dense fog was reported at points along the New England, New York, and New Jersey coasts with the approach of general storms.

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 December, 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 in extreme south Florida, where it was above 65, and the mean values were above 60 over the southern half of the Florida Peninsula, in the lower Rio Grande valley, and in extreme south California and southwest Arizona. The mean temperature was lowest in north New England and the Saint Lawrence Valley, where it was below 10, and the mean readings were below 20 north of a line traced from extreme south New Hampshire westward to northeast Pennsylvania, thence northward over central New York, and thence west-northwest over south Manitoba. The mean temperature was also below 20 at stations in central Idaho and Wyoming.

The mean temperature was above the normal, except from the east part of the upper lake region eastward and southward to the Atlantic coast, and on the middle Pacific coast and the west part of the middle plateau region. The greatest departure above the normal temperature occurred in the British Possessions north of Montana, where it was more than 15, and the departure above the normal exceeded 5 over the northern part of the country between the 87th and 120th meridians, and thence to north Texas. The departure above the normal also exceeded 5 on the extreme south Pacific coast and in southwest Arizona. The most marked departure below the normal temperature occurred in the Saint Lawrence Valley and thence southward to the west Maine coast, where it exceeded 10, and the departure below the normal exceeded 5 generally in New York, New England, and the Canadian Maritime Provinces.

A notable feature of the distribution of temperature for the month was the cool weather which prevailed over the northeast part of the country, and the unusual warmth of the season in the north-central districts. At Montreal, Quebec, where the normal temperature for December is 14 above that of Saint Vincent, Minn., and 5 above that of Bismarck, N. Dak., the mean temperature for the current month was 12 and 18 below

that of the stations named, respectively; and at Eastport, Me., where the normal temperature is 21 above that of Saint Vincent, Minn., and 12 above that of Bismarck, N. Dak., the mean temperature for the current month was 1 and 7 below that of the stations named, respectively.

The following are the more important general temperature changes of the month:

On the 2d a severe cold wave extended from Minnesota eastward over the Saint Lawrence Valley, the minimum temperature falling below —25 in parts of Quebec, Ontario, and in northwest Minnesota, to —8 at Eastport, Me., Northfield, Vt., and Sault de Ste. Marie, Mich., and to —6 at Duluth, Minn. On the 4th unusually cold weather prevailed east of the Rocky Mountains, the temperature in Wisconsin, north Illinois, and northeast Iowa being more than 20 below the average for the season. A report from Quebec, Quebec, dated the 8th, stated that an ice bridge had formed over the Saint Lawrence River, and that this was the earliest date on record for the formation of an ice bridge at that point. On the 10th a warm wave extended from the Lake region southwest to Missouri and Kansas, and thence northward to Manitoba, the temperature in the Dakotas and Manitoba being 20 to 30 above the average for the season. From the 19th to the 22d unusually warm weather prevailed in Minnesota and the Dakotas, the temperature ranging 20 to 30 above the average for the season. On the 22d the temperature in west Wisconsin, east Minnesota, Wyoming, and Montana was 20 above, and in the Dakotas 30 to 40 above the average for the season. In north Minnesota the high temperature was unprecedented, and was 5 to 10 higher than ever before recorded for the season. On the 31st the temperature was 25 to 30 above the average in Arkansas, east Missouri, and Iowa, and the month closed with one of the warmest periods on record for the season in that region.

The warmest December in the history of the Signal Service occurred from Nevada and Arizona eastward to the Atlantic coast from Massachusetts to north Florida in 1889, when the mean temperature was 5 to 9 above the normal in the plateau region, 10 to 15 above on the middle-eastern and southeast slopes of the Rocky Mountains and in the west Gulf states, 13 to 18 above in the middle and lower Mississippi and lower Missouri valleys, 9 to 10 above in the east Gulf states, 13 to to 16 above in the Ohio Valley and Tennessee, 9 to 12 above in the lower lake region, and 7 to 10 above in the south and middle Atlantic states and south New England; on the north Pacific coast, in the Sacramento Valley, and the west parts of the middle and northern plateau regions in 1886, when the mean temperature was 2 to 7 above the normal; in the upper Missouri valley and on the Pacific coast from San Francisco to Los Angeles, Cal., in 1885, when the mean temperature was 13 above the normal in the upper Missouri valley, and 2 to 3 above on the Pacific coast; in the Dakotas and Red River of the North Valley, and from Lake Ontario eastward over north New York and north New England in 1881, when the mean temperature was 10 to 12 above the normal in the Dakotas and 6 to 10 above in north New York and north New England; over the Florida Peninsula in 1879, when the mean temperature was 4 to 6 above the normal; and in the upper lake region and along the Mississippi River north of the 40th parallel in 1877, when the mean temperature was 10 to 17 above the normal.

