

meridian it occurred with the approach of general storms from the westward. On the dates fog was reported west of the 55th meridian it occurred with the approach or passage to the northward of general storms. On the 1st, 2d, 11th, 12th, 17th, 18th, 24th, and 29th, dense fog was reported at points along the New England, New York, and New Jersey coasts with the approach of general storms. On the 1st marine traffic was

almost entirely suspended in the afternoon at Baltimore, Md., by dense fog. Dense fog prevailed at New York City on the 1st and 2d, and navigation and traffic on railroads were almost entirely suspended. Dense fog prevailed at New Haven, Conn., on the 2d, delaying or stopping New York boats. On these dates a general storm of marked energy advanced from the middle Mississippi valley to east New England.

• ○ 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 January, 1891, 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 lowest over south Florida and in the extreme lower Rio Grande valley, where it was above 60, and the mean readings were above 50 along the Gulf coast, along the Atlantic coast south of Charleston, S. C., in southwest Arizona and south California, and along the immediate Pacific coast south of the 40th parallel. The mean temperature was lowest in Manitoba, north Ontario, and in the lower Saint Lawrence valley, where it was below 10; the mean was also below 10 at elevated stations in Colorado. The mean values were below 20 north of a line traced from the southwest coast of the Gulf of Saint Lawrence south of west to north Vermont, thence irregularly westward to south Minnesota, and thence northwest over the British Possessions north of Montana, and in areas in the middle and east plateau regions.

The mean temperature was above the normal, except in the east Gulf states and Florida, and in the southern and the west parts of the middle plateau regions. The greatest departure above the normal occurred in north-central Montana and the British Possessions to the northward, where it exceeded 20, and the departure was more than 10 from east Washington to the upper Mississippi valley and the west part of the upper lake region. The most marked departure below the normal was noted in the southeast plateau region and at Key West, Fla., where it equalled or exceeded 4.

From the north Pacific coast to the Red River of the North Valley the current month was the warmest January on record, the mean temperature varying from 5 above the normal on the north Pacific coast to more than 20 above the normal in Montana and North Dakota. The warmest January along the middle and south Atlantic and east Gulf coasts occurred in 1890, when the mean temperature was 9 to 14 above the normal in those districts; over the middle plateau in 1887, when the mean temperature was 3 to 5 above the normal; and from the middle and southern plateau regions northeast and east, save along the Atlantic coast south of New England and on the east Gulf coast, in 1880, when the mean temperature was 12 to 14 above the normal in east Texas, 14 to 18 above in the Mississippi Valley, and 12 to 16 above in the Lake region; in New England the warmest January was noted in 1880 and 1889, when the mean temperature was 8 to 12 above the normal.

At Fort Grant, Ariz., 13 years record, and at Montrose, Colo., 6 years record, the current month was the coldest January on record, the mean temperature being 3 below the normal at Fort Grant, and 6 below at Montrose. At stations on the middle and south Pacific coasts and in the west part of the middle plateau the coldest January was noted in 1890, when

the mean temperature was 4 to 6 below the normal on the California coast, and 8 below the normal at Winnemucca, Nev.; in New England, and from the north Pacific coast to central Montana, in 1888, when the mean temperature was 5 to 7 below the normal in New England, and 4 to 10 below the normal from west Montana to the north Pacific coast; from the southeast slope of the Rocky Mountains to the Atlantic coast between the 33d and 39th parallels in 1886, when the mean temperature was 5 to 8 below the normal in that region; in the lower Rio Grande valley in 1881, when the mean temperature was 6 to 8 below the normal; in the Lake region and thence to the New Jersey coast, and from the Missouri Valley over the middle-eastern slope of the Rocky Mountains, in 1875, when the mean temperature was 6 to 10 below the normal in the Lake region, 5 to 8 below in New Jersey and Pennsylvania, and 10 to 12 below in the middle Missouri valley and on the middle-eastern slope of the Rocky Mountains.

