

## 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 December, 1889:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
Boston, Mass.....	43.7	40.0	3.7	41.8	38.0
Canby, Fort, Wash.....	50.0	41.5	8.5	46.6	41.2
Cedar Keys, Fla.....	76.1	59.4	16.7	68.8	63.4
Charleston, S. C.....	61.3	53.1	8.2	57.1	60.0
Eastport, Me.....	45.5	40.8	4.7	43.0	28.4
Galveston, Tex. j.....	72.0	60.0	12.0	68.7	66.4
Key West, Fla.....	73.8	68.8	5.0	72.1	71.3
Nantucket, Mass.....	44.5	38.0	6.5	42.1	39.0
New York City.....	44.0	39.6	4.4	42.2	41.4
Portland, Oregon.....	46.0	37.5	8.5	41.7	38.6

The following table shows the comparative monthly mean air temperature and monthly mean water temperature, at the surface, for the month of December in 1889 and 1876, at Atlantic coast stations having water temperature records for those months. December, 1889, was generally the warmest, and December, 1876, the coldest December on record for the Atlantic states and the districts east of the Mississippi River:

Station.	Mean temperature of the air.		Mean temperature of water.		Excess of temperature in 1889 as compared with 1876.	
	1889.	1876.	1889.	1876.	Air.	Water.
	0	0	0	0	0	0
Eastport, Me.....	28.4	20.6	43.1	40.2	7.8	2.9
New York City.....	41.4	25.1	42.3	32.2	16.3	10.1
Charleston, S. C.....	60.0	43.4	57.2	46.7	16.6	10.5
Key West, Fla.....	71.3	66.1	72.2	66.5	5.2	5.7

## PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for December, 1889, as determined from the reports of nearly 1,800 stations, is exhibited on chart iii. In the table of miscellaneous meteorological 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 greatest monthly precipitation reported for December, 1889, was 29.36, at Upper Mattole, Humboldt Co., Cal. The precipitation exceeded twenty inches in the eastern Sacramento valley between the thirty-eight and fortieth parallels, and in areas along the coast of California north of the thirty-sixth parallel, and exceeded fifteen inches at and near Los Angeles, Cal. The destructive floods attending the unusually heavy rainfall in California are referred to under the heading "Floods." The monthly precipitation exceeded ten inches in central Arizona, where 12.38 fell at Strawberry; in east-central Nevada, where 11.12 was reported at Pioche; in southeastern Oregon, where 11.80 was reported at Bandon; and in extreme northwestern Washington, where 12.34 was reported at Neah Bay. East of the Rocky Mountains the greatest monthly precipitation was reported in limited areas in north-central and western New York, where it exceeded six inches. In areas in east-central Arkansas, western Florida, eastern Georgia, northern Indian Territory, central, south-central, and western Kansas, extreme northwestern Missouri, southeastern Nebraska, extreme southern South Carolina, central Virginia, and east-central Wyoming no precipitation was reported. Exclusive of the localities named where no precipitation was reported, less than one-half inch was noted in southeastern Alabama, southeastern Arizona, central and southeastern Colorado, west-central Illinois, southwestern Iowa, extreme southern Louisiana, southern Maryland, District of Columbia, northwestern Mississippi, central and north-central Montana, southern New Jersey, eastern and southern North Carolina, central and southwestern North Dakota, south and southeastern South Dakota, extreme southeastern Pennsylvania, western Tennessee, east-central Utah, eastern West Virginia, and north-central Wisconsin. The precipitation for December, 1889, was below the normal, except on the Pacific coast south of the forty-fourth parallel, over the western part of the plateau region, in eastern North and South Dakota, in the Lake region, and over northern New England, the lower Saint Lawrence valley, and northern New Brunswick, where the precipitation was in excess of the average for the month. The greatest

departures below the normal precipitation were noted on the North Carolina coast, where the deficiency was more than six inches at Hatteras, and at Pensacola, Fla., and on the extreme north Pacific coast, where the precipitation was more than five inches less than the December average. The deficiencies exceeded three inches in northwestern Washington, and south of a line traced from southern New Jersey south of west to extreme southern Missouri, and thence west of south to the central coast of Texas, except in southern Florida where they were less than two inches; and they were more than two inches along the coast of Nova Scotia. The greatest departures above the normal precipitation were noted on the south Pacific coast, where the rainfall exceeded the average for the month by more than twelve inches, whence the excesses diminished northward to the forty-fourth parallel, and eastward to New Mexico and Colorado. In the British Possessions east of the one hundred and twelfth meridian, and in eastern North and South Dakota, Minnesota, the Lake region, northern New England, and the lower Saint Lawrence valley the excesses in precipitation were less than one inch, except on the west Maine coast, in northwestern Minnesota, and extreme western Ontario, where they exceeded one inch, and in the lower Saint Lawrence valley, and on the coast of New Brunswick, where they were more than two inches.