The coolest December in the history of the Signal Service was generally noted east of the lower Missouri valley and the southeast slope of the Rocky Mountains in 1876, when the mean temperature was 6 to 8 below the normal in the west Gulf states, 9 to 15 below in the middle and upper Mississippi valleys, 7 to 9 below in the east Gulf states, 9 to 12 below in the Ohio Valley and Tennessee, 6 to 12 below in the south and middle Atlantic states and New England, and 7 to 10 below in the lower lake region; from the north Pacific coast and the northern plateau region southeast over the lower Missouri Valley in 1884, when the mean temperature was 6 to 10 below the normal on the north Pacific coast, 16 to 17 below in the northern plateau region and on the northeast slope of the Rocky Mountains, and 9 to 12 below on the middle-eastern slope of the Rocky Mountains and in the lower Missouri valley; in the middle Missouri valley and over a greater part of California south of the 40th parallel in 1879, when the mean temperature was 14 to 15 below the normal in the middle Missouri valley, and about 3 below in California; and at stations in the central upper lake region in 1872, when the mean temperature was 9 to 10 below the normal.

In 1889, when the mean temperature was the highest ever reported for December over a greater part of the country south of the 45th parallel and east of the 115th meridian, an area of high pressure occupied the southeastern states, where the mean pressure was about one-tenth of an inch above the normal; no general storm traversed the country east of the Mississippi River and south of the 40th parallel; and there was an unusual prevalence of general storms over and north of the Lake region.

In 1876, when the mean temperature was the lowest ever reported for December over the country east of the Mississippi River, an area of unusually high pressure extended over and west of the lower Mississippi valley; a similar area occupied the eastern Dakotas; and three well-defined and energetic general storms traversed the Gulf States.

DEVIATIONS FROM NORMAL TEMPERATURE.

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

State and station.	County.	(1) Normal for the month of Dec.	(2) Length of record.	(3) Mean for Dec., 1890.	(4) Departure from normal.	(5) Extreme monthly mean for Dec.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°		°	
Lead Hill	Boone	39.1	9	41.7	+ 2.6	55.3	1889	29.1	1884
California.									
Sacramento	Sacramento	46.9	36	39.9	— 7.0	50.9	1861	39.9	1890
Connecticut.									
Middletown	Middlesex	28.8	22	24.7	— 4.1	36.0	1889	21.8	1872
Florida.									
Merritt's Island	Brevard	62.8	8	61.2	— 1.6	67.0	1883	58.0	1885
Georgia.									
Forsyth	Monroe	49.7	16	51.6	+ 1.9	61.3	1889	39.8	1876
Illinois.									
Peoria	Peoria	29.2	35	33.8	+ 4.6	44.3	1877	18.5	1876
Riley	McHenry	22.8	34	25.6	+ 2.8	37.7	1877	11.1	1876
Indiana.									
Vevay	Switzerland	34.9	25	35.9	+ 1.0	49.0	1889	24.6	1876
Iowa.									
Cresco	Howard	17.1	19	22.3	+ 5.2	34.0	1877	4.5	1876
Monticello	Jones	21.7	36	26.0	+ 4.3	39.5	1877	8.1	1859
Logan	Harrison	25.5	16	33.8	+ 8.3	39.6	1889	15.4	1879
Kansas.									
Lawrence	Douglas	30.5	23	36.0	+ 5.5	44.8	1889	19.8	1872
Wellington	Sumner	32.8	11	39.0	+ 6.2	46.2	1889	23.1	1884
Louisiana.									
Grand Coteau	Saint Landry	56.3	8	56.5	+ 0.2	65.0	1889	51.8	1887
Maine.									
Orono	Penobscot	21.3	20	11.4	— 9.9	30.8	1881	11.4	1890
Maryland.									
Cumberland	Allegany	31.9	31	31.8	— 0.1	43.2	1889	24.8	1866
Massachusetts.									
Amherst	Hampshire	33.8	44	23.9	— 9.9	36.0	1881	19.5	1872
Newburyport	Essex	30.8	12	23.4	— 7.4	36.5	1881	23.4	1890
Somerset	Bristol	30.7	18	28.1	— 2.6	39.0	1889	21.8	1876
Michigan.									
Kalamazoo	Kalamazoo	29.4	14	29.1	— 0.3	40.2	1889	16.7	1876
Thornville	Lapeer	27.8	13	26.8	— 1.0	38.0	1889	19.6	1886
Minnesota.									
Minneapolis	Hennepin	15.2	26	23.3	+ 8.1	31.6	1877	1.9	1872
Montana.									
Fort Shaw	Lewis & Clarke	25.3	22	36.2	+10.9	39.7	1875	2.2	1884
New Hampshire.									
Hanover	Grafton	20.8	52	12.4	— 8.4	31.2	1847	10.2	1872
New Jersey.									
Moorestown	Burlington	32.5	27	30.3	— 2.2	41.0	1889	23.9	1876
South Orange	Essex	32.0	20	27.9	— 4.1	38.6	1889	24.3	1872
New York.									
Cooperstown	Otsego	27.3	36	18.4	— 8.9	33.1	1881	14.7	1876
Palermo	Oswego	24.9	36	19.5	— 5.4	33.7	1889	16.8	1880
North Carolina.									
Lenoir	Caldwell	38.2	18	38.9	+ 0.7	48.9	1889	29.1	1876
Ohio.									
N'th Lewisburgh	Champaign	30.1	58	30.4	+ 0.3	44.3	1889	19.0	1876
Wauseon	Fulton	27.2	20	27.7	+ 0.5	38.8	1877, '89	17.1	1872