In January, 1891, when the mean temperature was the highest on record for that month over the northwest part of the country, it was the lowest ever reported at stations in the south part of the plateau region. In 1890, when the warmest January on record was noted on the middle Atlantic and east Gulf coasts, the month was the coolest January reported at stations on the middle and south Pacific coasts.

• ○ DEVIATIONS FROM NORMAL TEMPERATURE.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for January 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 January, 1891; (4) the departure of the current month from the normal; (5) and the extreme monthly mean for January, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Jan.	(2) Length of record.	(3) Mean for Jan., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for Jan.			
						Highest.	Year.	Lowest.	Year.
<i>Arkansas.</i>			Years	°	°	°		°	
Lead Hill.....	Boone.....	33.1	9	38.3	+ 5.2	45.6	1890	24.2	1886
<i>California.</i>									
Sacramento.....	Sacramento	46.5	25	41.0	- 5.5	52.7	1873	38.4	1890
<i>Connecticut.</i>									
Middletown.....	Middlesex...	24.9	23	29.0	+ 4.1	33.7	1890	17.3	1888
<i>Florida.</i>									
Merritt's Island.....	Brevard.....	62.9	9	59.5	- 3.4	69.8	1882	55.4	1886
<i>Georgia.</i>									
Forsyth.....	Monroe.....	43.2	17	48.8	+ 0.6	59.4	1880	40.8	1884
<i>Illinois.</i>									
Peoria.....	Peoria.....	24.4	35	32.2	+ 7.8	40.9	1880	13.5	1857
Riley.....	McHenry.....	17.8	35	25.8	+ 8.0	33.2	1880	5.5	1875
<i>Indiana.</i>									
Vevay.....	Switzerland	31.2	25	36.4	+ 5.2	47.2	1880	23.0	1884
<i>Iowa.</i>									
Cresco.....	Howard.....	9.1	19	22.4	+13.3	26.1	1880	- 1.3	1883
Monticello.....	Jones.....	16.1	22	25.6	+ 9.5	32.9	1880	6.0	1883
Logan.....	Harrison.....	18.0	17	30.2	+12.2	34.4	1880	7.1	1886
<i>Kansas.</i>									
Lawrence.....	Douglas.....	26.5	28	32.4	+ 5.9	41.2	1880	14.3	1886
Wellington.....	Sumner.....	25.0	12	36.1	+11.1	40.2	1880	17.6	1886
<i>Louisiana.</i>									
Grand Coteau.....	Saint Landry	52.6	8	50.2	- 2.4	64.0	1890	47.4	1886
<i>Maine.</i>									
Orono.....	Penobscot...	15.0	17	21.0	+ 6.0	24.7	1889	8.2	1875
<i>Maryland.</i>									
Cumberland.....	Allegany.....	29.9	32	33.2	+ 3.3	40.7	1890	19.6	1865, '67

Deviations from normal temperature—Continued.