Considered by districts the average percentages of the normal precipitation in districts where the precipitation was in excess of the normal were about as follows: New England, 145 per cent.; lower lake region, 112 per cent.; upper lake region, 122 per cent.; extreme northwest, 134 per cent.; southern plateau, 176 per cent.; middle plateau, 292 per cent.; northern plateau, 118 per cent.; middle Pacific coast, 228 per cent.; south Pacific coast, 420 per cent. In districts where the precipitation was deficient the percentages of the normal were about as follows: middle Atlantic states, 27 per cent.; south Atlantic states and Florida Peninsula, 5 per cent.; east Gulf states, 11 per cent.; west Gulf states, 13 per cent.; Rio Grande Valley, 6 per cent.; Ohio Valley and Tennessee, 46 per cent.; upper Mississippi valley, 62 per cent.; Missouri Valley, 95 per cent.; northeastern slope of the Rocky Mountains, 49 per cent.; middle-eastern slope of the Rocky Mountains, 11 per cent.; southeastern slope of the Rocky Mountains, less than 1 per cent.; and north Pacific coast, 71 per cent. From the above it will be seen that the greatest average excess of precipitation occurred on the south Pacific coast, where more than four times the usual amount of rain fell, and on the middle Pacific coast and in the middle plateau region, where the precipitation was more than double the usual amount for December. The greatest deficiencies are shown on the southeastern slope of the Rocky Mountains, where less

than 1 per cent. of the usual amount of precipitation for the month was reported; and it is shown that in all districts east of the Rocky Mountains and south of the Lake region the precipitation for the month was less than one-half the usual amount for December, except in the upper Mississippi and Missouri valleys.

A summary of precipitation for the several districts for 1889 shows that in New England the total average amount for the year was 49.26, or 3.21 more than the average annual precipitation. In the middle Atlantic states the average amount, 56.68, was 11.85 in excess of the normal. South Atlantic states, 52.63, deficiency, 4.30. Florida Peninsula, 48.01, excess, 1.26. East Gulf states, 48.78, deficiency, 11.44. West Gulf states, 44.42, deficiency, 1.02. Rio Grande Valley, 28.61, deficiency, 1.85. Ohio valley and Tennessee, 39.77, deficiency, 7.55. Lower lake region, 31.74, deficiency, 3.83. Upper lake region, 30.07, deficiency, 4.21. Extreme northwest, 12.92, deficiency, 6.26. Upper Mississippi valley, 29.77, deficiency, 7.12. Missouri Valley, 24.38, deficiency, 3.62. Northern slope, 12.51, deficiency, 3.09. Middle slope, 23.83, excess, 1.46. Southern slope, 23.02, deficiency, 2.11. Southern plateau, 11.58, deficiency, 1.19. Middle plateau, 10.46, deficiency, 1.34. Northern plateau, 14.50, deficiency, 3.70. North Pacific coast, 45.74, deficiency, 13.30. Middle Pacific coast, 32.44, excess, 9.87. South Pacific coast, 25.68, excess, 10.52. The most marked average excesses in precipitation for the year are noted for the south Pacific coast, where the precipitation was about two-thirds, on the middle Pacific coast about one-third, and in the middle Atlantic states about one-fourth greater than the average yearly amount of precipitation; and the most notable deficiencies occurred in the extreme northwest, where about two-thirds, and on the north Pacific coast and in the west Gulf states where about four-fifths of the usual annual rainfall fell.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for December 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 December, 1889; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for December during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of Dec.	(2) Length of record.	(3) Total for Dec., 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for December.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Arkansas.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Lead Hill.....	Boone.....	3.93	8	1.15	-2.78	11.37	1884	1.15	1889
<i>California.</i>									
Sacramento.....	Sacramento..	4.60	39	8.59	+3.99	13.41	1852	0.00	'50, '76
<i>Colorado.</i>									
Fort Lyon.....	Bent.....	0.21	17			1.20	1883	0.00	1868
<i>Connecticut.</i>									
Middletown.....	Middlesex...	3.78	29	2.79	-0.99	7.91	1878	1.20	1875
<i>Florida.</i>									
Merritt's Island..	Brevard.....	2.69	11	0.00	-2.69	8.55	1888	0.00	1889
<i>Georgia.</i>									
Forsyth.....	Monroe.....	4.76	15	0.79	-3.97	7.56	1887	0.79	1889
<i>Illinois.</i>									
Peoria.....	Peoria.....	2.47	34	1.33	-1.14	7.15	1873	0.28	1876
Riley.....	McHenry.....	2.07	38	1.44	-0.63	5.67	1876	0.28	1857
<i>Indiana.</i>									
Logansport.....	Cass.....	3.44	13	2.50	-0.94	5.99	1881	2.00	1888
Vevay.....	Switzerland..	3.91	24	2.81	-1.10	7.60	1879	1.16	1888
<i>Iowa.</i>									
Cresco.....	Howard.....	1.37	18	1.33	-0.04	2.83	1879	0.30	1874
Monticello.....	Jones.....	2.43	34	1.55	-0.88	6.99	1856	0.65	1867
Logan.....	Harrison.....	1.43	19	0.14	-1.29	3.10	1868	0.14	1889
<i>Kansas.</i>									
Lawrence.....	Douglas.....	1.71	25	0.08	-1.63	4.39	1873	0.08	1889
Wellington.....	Sumner.....	1.08	10	T.	-1.08	3.14	1884	T.	1889
<i>Louisiana.</i>									
Grand Coteau.....	St. Landry..	6.16	6	3.75	-2.41	14.43	1884	2.70	1885
<i>Maine.</i>									
Orono.....	Penobscot...	3.97	19	3.40	-0.57	7.92	1878	1.50	1875
<i>Maryland.</i>									
Cumberland.....	Allegany.....	2.14	18	1.63	-0.51	4.50	1881	0.70	1870

