north Mississippi was about 7 weeks later than usual; that of the 5th to 7th in Tennessee was about 5 weeks late; that of the 13th in Kansas, of the 17th in West Virginia, and of the 27th in Ohio and New York was about 4 weeks late; and that of the 11th in Nebraska and of the 17th in Michigan and Iowa was about 2 weeks late.

NORMAL TEMPERATURE FOR MAY.

The normal distribution of temperature in the United States for May is shown by Chart No. V. The data used in the preparation of the chart were supplied largely by the records of observations at Signal Service stations for the twenty years—1871 to 1890. On this chart are given in plain figures the temperature as read at Signal Service stations at some elevation above the sea; underscored figures indicate temperatures observed at voluntary stations.

The instruments and methods employed during those years were substantially uniform at all stations, and the results for Signal Service stations, while not strictly comparable, owing to differences of exposure, are yet deemed fairly satisfactory. The hours of observation were changed a number of times and the method of obtaining the mean was not always the same. In order, therefore, to determine the error of a twenty-year mean derived from a combination of different hours, it was decided to reduce the 20-year value for 12 representative stations to the equivalent of a 20-year homogeneous series of observations. Mr. Alexander McAdie was charged with these reductions. He selected the following stations: New Orleans, La.; Washington City; Omaha, Nebr.; Saint Louis, Mo.; Saint Paul, Minn.; Philadelphia, Pa.; Boston, Mass.; Cleveland, Ohio; Milwaukee, Wis., and Cheyenne, Wyo. He first obtained the curve of diurnal variation for each station, as elsewhere described (see explanation of "Decade Normal Temperature Charts," O. C. S. O., June 15, 1891), and drew therefrom the appropriate corrections to reduce the mean of any hour, or combinations of hours, to the true mean.

It was found that the errors of the several combinations of hours very nearly neutralized each other, thus at New Orleans, La., for January the error of—

Series No. 1, Nov., 1870, to Aug., 1872, was —0°.2;
Series No. 2, Aug., 1872, to Oct., 1879, was 0°.0;
Series No. 3, Nov., 1879, to Dec., 1884, was 0°.0;
Series No. 4, Jan., 1885, to Dec., 1886, was 0°.0;
Series No. 5, Jan., 1887, to Jan., 1888, was +0°.3;
Series No. 6, July, 1888, to Dec., 1891, was —0°.2.

Having found for each month and a number of localities the corrections necessary to reduce the non-homogeneous mean to a homogeneous mean, it was clearly shown that the two were almost identical, and that no appreciable error would obtain in drawing isothermal lines from the unreduced means. The data were, therefore, charted without applying any corrections whatever.

A number of records made by reliable voluntary observers and U. S. Army surgeons were used in portions of the country not covered by Signal Service observations. The hours of observation at these stations were, as a rule, 7 a. m., 2 and 9 p. m. No corrections to reduce the means so obtained to the true mean have been applied. While these charts leave something to be desired in accuracy and completeness, they are desirable and important contributions at this time.

Table of normal temperature for May—Signal Service stations.

Stations.	Length of record.	Normal.	Stations.	Length of record.	Normal.
	Years	°		Years	°
Albany, N. Y.	17	59.3	Lynchburgh, Va.	19	66.3
Alpena, Mich	18	48.8	Marquette, Mich.	20	49.3
Atlanta, Ga.	12	68.6	Memphis, Tenn.	20	70.0
Atlantic City, N. J.	17	57.1	Milwaukee, Wis.	20	53.0
Augusta, Ga.	19	72.5	Mobile, Ala	20	73.8
Baltimore, Md.	20	64.4	Montgomery, Ala.	18	73.0
Bismarck, N. Dak.	16	54.6	Morgantown, W. Va.	11	62.6
Boise City, Idaho	24	59.8	Nashville, Tenn	20	68.8
Boston, Mass.	20	56.3	New Haven, Conn.	18	57.8
Brownsville, Tex.	16	78.5	New London, Conn	20	56.4
Buffalo, N. Y.	20	53.9	New Orleans, La.	20	74.7
Buford, Fort, N. Dak.	12	54.9	New York City	20	59.3
Cairo, Ill	20	67.8	Norfolk, Va.	20	66.6
Charleston, S. C.	20	72.7	North Platte, Nebr	16	58.4
Charlotte, N. C.	12	68.9	Olympia, Wash	18	55.6
Chattanooga, Tenn.	12	68.2	Omaha, Nebr.	20	62.1
Cheyenne, Wyo.	20	50.8	Oswego, N. Y	20	54.4
Chicago, Ill	20	56.4	Pensacola, Fla	10	73.8
Cincinnati, Ohio	20	65.2	Philadelphia, Pa.	20	62.2
Cleveland, Ohio	20	58.0	Pittsburg, Pa	20	62.4
Columbus, Ohio	12	61.4	Portland, Me.	20	55.4
Davenport, Iowa	19	61.1	Portland, Oregon	20	57.2
Denver, Colo.	19	56.5	Prescott, Ariz	14	60.2
Des Moines, Iowa	12	61.1	Red Bluff, Cal	13	67.1
Detroit, Mich.	20	57.7	Rochester, N. Y.	20	56.4
Dodge City, Kans.	16	63.1	Roseburgh, Oregon	14	56.9
Dubuque, Iowa	18	60.3	Sacramento, Cal.	14	64.0
Duluth, Minn.	20	48.3	Saint Louis, Mo.	20	66.0
Eastport, Me	18	47.4	Saint Paul, Minn.	20	57.9
El Paso, Tex.	12	73.7	Saint Vincent, Minn.	11	52.0
Erie, Pa.	18	57.2	Salt Lake City, Utah	17	58.0
Escanaba, Mich.	20	49.1	San Diego, Cal	20	61.2
Galveston, Tex	20	76.0	Sandusky, Ohio	14	59.4
Grand Haven, Mich.	20	54.9	San Francisco, Cal.	20	56.7
Indianapolis, Ind.	20	63.7	Santa Fe, N. Mex.	20	57.2
Jacksonville, Fla.	19	75.1	Savannah, Ga.	20	73.5
Keokuk, Iowa	19	62.9	Shreveport, La.	20	73.4
Key West, Fla.	20	79.6	Toledo, Ohio	20	59.9
Knoxville, Tenn.	20	66.4	Vicksburg, Miss.	19	73.0
La Crosse, Wis	18	59.7	Washington City	20	64.2
Leavenworth, Kans.	20	64.7	Wilmington, N. C.	20	69.9
Los Angeles, Cal.	14	62.2	Yankton, S. Dak	18	59.2
Louisville, Ky.	19	66.9	Yuma, Ariz.	15	77.4