State and station.	County.	(1) Normal for the month of Jan.	(2) Length of record.	(3) Mean for Jan., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for Jan.			
						Highest.	Year.	Lowest.	Year.
<i>Massachusetts.</i>									
Amherst .....	Hampshire..	0	Years	0	0				
Newburyport .....	Essex .....	23.5	55	27.4	+ 3.9	32.3	1889	13.5	1857
Somerset .....	Bristol .....	24.2	14	29.0	+ 4.8	33.1	1880	13.7	1857
		26.8	18	32.7	+ 5.9	35.7	1880	19.4	1888
<i>Michigan.</i>									
Kalamazoo .....	Kalamazoo..	21.6	15	29.2	+ 7.6	36.0	1880	14.0	1881
Thornville .....	Lapeer .....	22.2	14	28.4	+ 6.2	35.6	1880	15.6	1881
<i>Minnesota.</i>									
Minneapolis .....	Hennepin ...	8.3	26	20.7	+ 12.4	23.2	1880	- 4.4	1875
<i>Montana.</i>									
Fort Shaw .....	Lewis & Clarke	15.9	21	33.8	+ 17.9	33.8	1891	- 2.2	1875
<i>New Hampshire.</i>									
Hanover .....	Grafton .....	17.4	53	21.2	+ 3.8	26.5	1838	6.8	1857, '83
<i>New Jersey.</i>									
Moorestown .....	Burlington ..	29.4	27	33.9	+ 4.5	40.1	1890	22.2	1867
South Orange .....	Essex .....	28.8	20	31.9	+ 3.1	37.6	1880	23.8	1884
<i>New York.</i>									
Cooperstown .....	Otsego .....	20.3	37	23.4	+ 3.1	31.6	1880	10.3	1857
Palermo .....	Oswego .....	20.8	37	24.9	+ 4.1	29.4	*	11.6	1888
<i>North Carolina.</i>									
Lenoir .....	Caldwell .....	36.2	19	38.0	+ 1.8	46.5	1890	30.2	1882
<i>Ohio.</i>									
N'th Lewisburgh.	Champaign ..	27.5	59	31.1	+ 3.6	41.0	1880	14.0	1856, '57
Wauseon .....	Fulton .....	23.1	21	27.9	+ 4.8	37.7	1880	12.2	1875
<i>Oregon.</i>									
Albany .....	Linn .....	37.3	13	40.9	+ 3.6	43.8	1887	22.8	1868
Eola .....	Polk .....	37.0	20	40.8	+ 3.8	42.7	1874	29.7	1875
<i>Pennsylvania.</i>									
Dyberry .....	Wayne .....	21.1	26	24.9	+ 3.8	31.6	1890	13.9	1865
Grampian Hills..	Clearfield ..	23.1	26	27.0	+ 3.9	35.0	1880	16.1	1867
Wellsborough ..	Tioga .....	25.7	11	25.7	0.0	35.8	1890	19.1	1884
<i>South Carolina.</i>									
Statesburgh .....	Sumter .....	45.5	9	46.1	+ 0.6	54.6	1890	39.0	1886
<i>Tennessee.</i>									
Austin .....	Wilson .....	37.2	22	40.5	+ 3.3	53.1	1880	28.2	1884
<i>Texas.</i>									
New Uim .....	Austin .....	50.7	17	50.7	0.0	63.7	1880	34.8	1875
<i>Vermont.</i>									
Strafford .....	Orange .....	16.0	17	22.2	+ 6.2	25.4	1889	6.9	1888
<i>Virginia.</i>									
Birdsnest .....	Northamp'tn	39.8	22	41.2	+ 1.4	49.6	1890	33.7	1881
<i>Washington.</i>									
Fort Townsend ..	Jefferson ....	37.8	19	42.3	+ 3.6	55.4	1888	29.6	1869
<i>Wisconsin.</i>									
Madison .....	Dane .....	16.8	28	25.2	+ 8.4	33.6	1880	4.1	1875

\* 1863, 1880, and 1890.

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported by a regular station of the Signal Service was 88, at Rio Grande City, Tex., on the 30th. The maximum temperature was 80, or above, at Tampa and Jacksonville, Fla., Brownsville, Tex., and Los Angeles, Cal., and was above 70 in the east Gulf states, along the Atlantic coast south of the 35th parallel, in the Rio Grande Valley, in south and southwest California, southwest Arizona, and in the middle Sacramento valley. Over the north part of the upper lake region and the east part of the middle plateau the maximum temperature was below 40, and it was below 50 north of a line traced from the south Maine coast westward to south Iowa, and thence northwestward to northwest Montana. 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., 90; Pomona, Cal., and Eustis, Fla., 88; Tucson, Ariz., Hattiesburgh, Miss., and several stations in Louisiana, 81; Citronelle, Ala., and Hardeeville, S. C., 80.