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of Dec.	(2) Length of record.	(3) Total for Dec., 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for December.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Massachusetts.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Amherst.....	Hampshire..	3.57	54	2.92	-0.65	7.09	1839	0.96	1838
Newburyport.....	Essex.....	3.89	11	3.52	-0.37	5.80	1886	2.45	1880
Somerset.....	Bristol.....	3.50	17	2.37	-1.13	5.67	1884	0.82	1875
<i>Michigan.</i>									
Kalamazoo.....	Kalamazoo..	3.06	13	2.30	-0.76	7.14	1884	1.65	1880
Thornville.....	Lapeer.....	2.48	12	3.09	+0.61	5.25	1879	0.67	1880
<i>Minnesota.</i>									
Minneapolis.....	Hennepin....	1.58	22	1.26	-0.32	5.30	1873	0.33	1866
<i>Montana.</i>									
Fort Shaw.....	Lewis & Clarke	0.54	19	0.22	-0.32	2.47	1884	0.00	'75, '77
<i>New Hampshire.</i>									
Hanover.....	Grafton.....	2.51	47	2.85	+0.34	5.05	1839	0.78	1875
<i>New Jersey.</i>									
Moorestown.....	Burlington..	3.21	26	1.01		5.77	1865	0.90	1877
South Orange.....	Essex.....	3.89	19	2.47	-1.42	7.07	1878	0.91	1877
<i>New York.</i>									
Cooperstown.....	Otsego.....	2.58	35	2.68	+0.10	6.02	1851	0.97	1877
Palermo.....	Oswego.....	3.89	35	2.23	-1.66	7.95	1878	1.60	1874
<i>North Carolina.</i>									
Lenoir.....	Caldwell....	4.00	15	0.50	-3.50	8.70	1877	0.50	1889
<i>Ohio.</i>									
N. Lewisburgh..	Champaign..	2.94	17	3.00	+0.06	5.45	1873	1.50	1882
Wauseon.....	Fulton.....	2.36	17	2.87	+0.51	4.32	1879	0.41	1874
<i>Oregon.</i>									
Albany.....	Linn.....	8.82	10	6.58	-2.24	14.21	1887	4.30	1888
Eola.....	Polk.....	5.83	20	5.23	-0.60	11.50	1880	0.84	1876
<i>Pennsylvania.</i>									
Dyberry.....	Wayne.....	2.63	23	2.91	+0.28	5.02	1878	1.20	1874
Grampian Hills..	Clearfield...	3.64	19	4.67	+1.03	5.12	1872	1.99	1871
Wellsborough...	Tioga.....	4.80	10	3.93	-0.87	9.57	1881	1.27	1883
<i>South Carolina.</i>									
Statesburgh.....	Sumter.....	3.47	8	0.75	-2.72	5.87	1884	0.75	1889
<i>Tennessee.</i>									
Austin.....	Wilson.....	4.45	19	1.22	-3.23	10.20	1879	0.85	1882
Milan.....	Gibson.....	3.64	6	0.71	-2.93	7.25	1884	0.71	1889
<i>Texas.</i>									
New Ulm.....	Austin.....	4.61	16	0.37	-4.24	16.43	1875	0.37	1889
<i>Vermont.</i>									
Strafford.....	Orange.....	3.28	16	3.00	-0.28	5.90	1878	0.15	1875
<i>Virginia.</i>									
Birdsneat.....	Northampton	3.78	20	0.55	-3.23	6.75	1880	0.55	1889
<i>Wisconsin.</i>									
Madison.....	Dane.....	2.03	17	2.33	+0.30	5.73	1884	0.45	1874
<i>Washington.</i>									
Fort Townsend..	Jefferson....	2.61	15	2.07	-0.54	5.10	1886	1.14	1879

The above table shows that at stations in Arkansas, Florida, Georgia, Iowa, Kansas, North Carolina, South Carolina, Tennessee, Texas, and Virginia the precipitation for the current month was the least ever reported for December during the respective periods of observation.

EXCESSIVE PRECIPITATION.