Signal Service, post hospital, voluntary, and stations of the Canadian meteorological service.

Stations.	Length of record.	Normal.	Stations.	Length of record.	Normal.
	Years	°		Years	°
Amherst, Mass.	53	56.9	Lenoir, N. C.	19	63.7
Astoria, Oregon	26	52.8	Lunenburgh, Vt.	40	52.8
Austin, Tex.	35	74.2	Marietta, Ohio	57	62.4
Bidwell, Fort, Cal	23	55.1	McDowell, Fort, Ariz.	24	78.2
Bowie, Fort, Ariz.	22	71.1	McIntosh, Fort, Tex.	23	81.6
Brady, Fort, Mich.	51	49.8	Mohave, Fort, Ariz	26	80.4
Bridger, Fort, Wyo.	27	49.6	Monterey, Cal.	26	58.6
Brooke, Fort, Fla.	31	74.6	Montreal, Quebec	56	55.2
Burlington, Vt.	49	55.8	North Lewisburgh, Ohio	59	61.4
Canton, N. Y.	27	50.8	Northport, Mich.	18	51.9
Chatham, N. B.	16	48.3	Parry Sound, Ont.	15	50.8
Clark, Fort, Tex.	18	77.3	Peoria, Ill.	35	63.8
Colville, Fort, Wash.	18	55.5	Promontory, Utah	19	58.2
Cooperstown, N. Y.	34	54.5	Quebec, Quebec	44	50.2
Craig, Fort, N. Mex.	21	70.1	Randall, Fort, S. Dak.	20	61.2
Danville, Ky	18	65.9	Ripley, Fort, Minn.	27	55.5
Davis, Fort, Tex.	20	76.9	Rockliffe, Ont.	14	51.6
Eagle Pass, Tex.	22	80.6	San Antonio, Tex.	24	76.0
Father Point, Quebec	14	43.5	Saugeen, Ont.	16	50.2
Fort Smith, Ark.	25	69.1	Shaw, Fort, Mont.	22	54.1
Gaston, Fort, Cal	27	66.3	Sill, Fort, Oklahoma T.	20	76.1
Gibson, Fort, Ind. T.	46	69.6	Stanton, Fort, N. Mex.	15	60.6
Grampian Hills, Pa.	26	56.4	Sydney, C. B. I.	21	44.9
Grant, Fort, Ariz.	24	70.4	Toronto, Ont	51	52.1
Green Springs, Ala.	28	70.6	Totten, Fort, N. Dak	21	53.7
Halifax, N. S.	39	47.8	Truckee, Cal	20	48.8
Harrisburg, Pa.	32	63.9	Union, Fort, N. Mex.	37	57.9
Howard, Fort, Wis.	22	55.7	Washington, Ark.	22	69.8
Humboldt, Nev.	20	55.8	Wingate, Fort, N. Mex.	27	60.1
Indianola, Tex.	15	76.1	Winnipeg, Man	22	52.2
Kingston, Ont	21	53.4	Wytheville, Va.	25	61.4
Klamath, Fort, Oregon	19	49.1	Yarmouth, N. S.	14	47.2
Lansing, Mich	27	58.7	Yuma, Fort, Ariz.	25	79.6
Lapwai, Fort, Idaho	20	60.3			

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for May, 1891, 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 11.08, at Southern Pines, N. C., and 10.25 was reported at Kellogg, Kans. The monthly precipitation exceeded 8.00 in areas in North Carolina, Kansas, and northeast Colorado, and was more than 6.00 in south-central Virginia, over the greater part of North Carolina, in areas on the east Florida coast, in central Mississippi, northwest Missouri, a great part of Kansas, and at stations in north-central and northeast Colorado. At a number of stations in southeast and central California and southwest Arizona no precipitation was reported, and over the greater part of the southern plateau, generally in California south of the 40th parallel, over east Washington and northeast Oregon, in east-central Wyoming, east-central South Dakota, along a greater part of the middle and west Gulf and west Florida coasts, and in areas in the middle Missouri valley, the Ohio Valley and Tennessee, the east and west Gulf states, the north part of the Lake region, and from central New York to north-central Pennsylvania, less than 1.00 was reported.

East of the Rocky Mountains the precipitation was generally deficient, while over the Rocky Mountain, the middle and southern plateau regions, and on the Pacific coast between the 35th and 45th parallels the monthly precipitation was in excess of the May average. Over the eastern part of the country the only important area of excessive precipitation extended from central Virginia over the interior of the south Atlantic states, where the precipitation was more than 2.00 above the normal. There was also an excess of 2.00 at Roseburgh, Oregon. The greatest deficiency in precipitation occurred from the west Gulf coast to the Lake region, where it was generally more than 2.00, and the deficiency exceeded 4.00 over south Louisiana and Texas.