Deviations from normal temperature—Continued.

State and station.	County.	(1) Normal for the month of Dec.	(2) Length of record.	(3) Mean for Dec., 1890.	(4) Departure from normal.	(5) Extreme monthly mean for Dec.			
						Highest.	Year.	Lowest.	Year.
		°	Years	°	°	°		°	
Oregon.									
Albany	Linn	41.5	11	43.2	+ 1.7	49.5	1886	32.1	1884
Eola	Polk	39.9	19	41.2	+ 1.3	47.0	1886, '87	30.7	1884
Pennsylvania.									
Dyberry	Wayne	25.5	23	20.6	— 4.9	33.3	1889	17.3	1876
Grampian Hills	Clearfield	25.7	26	24.0	— 1.7	37.0	1877	16.0	1876
Wellsborough	Tioga	30.2	11	22.2	— 8.0	39.5	1881	22.2	1890
South Carolina.									
Statesburgh	Sumter	47.7	9	46.8	— 0.9	56.6	1889	43.6	1882
Tennessee.									
Austin	Wilson	40.7	20	41.8	+ 1.1	56.5	1889	25.0	1876
Texas.									
New Ulm	Austin	54.3	17	56.1	+ 1.8	65.8	1889	46.1	1876
Vermont.									
Strafford	Orange	22.1	17	13.4	— 8.7	29.5	1881	13.4	1890
Virginia.									
Birdsnest	Northampt'n	41.5	22	41.0	— 0.5	51.1	1879	32.7	1876
Washington.									
Fort Townsend	Jefferson	41.0	15	44.8	+ 3.8	45.3	1885	33.0	1884
Wisconsin.									
Madison	Dane	22.7	21	26.3	+ 3.6	38.7	1877	11.7	1876

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported by a regular station of the Signal Service was 88, at Brownsville, Tex., on the 5th. The maximum temperature rose above 80 over the Florida Peninsula, in south and east-central Texas, and at Los Angeles, Cal., and was above 70 south of a line traced from the Atlantic coast in latitude about 34° westward to the Mississippi River, thence northwestward to extreme southwest South Dakota, and east of this line continued southward to west Texas. The maximum temperature was also above 70 over south California, extreme south Nevada, and west Arizona. The maximum temperature was lowest in New England north of Massachusetts, generally over New York, the Lake region, and Minnesota, and at stations in the middle and northern plateau regions, where it was below 50. At stations in the middle and west Gulf states and the middle Missouri and Red River of the North valleys the maximum temperature was higher than previously reported for December, the excess above the highest maximum temperature previously reported for December varying from 1 to 4 in east Texas, from 2 to 4 in the middle Missouri valley, and amounting to 8 at Saint Vincent, Minn. The reports of United States Army post surgeons and voluntary observers show the following maximum temperatures in states and territories where temperature rising to or above 80 was reported: Fort Ringgold, Tex., 92; Gila Bend (2), Ariz., 88; Alva, Fla., 86; several stations in Louisiana, 82; Vaiden, Miss., 81; Citronelle, Ala., and Blakely, Ga., 80.