For December, 1889, monthly precipitation to exceed twenty inches was reported at seven stations in California; and at twenty-two stations in that state, not including those where twenty inches or more were noted, the precipitation exceeded ten inches. Precipitation to exceed ten inches was also reported at three stations in Arizona; at two stations in Oregon; and at one station each in Nevada and Washington. The greatest monthly precipitation, 29.36, was reported at Upper Mattole, Humboldt Co., Cal.

In December of preceding years precipitation to equal or exceed ten inches has been reported most frequently in Oregon, where it has been noted for twenty-five years; in California for twenty-three years; in Washington for fourteen years; in Mississippi for eleven years; in Florida, Louisiana, North Carolina, and Texas for from five to ten years, inclusive; and in Alabama, Arkansas, Georgia, Indiana, Kentucky, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, Ohio, Tennessee, and Virginia for from one to five years, inclusive. In states and territories other than those named precipitation to equal or exceed ten inches has not been reported for December of preceding years. Among the heavier rainfalls reported for December of preceding years are: in California, 20.60, at Fort Miller, in 1852; 28.65, at Fort Gaston, in 1864; 20.55, at Fort Gaston, in 1866; 24.67, at Camp Wright, in 1866; 30.35, at Meadow Valley, in 1866; 22.19, at Fort Gaston, in 1867; 29.03, at Camp Wright, in 1867; 41.95, at Nevada City, in 1867; 23.76, at Shingle Springs, in 1867;

28.39, at Cisco, in 1871; 20.42, at Healdsburg, in 1871; 41.87, at Pilarcitos, in 1871; 51.05, at San Andreas, in 1871; 28.88, at Summit, in 1871; 28.91, at Mount Saint Helena, in 1880; 24.34, at Mumford Hill, in 1880; 32.07, at Reed's Camp, in 1880; 21.85, at Vacaville, in 1880; 31.20, at Emigrant Gap, in 1884; 25.05, at Cisco, in 1884; 23.60, at Colfax, in 1884; 33.84, at Mount Hamilton, in 1884; 20.96, at San Rafael, in 1884; 26.26, at Crescent City, in 1885; and 22.69, at Grass Valley, in 1888. In Oregon, 20.00, at Port Orford, in 1853; 20.00, at Port Orford, in 1855; 22.78, at Astoria, in 1857; 22.59, at Block House, in 1858; 21.69, at Fort Stevens, in 1867; 24.73, at Astoria, in 1867; 21.27, at Fort Stevens, in 1880; 20.14, at Portland, in 1882. In Washington, 27.30, at Neah Bay, in 1863; 20.00, at Cathlamet, in 1875; 23.22, at Neah Bay, in 1880; 21.61, at Pysht, in 1886; 30.70, at Neah Bay, in 1886; 25.84, at Tatoosh Island, in 1886; 22.57, at Neah Bay, in 1887. In Texas, 23.03, at Fort Clark, in 1857. In Louisiana, 20.39, at Point Pleasant, in 1884. In Kentucky, 20.12, at Paducah, in 1879? Exclusive of the instances and years cited, precipitation to equal or exceed fifteen inches in December has been reported in Washington for seven years; in Oregon for nine years; in California for five years; in Texas for two years; and in Alabama, Arkansas, Florida, Louisiana, New Hampshire, New York, and North Carolina for one year.

Precipitation to equal or exceed 2.50 inches in twenty-four hours was reported at thirteen stations in California, on the 8th, 10th to 12th, 15th, 20th, 22d, 24th, and 25th; at two stations in Indiana, on the 10-11th; at one station in Alabama, on the 29-30th; and at one station each in Arizona and Utah, on the 6-7th. Among the heavier rainfalls reported for this period were: 4.22 at Upper Mattole, Cal., on the 10th; 3.50 at Los Gatos, Cal., on the 8th; 3.40 at Colegrove, Cal., on the 24th; 4.30, at Los Angeles, Cal., on the 11-12th; 3.75 at Livingston, Ala., on the 29-30th; and 3.08 at Shelbyville, Ind., on the 10-11th.

In December of preceding years precipitation to equal or exceed 2.50 inches in twenty-four hours has been reported most frequently in California and Texas, where it has been noted for twelve years; in Georgia and North Carolina for eleven years; in Florida and Louisiana for ten years; in Alabama, Illinois, Indiana, Kansas, Maryland, Mississippi, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Virginia, and Washington for from five to nine years, inclusive; and in Arizona, Arkansas, Connecticut, Delaware, District of Columbia, Indian Territory, Iowa, Kentucky, Maine, Massachusetts, Missouri, New Hampshire, New Jersey, New York, Vermont, and Michigan for from one to four years, inclusive. In states and territories other than those named, precipitation to equal or exceed 2.50 inches in twenty-four hours has not been reported for December of preceding years. Among the heavier rainfalls reported for this period in December of preceding years, are: 13.50, at Point Pleasant, La., 19th, 1882; 6.60, at Fort Gaston, Cal., 24-25th, 1883; 6.65, on the 2-3d, and 9.04, on the 23-24th, at Mount Saint Helena, Cal., 1880; 12.15, at Monroe, La., 29-30th, 1884; 6.00, at Fayetteville, N. C., 9-10th, and 20th-21st, 1878; 6.33, at Micco, Fla., 24th, 1888; 8.47, at Yaquina Lighthouse, Oregon, 5-6th, 1887; at Clarksville, Tex., 8.50, 29-30th, 1874, and 8.50, 28-29th, 1876; 6.74, at Lynchburgh, Va., 21st, 1884. Exclusive of the instances and years cited, rainfall to equal or exceed five inches for the period given has been reported in Florida for two years, and in Alabama, California, Illinois, Louisiana, Missouri, New York, North Carolina, and Texas for one year.