Considered by districts the average percentage of the normal in districts where the precipitation was in excess was about as follows: southern plateau, 349 per cent.; middle plateau, 137 per cent.; northeast slope of the Rocky Mountains and middle Pacific coast, 124 per cent.; middle-eastern slope of the Rocky Mountains, 106 per cent. In districts where the precipitation was deficient the percentage of the normal was about as follows: Key West, Fla., 7 per cent.; west Gulf states, 33 per cent.; upper lake region, 37 per cent.; east Gulf states, 39 per cent.; lower lake region, 44 per cent.; northern plateau, 47 per cent.; Ohio Valley and Tennessee, 48 per cent.; upper Mississippi valley, 55 per cent.; New England, 56 per cent.; south Pacific coast, 64 per cent.; north Pacific coast, 68 per cent.; Rio Grande Valley, 70 per cent.; Missouri Valley, 78 per cent.; extreme northwest, 79 per cent.; southeast slope of the Rocky Mountains, 87 per cent.; middle Atlantic states, 90 per cent.; south Atlantic states, 95 per cent.

At the following-named stations the precipitation for the current month was the heaviest ever reported for May: Santa Fé, N. Mex., 3.21, 2.41 above the normal, and 0.90 greater than in 1881; Fort Grant, Ariz., 1.40, 1.12 above the normal, and 0.24 greater than in 1883; Winnemucca, Nev., 2.32, 1.54 above the normal, and 0.43 greater than in 1883; Fort Assiniboine, Mont., 3.79, 2.38 above the normal, and 0.64 greater than in 1889. The heaviest precipitation for May occurred in West Washington in 1887, when the excess was 1.00 to 3.00; in the lower Rio Grande valley in 1885, when the excess was 4.00 to 7.00; at stations from Iowa over the south part of the Lake region to central New York in 1883, when the excess was 2.00 to 6.00; from east Arkansas over the middle Mississippi and Ohio valleys in 1882, when the excess was 4.00 to 5.00; from New Mexico to extreme southeast South Dakota in 1881, when the excess was more than 1.00 in New Mexico and 5.00 to 9.00 in parts of South Dakota, Nebraska, and Kansas; in west Oregon and at San Francisco, Cal., in 1879, when the excess was 3.00 to 4.00 in west Oregon and 1.77 at San Francisco.

At the following-named stations the precipitation for the current month was the least ever reported for May: Eastport, Me., 1.64, 2.59 below the normal, and 0.65 less than in 1889; Grampian Hills, Pa., 1.29, 3.05 below the normal, and 0.29 less than in 1866; Wellsborough, Pa., 1.30, 4.06 below the normal, and 0.21 less than in 1886; Wilmington, N. C., 1.03, 3.32 below the normal, and 0.15 less than in 1886; Mobile, Ala., 0.67, 3.97 below the normal, and 0.50 less than in 1886; Lead Hill, Ark., 1.97, 4.40 below the normal, and 0.07 less than in 1886; Cincinnati, Ohio, 1.08, 2.41 below the normal, and 0.17 less than in 1876; Rochester, N. Y., 1.12, 1.96 below the normal, and 0.05 less than in 1887; Thornville, Mich., 1.10, 2.47 below the normal, and 0.27 less than in 1881; Marquette, Mich., 0.21, 2.58 below the normal, and 0.63 less than in 1877; Moorhead, Minn., 1.03, 1.58 below the normal, and 0.39 less than in 1890; Fort Townsend, Wash., 0.30, 1.64 below the normal, and 0.37 less than in 1888; and Neah Bay, Wash., 0.91, 3.58 below the normal, and 0.76 less than in 1888.

In the southern plateau region, where the rainfall was unusually heavy for the current month, an entire absence of precipitation is not uncommon in May. At El Paso, Tex., 11 years' record, there have been 3 years for which no precipitation was reported for May; at Fort Apache, Ariz., 12 years' record, 4 years; at Fort Grant, Ariz., 13 years' record, 3 years; at Yuma, Ariz., 15 years' record, 10 years; and at Keeler, Cal., 6 years' record, 2 years. The least precipitation for May occurred on the north Pacific coast in 1888, when the deficiency was 2.00 to 4.00; from east Texas and Louisiana northwestward to the northern plateau region in 1886, when the deficiency was 4.00 to 6.00 in Arkansas, east Texas, and west Louisiana, 3.00 to 4.00 on the southeast slope of the Rocky Mountains, and 0.50 to 1.75 in the middle and northern plateau regions; over the northeast part of the Lake region in 1877, when the deficiency was 2.00 to 3.00; and in the lower Mississippi and lower Missouri valleys in 1874, when the deficiency was 3.00 to 5.00.

The precipitation from January to May, inclusive, averaged about as follows: in New England, the Ohio Valley and Tennessee, the Rio Grande Valley, the Missouri Valley, on the southeast slope of the Rocky Mountains, and on the middle and south Pacific coasts it was about normal; on the northeast and middle-eastern slopes of the Rocky Mountains it was about one-third greater, and in the middle Atlantic states, extreme northwest, and over the middle plateau region it was one-tenth to two-tenths greater than usual. At Key West, Fla., about one-half the usual amount of precipitation fell, and in the south Atlantic and east and west Gulf states, the Lake region, the upper Mississippi valley, the northern plateau region, and on the north Pacific coast seven-tenths to nine-tenths of the average precipitation for the period named was reported.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for May for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for May, 1891; (4) the departure of the current month from the average; (5) and the extremes for May during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of May.	(2) Length of record.	(3) Total for May, 1891.	(4) Departure from average.	(5) Extremes for May. Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches.*		*Inches*	
Lead Hill	Boone	6.37	9	1.97	−4.40	10.56	1882	1.97	1891
California.									
Sacramento	Sacramento	0.76	41	0.66	−0.10	3.65	1889	0.00	*
Connecticut.									
Middletown	Middlesex	3.85	29	1.62	−2.23	7.63	1868	0.22	1887