The lowest temperature reported by a regular station of the Signal Service was -27, at Saint Vincent, Minn., on the 15th. The minimum temperature was below -10 in north Vermont, extreme east upper Michigan, central and north Minnesota, North Dakota, northeast Montana, and in areas in northeast Utah and central Colorado, and the temperature fell below 0 (zero) north of a line traced along the Maine coast, thence westward north of the lower lakes to south Minnesota, thence southwest to south-central New Mexico, thence northwest to northwest Nevada, and thence east of north over the northern plateau. The highest minimum temperature, 53, was reported at Key West, Fla., and the minimum readings were above 30 along the immediate south Atlantic, Gulf, and Pacific coasts. The reports of United States Army post surgeons and volun-

tary observers show the following minimum temperatures in states and territories where minimum temperature falling to or below 0 (zero) was reported: Breckenridge, Colo., -36; West Milan, N. H., -30; Pokegama Falls, Minn., -26; Elko (2), Nev., -25; Grafton and Fort Pembina, N. Dak., -24; East Berkshire, Vt., and Oelrichs, S. Dak., -23; Choteau, Mont., -22; Fairfield, Me., -20; Boca, Cal., Henry's Lake, Idaho, and Antelope Spring, N. Mex., -19; Ogdensburgh, N. Y., -18; Hayward, Wis., -16; Fort Fetterman, Wyo., and Roscommon, Mich., -15; Silver Lake, Oregon, -14; Fort Du Chesne, Utah, -13; Fort Niobrara and North Loup, Nebr., -10; Carroll, Iowa, -8; Cooleys, Ariz., -7; New Hartford (1), Conn., and several elevated stations in Pennsylvania, -4; Lakin and Spearville, Kans., -3; several stations in Massachusetts, -2; Adrian and Pickering, Mo., -1; Bolar, Va., and Warren and Winnebago, Ill., 0 (zero).

LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather is shown on Chart IV by a line traced over the Florida Peninsula in latitude about 29° and a second line traced just inside the west Gulf coast line. The western limit of freezing weather is shown on this chart by a line traced along the immediate north Pacific coast and a second line traced inside the Pacific coast line south of the 40th parallel.

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 over the north-central part of the country, where they exceeded 60, whence they decreased eastward to less than 40 on the south New England coast, southeastward to less than 30 over extreme south Florida, southward to less than 40 on the middle west Gulf coast, southwestward to less than 50 over the middle and south plateau and on the south Pacific coast, and westward to less than 30 on the north Pacific coast.

FROST.

The first killing frost of the season was reported at Yuma, Ariz., 7th; at San Antonio, Tex., 11th; and at Titusville, Fla., 14th.

The first black frost of the season was reported at Jacksonville, Fla., 14th, and at Aiken, S. C., 18th.

The first light frost of the season was reported at San Diego, Cal., 8th; at Colegrove, Cal., 9th; at Corpus Christi, Tex., 11th; and at Jupiter, Fla., 14th. Light frost occurred as far south as Lee county, Fla., on the 5th, 6th, 14th, 15th, 19th, 20th, and 25th; along the immediate Gulf coast on a number of dates; in the lower Rio Grande valley on the 24th; at Yuma, Ariz., on the 1st, 2d, 7th, and 8th; and at San Diego, Cal., on the 8th and 9th. The light frost of the 9th at San Diego, Cal., injured plants in the Cajon Valley, and the light frost of the 14th at Jupiter, Fla., injured vegetation.

THE COLD WINTER OF 1890-1891 IN EUROPE.

The period of low temperature in central and western Europe which continued through the greater part of the past winter was probably the most persistent in the annals of European meteorology. A determination of the causes which contributed to produce the cold spell is of paramount importance to the science of meteorology, and this work will doubtless be undertaken by European meteorologists. It is not within the province of this publication, nor is it possible at the present time and with the data at hand, to attempt more than a brief review of the general meteorological conditions over a considerable area of the northern hemisphere during the prevalence of the great cold. A recognized fact in connection with abnormally high barometric pressure and unusually low temperature is their dependence upon each other, and an interesting line of investigation is that which has for its object the confirmation of the theory that abnormal cold over one portion of the northern hemisphere is compensated in some degree by an excess of