The only reports of precipitation to equal or exceed one inch in one hour were: one inch in twenty minutes, at Winnebago, Ill., on the 21st, and 2.33 in one hour and fifty minutes at Pasadena, Cal., on the 24th. In December of preceding years precipitation to equal or exceed the rate of one inch in one hour has been reported most frequently in Texas, where it has been noted for five years; in California, Florida, Indiana, Pennsylvania, and Tennessee for two years; and in Alabama, Arkansas, Illinois, Kansas, Louisiana, Massachusetts, Michi-

gan, and Mississippi for one year. In states and territories other than those named precipitation to equal or exceed one inch in one hour has not been reported for December of preceding years. Among the heavier rainfalls reported for this period in December of preceding years are: 1.20, in twenty minutes, at Wellsborough, Pa., 7th, 1884; 1.36, in twenty minutes, at Clarksville, Tex., and 1.36 in twenty minutes, at Galveston, Tex., 28th, 1871.

Table of excessive precipitation, December, 1889.

State and station.	Monthly rainfall in inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Livingston (1) <i>Alabama.</i>	Inches.	Inches.	29-30	Inches	h. m.	
Ash Creek <i>Arizona.</i>	10.22	3.75				
Fort Mojave	11.27	2.70	6-7			
Strawberry	12.38					
Alcatraz Island <i>California.</i>	13.04					
American Hill	21.22	3.00	25			
Anderson	18.24	2.69	12			
Do.		2.70	25			
Angel Island	11.28					
Benecia Barracks	11.18					
Berkeley	12.59					
Colegrove	15.40	3.85	11-12			
Do.		3.40	24			
Crescent City	20.58					
Eureka	12.88					
Fendall	15.13					
Fort Gaston	13.94					
Fort Mason	14.08					
Georgetown	22.94	2.96	20			
Grass Valley	21.08					
Hydeville	12.66					
Iowa Hill	21.04					
Jolon	11.42					
Julian	13.76	2.83	22			
Los Angeles	15.80	4.30	11-12			
Do.		2.72	24-25			
Los Gatos (1)	20.73	3.50	8			
Do.		3.30	24			
Mendocino	17.21					
National City		3.23				
Oakland (1)	13.38			2.33	1 50	24
Pasadena	17.05					
Presidio of San Francisco	13.97					
San Francisco	13.81					
Santa Barbara (1)	10.64					
Santa Clara	20.78					
Steeles	11.60					
Upper Mattole	29.36	4.22	10			
Winnebago <i>Illinois.</i>				1.00	0 20	21
Marengo <i>Indiana.</i>		2.75	10			
Shelbyville		3.08	10-11			
Pioche <i>Nevada.</i>	11.12					
Bandon <i>Oregon.</i>	11.80					
Tillamook	10.24					
Losee <i>Utah.</i>		2.70	6-7			
Neah Bay <i>Washington.</i>	12.34					
Punta Banda <i>Mexico.</i>		3.50	15			

Excessive precipitation data received too late for publication in November, 1889, Review.

State and station.	Monthly rainfall in inches, or more.	Amt.	Day.	Amt.	Time.	Day.
Andersonville <i>Georgia.</i>				2.00	2.00	15

Received too late for general discussion of weather for December, 1889.

State and station.	Monthly rainfall in inches, or more.	Amt.	Day.	Amt.	Time.	Day.
Alcade <i>California.</i>	12.50					
Almaden	14.11					
Anaheim	10.95					
Aptos	18.29					
Auburn	11.94					
Beaumont	11.09					
Castroville	11.81					
Calistoga	17.67					
Cisco	25.57					
Colfax	21.85					
Corning	10.11					
Delta	25.83					
Downey	10.44					
Dunsmuir	20.58					
El Dorado	14.94					
El Verano	14.85					
Emigrant Gap	20.85					
Felton	34.95					