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of May.	(2) Length of record.	(3) Total for May, 1891.	(4) Departure from average.	(5) Extremes for May. Greatest. Am't.	Greatest. Year.	Least. Am't.	Least. Year.
		Inches	Inches	Years	Inches.	Inches.		Inches	
Florida.									
Merritt's Island	Brevard	4.23	13	1.63	—2.60	11.58	1890	0.88	1886
Georgia.									
Forsyth	Monroe	3.18	17	2.29	—0.89	7.31	1890	0.45	1877
Illinois.									
Peoria	Peoria	3.76	35	1.97	—1.79	10.73	1858	0.93	1879
Riley	McHenry	3.80	40	4.38	+0.58	15.46	1851	0.54	1870
Indiana.									
Logansport	Cass	5.06	16	2.67	—2.39	11.13	1858	2.09	1881
Vevay	Switzerland	3.93	26	2.59	—1.34	11.80	1865	0.52	1874
Iowa.									
Cresco	Howard	3.57	19	1.58	—1.99	7.89	1880	0.76	1874
Monticello	Jones	3.62	36	2.70	—0.92	7.97	1858	0.76	1874
Logan	Harrison	4.49	25	3.93	—0.56	11.00	1877	1.10	1874
Kansas.									
Lawrence	Douglas	4.29	25	6.55	+2.26	8.27	1889	0.12	1887
Wellington	Sumner	4.60	12	8.90	+4.30	9.37	1881	0.88	1886
Louisiana.									
Grand Coteau	St. Landry	5.54	8	1.20	—4.34	14.03	1884	0.21	1889
Maine.									
Orono	Penobscot	3.60	21	2.83	—0.77	10.52	1890	1.25	1887
Maryland.									
Cumberland	Allegany	3.26	19	2.57	—0.69	7.13	1890	0.30	1875
Massachusetts.									
Amherst	Hampshire	3.91	55	1.81	—2.10	8.72	1850	0.75	1887
Newburyport	Essex	3.91	12	2.39	—1.52	6.08	1890	0.43	1880
Somerset	Bristol	3.71	18	2.09	—1.62	5.81	1890	1.08	1880
Michigan.									
Kalamazoo	Kalamazoo	4.14	15	3.06	—1.08	6.38	1883	1.44	1885
Thornville	Lapeer	3.57	14	1.10	—2.47	5.87	1890	1.10	1891
Minnesota.									
Minneapolis	Hennepin	3.47	25	1.54	—1.93	6.21	1879, '88	0.07	1866
Montana.									
Fort Shaw	Lewis & Clarke	1.97	21	3.40	+1.43	7.19	1876	0.36	1872
New Hampshire.									
Hanover	Grafton	3.21	45	1.90	—1.31	7.37	1850	0.55	1852
New Jersey.									
Moorestown	Burlington	3.87	27	2.33	—1.54	7.38	1867	0.65	1880
South Orange	Essex	3.12	20	3.54	+0.42	6.46	1888	0.41	1880
New York.									
Cooperstown	Otsego	3.46	37	2.16	—1.30	8.84	1890	0.36	1879
Palermo	Oswego	2.68	37	0.44?	—2.24	6.90	1867	0.30	1870
North Carolina.									
Lenoir	Caldwell	4.75	19	5.10	+0.35	11.50	1873	1.60	'81, '83
Ohio.									
N. Lewisburgh	Champaign	3.80	19	3.50	—0.30	7.95	1882	1.55	1879
Wauseon	Fulton	4.21	19	1.49	—2.72	8.22	1889	1.14	1877
Oregon.									
Albany	Linn	2.63	14	2.49	—0.14	5.70	1879	0.39	1884
Eola	Polk	1.91	21	2.29	+0.38	5.94	1879	0.26	1890
Pennsylvania.									
Dyberry	Wayne	3.05	21	2.27	—0.78	5.56	1890	0.36	1875
Grampian Hills	Clearfield	4.34	19	1.29	—3.05	11.60	1889	1.29	1891
Wellsborough	Tioga	5.36	12	1.30	—4.06	9.36	1884	1.30	1891
South Carolina.									
Statesburgh	Sumter	3.85	10	1.85	—2.00	6.68	1888	1.24	1882
Tennessee.									
Austin	Wilson	3.44	23	1.54	—1.90	8.40	1882	1.44	1877
Texas.									
New Ulm	Austin	2.74	18	0.66	—2.08	12.25	1884	0.05	1886
Vermont.									
Strafford	Orange	3.26	18	3.10	—0.16	7.60	1890	0.40	1877
Virginia.									
Birdsnest	Northampton	3.80	22	4.75	+0.95	7.85	1885	0.50	1879
Washington.									
Fort Townsend	Jefferson	1.94	17	0.30	—1.64	7.81	1875	0.30	1891
Wisconsin.									
Madison	Dane	3.69	23	1.42	—2.27	8.39	1858	1.09	1870

* 1857, 1873, and 1885.