The lowest temperature reported by a regular station of the Signal Service was —27, at Saint Vincent, Minn., on the 2d. The minimum temperature fell below zero in New England from Massachusetts northward, in northeast New York, in the extreme north part of the upper lake region, and north of a line traced from north Wisconsin southwestward to west-central Iowa, and thence northwestward to northwest Montana. The minimum temperature was highest over extreme south Florida, where it was above 50, and the minimum values were above 40 over south Florida, extreme south Louisiana, along the south Pacific coast, and in extreme south Nevada. The reports of United States Army post surgeons and voluntary observers show the following minimum temperatures in states and territories where temperature falling to or below zero was reported: Orono, Me., —36; East Berkshire, Vt., —34; Berlin Falls, N. H., —31; Fort Pembina, N. Dak., —29; Pokegama Falls, Minn., —24; Woonsocket, S. Dak., and Breckenridge, Colo., —21; Fort Keogh, Mont., —19; West Bend, Iowa, and Madison Barracks, N. Y., —18; Hillman, Mich., —17; Hayward, Wis., —16; Saratoga, Wyo., —14; Troy, Pa., —13; Monson, Mass., and Fort Niobrara, Nebr., —10; Bonanza, Idaho, —9; Southington, Conn., —5; Garrettsville, Ohio, —4; Lakin, Kans., and Cassville, Mo., —3; Chama and Monero, N. Mex., and several stations in Illinois, —2; Alta, Utah, and Burns, Oregon, zero.

LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather is shown on chart IV by a line traced from the Florida coast south of Jacksonville southwestward to the west Florida coast south of Tampa, and a second line traced just inside the west Gulf coast. The western limit of freezing weather is shown on this chart by a line traced from the lower Gila valley, Arizona, west of north to extreme south Nevada, thence westward to west-central California, thence west of north along the San Joaquin and Sacramento valleys to extreme northwest California, thence along the coast line to the mouth of the Columbia River, and thence northward inside the coast line over west Washington.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature are given in the table of Signal Service data. The greatest monthly ranges of temperature occurred in the middle Missouri and Red River of the North valleys, where they exceeded 70, whence they decreased eastward to less than 40 from the lower lake region southward to east Tennessee and the middle Atlantic coast, and thence increased to more than 60 in north New England. From the middle Missouri valley the monthly ranges decreased southeastward to less than 30 over extreme south Florida, southward to less than 40 on the middle Texas coast, southwestward to less than 40 over south Arizona, and westward to less than 30 on the middle Pacific coast, and to less than 20 in extreme northwest Washington.

FROST.

The first black frost of the season was reported at Shreveport, La., on the 9th, and at New Orleans, La., on the 10th. The first killing frost of the season was reported as follows: 1st, Monticello, Ga.; 4th, Little Rock, Ark.; 8th, Palestine, Tex.; 9th, Pensacola, Fla.; 10th, Savannah, Ga., Duke, Fla., and Red Bluff, Cal.; 28th, Villa City, Fla., and Charleston, S. C.; 29th, Tampa, Eustis, Jacksonville, and Titusville (1 mile from), Fla. Compared with the average date of first killing frost in the several localities the killing frost of the 10th at New Orleans, La., was about 1 week late; that of the 4th at Little Rock, Ark., and of the 29th at Titusville, Fla., was about 2 weeks late; that of the 9th at Pensacola, Fla., and of the 29th at Tampa, Fla., was about 3 weeks late; that of the 10th at Savannah, Ga., and of the 29th at Jacksonville, Fla., was about 4 weeks late; that of the 8th at Palestine, Tex., was about 5 weeks late; and that of the 28th at Charleston, S. C., was about 2 months late. Light frost occurred as far south as Lee county, Fla., on the 10th, 19th, 29th, and 30th; to extreme south Alabama and Mississippi on the 1st, 9th, 10th, 18th, 19th, and 27th to 29th; in east Texas to the 29th parallel on the 8th to 10th, 17th, 18th, and 26th; in southwest New Mexico and southeast Arizona on a number of dates; and in California to Los Angeles on the 6th, 9th, and 31st.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for December, 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.