Reports received too late, etc.—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>California—Continued.</i>						
Florence	Inches. 13.14					
Folsom	11.25					
Fruto	10.38					
Gilroy	10.21					
Glen Ellen	19.25					
Laurel	31.79					
Los Gatos (2)	19.94					
Martinez	11.80					
Menlo Park	10.85					
Monterey	11.54					
Mount Hamilton	13.19					
Napa	12.23					
Newark	11.96					
Newhall	15.70					
Niles	12.41					
Oakland (2)	12.36					
Ontario	12.54					
Pajaro	14.12					
Petaluma	10.12					
Placerville	19.07					
Pleasanton	10.39					
Pomona	11.53					
Puente	15.26					
Redding	17.66					
Rumsey	12.07					
San Fernando	14.40					
San Gabriel	14.32					
San José	10.55					
San Mateo	12.44					
Santa Ana	12.09					
Santa Barbara (2)	10.33					
Santa Cruz	20.38					
Santa Margarita	15.68					
Santa Paula	16.45					
Santa Rosa	15.94					
Shingle Springs	17.35					
Sims	19.85					
South Side	10.78					
Suisun City	10.18					
Summit	18.50					
Tehama	11.45					
Templeton	10.68					
Tropico	16.12					
Vacaville (2)	12.48					
Vina	12.16					
Winters	12.74					
<i>Oregon.</i>						
Gardiner	12.72					

MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfalls during December, 1889, 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.		10 min.		1 hour.	
	Inch.	Date.	Inch.	Date.	Inch.	Date.
Bismarck, N. Dak.*						
Boston, Mass.	0.05	11, 19	0.08	11, 25	0.13	11
Buffalo, N. Y.	0.03	22	0.05	22	0.15	20
Cincinnati, Ohio	0.15	22	0.25	22	0.45	22
Chicago, Ill.*						
Detroit, Mich.	0.05	21	0.10	21	0.35	21
Galveston, Tex.			0.01	30	0.06	30
Jupiter, Fla.*			0.05	20	0.10	3
Marquette, Mich.*						
New York City			0.03	8	0.07	8
New Orleans, La.						
Norfolk, Va.			0.05	30	0.10	30
Savannah, Ga. †					†	
San Francisco, Cal.	0.15	21	0.19	21	0.38	21
Saint Louis, Mo.*						
Washington City †						

\* Record incomplete on account of snow and other causes. † Total for month. ‡ Not sufficient precipitation for gauge to register.

SNOW (snowfall in inches and tenths.)

The greatest depth of snowfall reported for the month was eighty-one and one-half inches, at Tuscarora, in the east north-central part of Nevada. At Susanville, northeastern California, sixty-four inches were reported. The monthly snowfall equalled or exceeded sixty inches in extreme northwestern Wyoming; forty inches in extreme northern Idaho; thirty inches in southwestern Colorado, extreme northern Michigan,

and east-central Washington; twenty inches in northwestern Minnesota, extreme western Montana, southwestern Utah, and north-central Wisconsin; ten inches in western Maine, north-eastern Massachusetts, southern and central New Hampshire and Vermont, west-central New Jersey, central and east-central New York, eastern Oregon, northeastern South Dakota, north-central Iowa, and east-central Arizona; five inches in western and northwestern Connecticut, and northeastern Pennsylvania; one inch in southeastern Virginia; and less than one inch in northern Illinois, northern Ohio, and eastern Tennessee. On the Atlantic coast measurable snow, trace, fell as far south as southern Virginia; in the central valleys no snow fell south of the fortieth parallel, save trace in eastern Tennessee; in the Rocky Mountain and plateau regions as far south as extreme southeastern Arizona; and in the Pacific coast states as far south as the thirty-eighth parallel in California east of the Sacramento River.

Snowfalls of ten inches or more were reported as follows, and in states and territories where the maximum depth was below that amount, the station reporting the greatest is given: *Arizona*.—Cooley Springs, 11. *California*.—Susanville, 64; Fort Bidwell, 35.4; Georgetown, 33.5; American Hill, 12.5. *Colorado*.—Fort Lewis, 36.2; Fraser, 18.8. *Connecticut*.—Falls Village, 8. *Idaho*.—Soda Springs, 48.5; Fort Sherman, 46.5; Kootenai, 27; Boise City, 10.6. *Illinois*.—Chicago, Hilton, and Oneida, trace. *Indiana*.—La Fayette, trace. *Iowa*.—Eagle Grove, 10. *Maine*.—Lewiston, 11. *Massachusetts*.—Salem, 10. *Michigan*.—Calumet, 30; Sault de Ste. Marie, 27.4; Marquette, 23.7; Lathrop, 17.5; Mio, 17; Grayling, 15.5; Fort Brady, 14.6; West Branch, 13.5; Crystal Falls and Roscommon, 13; Harrisville, 12.5; Ivan, 11. *Minnesota*.—Saint Vincent, 23.6; Duluth, 13.7; Morris, 12; Ortonville, 11. *Montana*.—Sheldon, 20; Virginia City, 17. *Nebraska*.—Alliance and Fort Robinson, 8. *Nevada*.—Tuscarora, 81.5; Belmont, 48; Lewers' Ranch, 43.1; Genoa, 39.6; Carson City a, 35.2; Verdi, 34; Carson City b, 31.4; Virginia City, 29.5; Mill City, 29; Crane's Ranch, 28; Austin and Winnemucca, 26; Elko, 25; Reno, 24.5; Pioch, 22.2; Downeyville, 22; Ely, 18.5; Eureka, 13.4; Beowawe, 12.5; Candelaria, 11.5; Palisade, 11.2. *New Hampshire*.—West Milan, 18; Berlin Mills, 16; Bristol, 14; Belmont, Lake Village, Plymouth and Wiers Bridge, 13; North Conway, 12; Hanover and Manchester a, 11; Manchester b, 10.8; Antrim and Manchester c, 10. *New Jersey*.—Trenton, 10. *New Mexico*.—Chama, 32. *New York*.—Constableville and Queensbury, 10. *North Carolina*.—Soapstone Mount, trace. *North Dakota*.—Fort Pembina, 10.2. *Ohio*.—Cleveland, 0.3. *Oregon*.—Silver Lake, 16.5; Baker City, 11.2. *Pennsylvania*.—Dyberry and Salem Corners, 7. *Rhode Island*.—Pawtucket, 6. *South Dakota*.—Huron, 14.4; De Smet and Spearfish, 12; Wolsey, 11. *Tennessee*.—Jacksboro, trace. *Utah*.—Mount Carmel, 23; Salt Lake City, 15; Levau, 12.8; Mount Pleasant, 11.5. *Vermont*.—Chelsea, 12; Jacksonville and Strafford, 10. *Virginia*.—Mossingford, 1. *Washington*.—Fort Spokane, 36; Spokane Falls, 31.5; Blakeley, 13.5; Walla Walla, 12.1. *Wisconsin*.—Butternut and Grantsburgh, 20; Summit Lake, 15; Green Bay, 13.9; Phillips, 13; Embarras, 11.8; Medford, 11.5; Chippewa Falls, 10. *Wyoming*.—Camp Sheridan, 60.6; Evanston, 34.8; Fort Bridger, 12.