Table of excessive precipitation, May, 1891.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
	Inches.	Inches.		Inches	h. m.	
Alabama.						
Livingston (1)				1.22	1 00	4
Livingston (2)				1.51	1 00	4
Arkansas.						
Hot Springs		3.00	18	3.00	0 50	18
California.						
Crescent		3.17	4			
Upper Mattole		5.59	5, 6			
Colorado.						
Brush		3.43	15, 16			
First View		2.65	20, 21			
Kirk		3.00	16			
Lamar		3.01	25			
Las Animas		3.01	24, 25			
Sanborn		3.33	24			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
	Inches.	Inches.		Inches	h. m.	
Florida.						
Duke		2.94	29, 30			
Jacksonville				1.01	0 45	27
Jupiter		2.60	7, 8	2.20	0 40	7
Ocala		4.16	25			
Passadena		3.12	25, 26			
Pensacola				1.19	1 00	28
Georgia.						
Augusta				1.15	1 00	27
Macon				1.00	0 45	18
Point Peter				1.10	1 00	27
Illinois.						
Riley				1.88	1 10	20
Rushville		3.33	20, 21			
Indiana.						
Butlerville				1.07	0 40	22
Iowa.						
Carroll		2.50	30			
Cordova				1.23	1 00	22
Do				1.25	1 00	24
Glenwood		2.50	20, 21			
Indianola		3.30	21, 22			
Kansas.						
Bucklin		3.30	15			
Dwight		2.50	21			
Emporia		2.72	20, 21			
Globe		2.72	21			
Kellogg	10.25	3.96	20, 21			
Do		3.71	24, 25			
Lebo		3.15	25, 26			
Minneapolis		2.75	20, 21			
Morton		2.00	23			
Pauline		2.50	21			
Sharon Springs		3.00	20, 21			
Springvale		2.90	16, 17			
Do		3.30	21			
Topeka		2.58	21			
Wellington		2.54	21			
Do		3.06	25, 26			
Wichita		3.05	20, 21			
Do		3.19	24, 25			
Louisiana.						
Amité City		3.02	5			
Maryland.						
Jewell		2.50	28			
Mississippi.						
Brookhaven		3.52	19			
Hazlehurst		2.55	19			
Louisville				1.29	1 00	25
Vaiden				1.62	1 05	4
Missouri.						
Carrollton		3.28	2			
Columbia		2.63	2			
Fayette		3.24	2			
Grand Pass		2.94	21			
Gordonville				2.00	1 00	20
Kansas City				1.02	0 35	31
Oregon		2.69	31			
Platte River		2.87	2			
Sarcoxie		2.66	25, 26			
Nebraska.						
Omaha				1.14	1 00	30
North Carolina.						
Charlotte		3.00	12, 13	1.32	0 16	12
Lumberton				1.17	1 00	14
Southern Pines	11.08					
Weldon		3.05	26, 27			
Ohio.						
Bement		2.50	21			
West Milton				1.25	0 30	22
Oklahoma Territory.						
Oklahoma City				1.75	0 15	20
Oregon.						
Bandon		2.70	4			
Gooseberry				1.00	0 30	26
Pennsylvania.						
Coatesville				1.24	0 15	11
South Carolina.						
Allendale				1.13	1 00	13
Batesburgh		3.40	27			
Spartanburg		2.73	14			
South Dakota.						
Clark				2.37	2 00	30
Fort Meade		3.24		3.24	2 55	31
Tennessee.						
Jacksboro		2.83	27	1.00	0 50	26
Lewisburgh				1.01	1 00	25
Texas.						
Columbia		4.25	5			
Eagle Pass		3.35	22			
Fort Ringgold		2.66	4, 5			
Longview		2.50	18			
Rio Grande City		2.76	4, 5			
Round Rock				2.22	1 00	17
San Angelo				1.03	1 05	25

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Wray, Colorado		2.70	18			
Diamond, Georgia				2.00	2 00	19

MAXIMUM RAINFALL IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfall during May, 1891, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		*Inch.*		*Inch.*	
Bismarck, N. Dak	0.15	30	0.16	30	0.43	23
Boston, Mass	0.05	16	0.10	16	0.15	16
Buffalo, N. Y	0.05	22	0.05	22	0.10	26
Cincinnati, Ohio	0.15	22	0.25	22	0.45	22
Chicago, Ill	0.06	22	0.09	22	0.25	22
Cleveland, Ohio	0.18	21	0.27	21	0.59	21
Denver, Colo	0.05	20	0.10	20	0.32	20
Detroit, Mich	0.22	21	0.30	21	0.30	21
Dodge City, Kans	0.20	24	0.25	15	0.55	15
Duluth, Minn	0.18	20	0.22	20	0.40	20
Eastport, Me	0.03	22	0.05	22	0.18	22
Galveston, Tex*	.....	.....	.....	.....	.....	.....
Jupiter, Fla	0.50	7	0.80	7	2.20	7
Kansas City, Mo	0.30	31	0.51	31	1.20	31
Key West, Fla	0.15	9	0.20	9	0.24	9
Marquette, Mich †	.....	.....	.....	.....	.....	.....
Memphis, Tenn*	.....	.....	.....	.....	.....	.....
New York City	0.09	29	0.15	16	0.38	29
New Orleans, La	0.10	12	0.17	12	0.52	12
Norfolk, Va	0.27	26	0.40	26	0.40	26
Philadelphia, Pa	0.05	3	0.10	3	0.22	3
Philadelphia Water Works	0.05	3	0.10	3	0.20	3
Portland, Oregon	0.05	6	0.05	6	0.15	6
Saint Louis, Mo	0.10	10	0.13	10	0.53	10
Saint Paul, Minn	0.22	31	0.38	31	0.65	31
San Diego, Cal†	0.05	21	0.05	21	0.05	21
San Francisco, Cal*	.....	.....	.....	.....	.....	.....
Savannah, Ga	0.35	27	0.50	27	0.75	27
Washington City	0.15	3	0.18	3	0.30	3, 26
Wilmington, N. C	0.10	5	0.15	5	0.20	5

* Register not working. † Less than 0.05 in 1 hour.

EXCESSIVE PRECIPITATION.

Monthly precipitation to equal or exceed 10.00 was reported at 1 station in North Carolina and at 1 station in Kansas. The greatest amount, 11.08, was noted at Southern Pines, N. C.