DEPTH OF SNOW ON GROUND AT CLOSE OF MONTH.

Chart iv shows the depth of snow reported on the ground at the close of the month. In New England snow was reported on the ground in central New Hampshire and central Vermont, where in New Hampshire six inches were reported in the east-central part of the state. Trace, only, was reported in New York, west of the seventy-fifth meridian. The southern limit of trace of snow on the ground west of the eightieth meridian is shown by a line traced from central lower Michigan, south of west to central Colorado, thence southward to central New Mexico, thence west-northwest to the west Sacramento valley in about latitude north thirty-eight degrees, and east of a line continued thence northward over north-central California, and

western Oregon and Washington. In the upper lake region eighteen inches were reported in extreme northern Michigan and north-central Wisconsin; in the Red River of the North valley, sixteen inches at Saint Vincent, Minn.; in South Dakota and northern Nebraska, two to eight inches; in west-central and northwestern Colorado, eight to twenty inches; in the middle and northern plateau regions the amount varied from over forty inches in northeastern Nevada to thirty inches in southeastern Wyoming, to sixteen inches in eastern Washington, to fifteen inches near Carson City, Nev., to twelve inches in southeastern Utah, and in northeastern California a depth of twenty-one inches was reported.

#### HAIL.

Hail was reported during the month as follows: 4th, Cal., Nev. 5th, Md., N. Y., Pa. 6th, N. Y. 8th, Cal. 9th, Wash. 10th, Ill., Ind., Iowa, Kans., Ky., Mich., Mo., N. Y., Ohio, Wis. 11th, and 12th, Cal. 14th, Ind., N. J., N. Y., Ohio,

Pa. 16th, N. C. 18th, Cal., Wash. 19th, Nebr., Oregon, Wash., Wis. 20th, Cal., Oregon. 21st, Cal., Ill., Iowa, Kans., Minn., Mo., Tenn. 22d, Cal., Mass., N. Y. 23d, Mass., Ohio. 24th, Mass., N. Y. 25th, Cal., Mass. 26th, N. Y., Pa. 28th, Iowa, Nebr., S. Dak. 29th, Iowa, Mass. 30th, Md., Ohio, Va. 31st, Iowa, Ohio, Va.

#### SLEET.

Sleet was reported as follows: 1st, Wis. 3d, N. Dak., Pa., S. Dak. 4th, Minn., Wis. 5th, Mich., N. J., N. Y., Ohio, Pa. 6th, Conn., N. J., Vt. 8th, N. Dak., Utah. 9th, N. Dak. 10th, Mass., N. Y., Wis. 11th, Utah, Vt. 13th, Vt. 14th, N. J., Pa., Vt., Wis. 15th, Pa., Vt. 16th, Kans., Minn., N. Dak. 19th, Ill., Iowa, Nebr., Utah, Wis. 20th, Wis. 21st, Iowa, Wash., Wis. 22d, N. H., N. Y., Vt. 23d, Mass. 24th, Conn., Mass. 26th, Conn., N. Y., Vt., Wash. 27th, Utah. 28th, Colo., Minn., Nebr., S. Dak., Wis. 29th, Colo., Iowa, Minn., Oregon, Pa., Tenn., Vt., Wis. 31st, Ariz., Iowa, N. C.

#### WINDS.

The prevailing winds during December, 1889, are shown on chart ii by arrows flying with the wind. In New England, the prevailing winds were from the northwest to west; in the middle Atlantic and east and west Gulf states, the upper Mississippi and Missouri valleys, and over the northern plateau region, southeast to southwest; in the south Atlantic states and on the northeastern slope of the Rocky Mountains, west to southwest; in Florida, northeast to northwest; in the Rio Grande Valley, and on the middle Pacific coast, southeast; in the Ohio valley and Tennessee, and on the southeastern slope of the Rocky Mountains, south to southwest; in the lower lake region, southwest; in the upper lake region, and over the middle plateau region, south to west; in the extreme northwest, north to northwest; on the middle-eastern slope of the Rocky Mountains, south to northwest; on the north Pacific coast, south to southeast; on the south Pacific coast, east to northeast; and over the southern plateau, variable.

#### HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour were reported at regular stations of the Signal Service as follows: 2d, 51, sw., at Wood's Holl, Mass. 6th, 52, sw., at Whipple

Barracks (Prescott), Ariz. 7th, 50, sw., at Whipple Barracks (Prescott), Ariz. 10th, 50, sw., at Lexington, Ky. 14th, 60, ne., at Block Island, R. I. 15th, 54, s., at Whipple Barracks (Prescott), Ariz. 16th, 56, se., at Fort Canby, Wash. 19th, 60, se., at Fort Canby, Wash. 20th, 56, w., at Buffalo, N. Y. 22d, 50, sw., at Port Huron, Mich.; 72, w., at Buffalo, N. Y.; 54, w., at Rochester, N. Y.; and 56, w., at Grand Haven, Mich. 26th, 54, w., at Boston, Mass.; 54, nw., at Block Island, R. I.; 65, w., at Buffalo, N. Y.; 57, w., at Port Huron, Mich.; 54, w., at Harrisburg, Pa.; and 52, w., at Oswego, N. Y. 27th, 60, nw., at Wood's Holl, Mass.; and 50, se., at Fort Canby, Wash. 28th, 60, s.; at Dodge City, Kans. 29th, 66, w., at Buffalo, N. Y.; 51, sw., at Grand Haven, Mich.; and 67, sw., at Port Huron, Mich. 31st, 54, s., at Dodge City, Kans.

#### LOCAL STORMS.

Heavy thunder-storms were reported near Cambridge, Ind., on the 11th, and at Buffalo, N. Y., on the 22d. Destructive gales were reported at Jeannette, Pa., on the 11th; over the lower lake region on the 22d; over New England and the lake region on the 26th; on the middle Atlantic and New England coasts on the 27th; at Fort Sully, South Dakota, on the 28th; and at Port Huron, Mich., on the 29th.

#### INLAND NAVIGATION.

##### CLOSING OF NAVIGATION.

*Lake Michigan.*—Grand Haven, Mich.: navigation closed for the season on the 1st, but steamers will run between this port and Milwaukee throughout the winter. Chicago, Ill.: navigation closed for the season on the 15th.

*Green Bay.*—Green Bay, Wis.: navigation was practically closed for the season on the first.

*Lake Superior.*—Duluth, Minn.: navigation closed for the season on the 4th.

*Kennebec River.*—Augusta, Me.: the river froze over on the night of the 3d-4th from this city to Merry Meeting Bay, and reports from Gardiner, Me., stated that the river also froze over at that point.

*Saint Olair River.*—Port Huron, Mich.: the last boats of the season, en route from Chicago to Buffalo, passed this port on the 11th.

*Saint Mary's River.*—Sault de Ste. Marie, Mich.: navigation closed for the season on the 4th.

*Missouri River.*—Yankton, S. Dak.: navigation opened on the 8th. The river froze over on the 28th, closing navigation.

*Mississippi River.*—Saint Paul, Minn.: the ice-gorge in the river disappeared early in the morning of the 8th, and the

channel was clear as far as the eye could reach. A small gorge formed during the night of the 19-20th, and another during the night of the 26-27th. Davenport, Iowa: owing to an ice gorge which formed above this place, the stage of the water on the 1st and 2d, 0.2 and 0.3, respectively, below low-water mark, was the lowest on record, the former lowest mark being zero, in 1878. La Crosse, Wis.: the river was nearly clear of ice on the 2d, and the ferry boat resumed her trips; floating ice 25th to 27th. The ferry boat stopped running on the 29th. The river was frozen over on the 30th, on which date the water was reported the lowest ever known.

#### FLOODS.

Heavy and continuous rains caused destructive floods in California and parts of Nevada and Arizona, and heavy rain caused the rivers at Johnstown, Pa., to rise to a dangerous height on the 14th. On the 12th the Sacramento River at Sacramento, Cal., was the highest ever known, the gauge reading being twenty-six feet eleven and one-half inches; the highest previous reading was twenty-six and six-tenths feet, in February, 1881. The levee opposite Sacramento broke, flooding a great part of Yolo county. Colusa county sustained greater damage than any of the surrounding sections,