In the last 21 years monthly precipitation to equal or exceed 10.00 in May has been reported for 14 years in Tex.; for 10 years in Kans.; for 7 years in Iowa; for 6 years in Ark., La., Mo., and N. C.; for 5 years in Nebr.; for 4 years in Fla., Ga., Miss., S. C., and Va.; for 3 years in Ala., Ill., and Mich.; for 2 years in Colo., the Dakotas, D. C., Ind., Me., Md., Mass., N. H., Mont., N. J., N. Y., Ohio, Pa., Tenn., and Wis.; and for 1 year in Cal., Ky., Minn., and Wash. Among the heavier monthly rainfalls reported for May are: 34.85, at Melissa, Tex., in 1881; 21.95, at Melissa, Tex., in 1873; 19.85, at Northport, Mich., in 1884; 19.40, at Hudson, N. Y., in 1876; and 16.19, at Hypoluxo, Fla., in 1890.

Precipitation to equal or exceed 2.50 in 24 hours was reported for 14 stations in Kans., and on 9 dates, the 15th to 17th, 20th, 21st, and 23d to 26th; at 7 stations in Mo., and on 5 dates, the 2d, 21st, 25th, 26th, and 31st; at 6 stations in Colo., and on 6 dates, the 15th, 16th, 20th, 21st, 24th, and 25th; at 5 stations in Tex., and on 4 dates, the 4th, 5th, 18th, and 22d; at 4 stations in Fla., and on 6 dates, the 7th, 8th, 25th, 26th, 29th, and 30th; at 3 stations in Iowa, and on 4 dates, the 20th to 22d, and 30th; at 2 stations in Cal., and on 3 dates, the 4th and 5–6th; at 2 stations in Miss. on the 19th; at 2 stations in N. C., and on 4 dates, the 12–13th and 26–27th; at 2 stations in S. C., and on 2 dates, the 14th and 27th; at 1 station in Ark. on the 18th; at one station in Ill. on the 20th–21st; at 1 station in La. on the 5th; at 1 station in Md. on the 28th; at one station in Ohio on the 21st; at 1 station in Oregon on the 4th; and at one station in Tenn. on the 27th. Among the heavier rainfalls reported for this period are: 5.59, at Upper Mattole, Cal., 5-6th; and 4.25, at Columbia, Tex., 5th.

In the last 21 years precipitation to equal or exceed 2.50 in May has been reported for 18 years in Kans.; for 16 years in Tex.; for 12 years in N. C., S. C., Ill., and Ala.; for 11 years in Fla.; for 10 years in Iowa and Miss.; for 9 years in Ind. T., La., and Nebr.; for 8 years in Ark., the Dakotas, Ga., and Tenn.; for 7 years in Md. and Mich.; for 6 years in Ind., Mo., and Va.; for 5 years in Colo., Minn., and Pa.; for 4 years in Mass. and Ohio; for 3 years in Ky., Mont., R. I., and Wis.; for 2 years in Conn., N. J., and N. Y.; and for one year in Cal., Del., D. C., Me., and Vt. Among the heavier rainfalls reported for this period are: 9.92, at Columbus, Ga., 22d, 1880; 9.28, at Durham, Ark., 1st, 1876; 7.60, at Austin, Tex., 30th, 1870; 7.50, at Okalona, Miss., 4th, 1887; 7.37, at Shreveport, La., 6th, 1876; 9.00, at New Frankford, Mo., 28–29th, 1889; 6.89, at Hypoluxo, Fla., 29–30th, 1890. Over 5.00 fell at a number of stations in Pa., southwest N. Y., and north Md., 31st, 1889.

Precipitation to equal or exceed 1.00 in 1 hour was reported at 3 stations in Fla., and on 3 dates, the 7th, 27th, and 28th; at 3 stations in Ga., and on 2 dates, the 18th and 27th; at 2 stations in Iowa, and on two dates, the 22d and 24th; at 2 stations in Miss., and on 2 dates, the 4th and 25th; at 2 stations in Mo., and on 2 dates, the 20th and 31st; at 2 stations in N. C., and on 2 dates, the 12th and 14th; at 2 stations in S. Dak., and on 2 dates, the 30th and 31st; at 2 stations in Tenn., and on 2 dates, the 25th and 26th; at 2 stations in Tex., and on 2 dates, the 17th and 25th; at 1 station in Ala. on the 4th; at 1 station in Ark. on the 18th; at 1 station in Ill. on the 20th; at 1 station in Ind. on the 22d; at 1 station in Nebr. on the 30th; at 1 station in Ohio on the 22d; at 1 station in Okla. T. on the 20th; at 1 station in Oregon on the 26th; at 1 station in Pa. on the 11th; and at 1 station in S. C. on the 13th. Among the heavier rainfalls reported for this period are: 1.75 in 15 minutes, at Oklahoma City, Okla. T., 20th; 1.32 in 16 minutes, at Charlotte, N. C., 12th; 1.24 in 15 minutes, at Coatesville, Pa., 11th; 2.20 in 40 minutes, at Jupiter, Fla., 7th; and 3.00 in 50 minutes, at Hot Springs, Ark., 18th. Excessive rainfall for 5 and 10 minute periods at regular stations of the Signal Service is given in the table of "Maximum rainfall in 1 hour or less."

In the last 21 years precipitation to equal or exceed 1.00 in 1 hour has been reported for 16 years in Kans.; for 12 years in Tex.; for 11 years in Iowa; for 9 years in Nebr.; for 8 years in Fla., N. C., and S. C.; for 6 years in Ga., Md., Ohio, Pa., and Tenn.; for 4 years in the Dakotas, Ill., Ind., and Wis.; for 3 years in Ala., Ark., Ind. T., La., Miss., and Va.; for 2 years in Colo., Ky., Mass., Mich., Minn., and Mo.; and for 1 year in Ariz., Mont., and Vt. Among the heavier rainfalls reported for this period are: 1.15 in 5 minutes, at New York City, 22d, 1881; 1.20 in 10 minutes, at Mount Ida, Ark., 10th, 1882; 1.70 in 12 minutes, at Collinsville, Ill., 23d, 1888; 2.50 in 15 minutes, at Embarrass, Wis., 28th, 1881; 1.10 in 15 minutes, at Toledo, Ohio, 20th, 1880; and 1.10 in 15 minutes, at Dale Enterprise, Va., 12th, 1889.

SNOW (in inches and tenths).

Chart IV shows the depth of snowfall reported for the month. The greatest depth of snowfall reported was 39, at Alma, Colo., and the monthly snowfall exceeded 10 at a number of stations in central and south Colorado, along the line of the Central Pacific Railroad crossing the summit of the Sierra Nevada Mountains in California, and at Belmont, Nev. At Fort Sidney, Nebr., Virginia City, Nev., and Laramie, Wyo., the snowfall amounted to 5 or more. East of the Mississippi River the heaviest snowfall, 4.0, was reported at Malone, N. Y. 2.0 was reported at Corry, Pa., Littleton, N. H., and in the Chiricahua Mountains, Ariz. Trace of snowfall was reported in the Atlantic coast states to extreme south New Jersey and central Maryland. In the central valleys snow fell as far south as southeast Iowa. In the Rocky Mountain and plateau regions snow was reported to extreme north New Mexico; and heavy drifts were reported in the mountains of south Colorado. Over the west part of the plateau region no snow was reported, except in Nevada and in east California between the 38th and 40th parallels.

Snowfall was reported as follows: *Arizona.*—Chiricahua Mountains, 2. *California.*—Summit, 11; Cisco, 9; Emigrant

Gap, 7; Fort Bidwell, trace. *Colorado.*—Alma, 39; Breckenridge, 22; Ward District, 19.1; Como (near), 16; Thon and Cumbres, 12; Husted and Castle Rock, 10; Georgetown, 9; Stunner, 8.8; Dillon, 7.5; Idaho Springs, 7; Le Roy, 6.5; Kirk and Carson, 6; Red Cliff, 5.5; First View, Stanford, and Yuma, 4; Leslie and Akron, 2.5; Jefferson, 1.4; Greenhorn, and Denver, 1; Watervale, and Magnolia, 0.5; Fort Logan, 0.1; Haxtum and Sheridan Lake, trace. *Connecticut.*—New London, Canton, Falls Village, Middletown, and Wallingford, trace. *Illinois.*—Chicago and Riley, trace. *Indiana.*—Angola, 0.2. *Iowa.*—Dubuque, Fairfield, and Marshalltown, trace. *Maine.*—Calais, Lewiston, and Mayfield, trace. *Maryland.*—Baltimore, trace. *Massachusetts.*—Amherst Experiment Station (2), Fort Warren, Mount Nonotuck, Provincetown, Royalston, and Taunton (3 and 4), trace. *Michigan.*—Roscommon, 0.5; Alpena, Port Huron, Sault de Ste. Marie, Atlantic, Calumet, Mottville, and North Marshall, trace. *Minnesota.*—Alexandria, 1.5; Saint Vincent, 1?; Montevideo, trace. *Montana.*—Virginia City, 6.5; Helena, 3; Fort Assinniboine, 1; Camp Poplar River and Choteau, trace. *Nebraska.*—Fort Sidney, 8.5; Kimball, 5.5; Valentine, Fort Niobrara, Gering, and Hay Springs, trace. *Nevada.*—Belmont, 14; Palmetto, 9; Ely, 8; Austin, 6.5; Pioche, 5; Virginia City, 4.5; Eureka, 2.5; Lewer's Ranch, 1.5; Carson City, 1.2; Palisade, 1; Candelaria, Genoa, and Monitor's Ranch, trace.

New Hampshire.—Littleton, 2; Manchester, Hanover (1), Plymouth, and West Milan, trace. *New Jersey.*—Atlantic City, Moorestown, and South Orange, trace. *New Mexico.*—Monero, 0.2. *New York.*—Malone, 4; Le Roy, 3; Sherman, 2.5; Arcade (1) and Lockport, 2; South Canisteo and Brookfield, 1.5; Cooperstown, New Lisbon, and Turin, 1; Oxford, 0.9; Perry City, 0.8; Buffalo, Alfred Centre, Ithaca, and Syracuse, 0.5; Albany, New York City, Oswego, Rochester, Geneva, Honeymead Brook, Lyons, Madison Barracks, Middletown, Ogdensburgh (1), Poughkeepsie, and Watervliet Arsenal, trace. *North Dakota.*—Fort Pembina, 0.5; Bismarck, 0.3; Fort Buford and Grafton, trace. *Ohio.*—Bangorville, Garrettsville, Hiram, New Alexandria, Orangeville, and Weymouth, trace. *Oregon.*—Joseph, 0.8; Happy Valley, trace. *Pennsylvania.*—Corry, 2; Wellsborough, 1.5; Blue Knob, Dyberry, and Pleasant Mount, 1; Greenville, Selin's Grove, and Wilkesbarre, 0.5; Le Roy, 0.4; Grampian Hills and Salem Corners, 0.3; Harrisburg, Blooming Grove, Kilmer, Quakerstown, and Ridgway, trace. *Rhode Island.*—Kingston (1), trace. *South Dakota.*—Cross and Spearfish, 1.5; Fort Meade, 1.1; Wolsey and Forestburgh, 1; Huron, 0.6; Fort Sully, 0.4; De Smet and Egeland, 0.3; Rapid City, 0.2; Kimball, 0.1; Flandreau, Fort Bennett, Millbank, Parkston, and Saint Lawrence, trace. *Vermont.*—Chelsea and Strafford, 1; Brattleborough (2), Burlington, and Jacksonville, trace. *West Virginia.*—Tannery and Weston, trace. *Wisconsin.*—Hayward, trace. *Wyoming.*—Laramie, 5; Fort Washakie, 4; Cheyenne, 3.3; Fort Yellowstone, 0.5; Fort Fetterman, trace.

HAIL.

Description of the more severe hail storms of the month is given under "Local Storms." Hail was reported as follows: 1st, Md., Mo., Mont., N. C., S. Dak., Va. 2d, Colo., Kans., Ky., Mo., Nebr. 3d, Colo., Idaho, Iowa, Kans., Miss., Mo., N. C. 4th, Ala., Ill., La., Miss., Ohio. 5th, Colo., Ind., Kans., N. H., N. C. 6th, Colo., Del., Iowa, N. J., N. Y., Oregon, Pa. 7th, Colo., Iowa, Mont., N. Mex., Oregon. 8th, Mont., N. Mex. 9th, Ariz., Fla., Wis. 10th, Colo., Fla., Iowa, Kans., N. Dak. 11th, Ariz., Colo., Kans., N. Mex., Tex. 12th, N. H., N. Mex., N. C. 13th, Colo., Kans., N. C., S. C. 14th, Colo., Kans., N. Mex., Utah. 15th, Colo., Fla., Kans., N. Mex., Oregon. 16th, Kans., Nev., Tex. 17th, Ark., Colo., Ind. T., Nev., Okla. T., Tex., Utah. 18th, Colo., Ga., N. H., Tex., Utah. 19th, Ariz., Colo., Iowa, Kans., Miss., Mo., S. C., S. Dak., Wyo. 20th, Ariz., Colo., Ill., Ind., Iowa, Kans., Mich., Mo., Nebr., N. C., Okla. T., S. Dak. 21st, Ariz., Colo., Ill., Mo., N. Mex., Ohio, Pa., Utah. 22d, Cal., Colo., Ind., Ohio, Tex., Utah. 23d, Ariz., Colo., Kans., Nebr., N. Mex., N. C., Va., Wyo. 24th, Colo., Iowa, N. Mex. 25th, Ala., Colo., Nev., N. Mex., Okla. T., S. C., Tex. 26th, Ark., Colo., Miss., Nev., Oregon, Tenn. 27th, Ariz., Colo., Iowa, Nev. 28th, Cal., Kans., S. Dak. 29th, Iowa, Kans., Minn., Nebr., S. Dak., Tenn., Tex. 30th, Cal., Fla., Iowa, Minn., Nebr., N. C., Oregon, S. C., S. Dak., Tex., W. Va. 31st, Colo., Iowa, Kans., Minn., Mo., Nebr., N. C., Ohio, S. Dak., Va.

SLEET.

Sleet was reported as follows: 2d, Mont. 3d, Nebr. 4th Iowa, Nebr., Ohio, Pa., S. Dak. 5th, D. C., N. Y., Ohio, Pa. 6th, N. Y., Pa. 8th, S. Dak. 10th, Colo., Iowa, Mich. 13th, 14th, 16th, and 20th, Colo. 21st, Wyo. 24th and 25th, Colo.

WINDS.

The prevailing winds during May, 1891, are shown on Chart II by arrows flying with the wind. In New England, on the northeast slope of the Rocky Mountains, and over the middle plateau region the winds were generally from southeast to southwest; in the west Gulf states, the Missouri Valley, and on the southeast slope of the Rocky Mountains, from southeast to south; in the Rio Grande Valley, from the southeast; in the Ohio Valley and Tennessee, and the lower lake region, from northwest to northeast; in the extreme northwest, from northeast to southeast; in the upper Mississippi valley, from north to northeast; on the middle-eastern slope of the Rocky Mountains, from south to southwest; over the southern plateau region, from southwest to northwest; on the north Pacific coast, northerly; on the south Pacific coast, from west to northwest; and in the middle and south Atlantic and east Gulf states, over the Florida Peninsula, in the upper Lake region, over the northern plateau region, and on the middle Pacific coast, variable.

HIGH WINDS.

[In miles per hour.]

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Signal Service, as follows: 2d, 52, nw., at Cairo, Ill. 4th, 54, w., at Northfield, Vt. 8th, 58, sw., at Fort Sully, S. Dak. 9th, 51, s., at Chicago, Ill. 20th 60, se., at Lexington, Ky.

LOCAL STORMS.

1st.—A heavy thunder, rain, and hail storm moved southeast over Fredericksburgh, Va., at 5 p. m. A heavy hail storm injured trees, etc., at Lebanon, Mo.

2d.—A severe storm visited Paducah, Ky., between 5 and 6 p. m.; a number of persons were injured, many buildings were damaged by high wind, and the streets were flooded by heavy rain. A thunder-storm moved southeast over Cairo, Ill., at 5.20 p. m., 75th meridian time; heavy rain followed a shift of wind from s. to nw., when it blew a gale for 7 minutes, during 3 minutes of which time the wind reached 60 miles per hour; temperature fell from 74°.5 to 57°; another heavy thunder-storm moved southeast over Cairo in the evening. A hail storm injured fruit at Platte River, Mo. A flouring mill was struck by lightning and burned at Aullville, La Fayette Co., Mo. A very heavy rain storm occurred at Fayette, Mo, At 11 a. m., central time, a storm moved southeast about 5 miles west and 2 miles south of Goodrich, Kans., blowing down trees, houses, etc.; the storm had the appearance of a tornado, was funnel-shaped, and of a dirty, milky appearance, and seemed to rise and fall; when it reached the earth it moved everything,