

119; south Atlantic, 120; Florida Peninsula, 125; Ohio Valley and Tennessee, 196; lower Lake, 175; upper Mississippi, 147; Missouri Valley, 112; northern Slope, 136; middle Slope, 146; southern Slope, 222; southern Plateau, 190; middle Plateau, 292; northern Plateau, 120.

Normal: South Pacific, 100.

Below the normal: East Gulf, 92; west Gulf, 61; upper Lake, 93; North Dakota, 42; north Pacific, 3; middle Pacific, 9.

The years of greatest and least precipitation for July are given in the REVIEW for July, 1890. The precipitation for the current month was the greatest on record at: Tampa, 12.30; Parkersburg, 11.46; Columbia, S. C., 10.89; Concordia, 9.27; Springfield, Ill., 8.15; Toledo, 6.65; Cheyenne, 6.35; Northfield, 5.99; Nantucket, 4.12; Lander, 3.00; Carson City, 0.63; Fresno, 0.07. It was the least on record at: Meridian, 1.12; Vicksburg, 1.09; Sault Ste. Marie, 0.96; Little Rock, 0.86; Fort Smith, 0.72; Neah Bay, 0.08; Astoria, 0.01; Port Angeles and Fort Canby, 0.00.

The total accumulated monthly departures from normal precipitation from January 1 to the end of the current month are given in the second column of the following table; the third column gives the ratio of the current accumulated precipitation to its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
Florida Peninsula	+ 1.50	106	New England	- 3.40	87
Lower Lake	+ 2.10	110	Middle Atlantic	- 0.10	100
North Dakota	+ 1.40	111	South Atlantic	- 4.00	87
Upper Mississippi	+ 1.00	105	East Gulf	- 5.00	86
Missouri Valley	+ 0.70	103	West Gulf	- 7.40	72
Northern Slope	+ 0.30	102	Ohio Valley and Tenn.	- 2.80	91
Southern Plateau	+ 0.50	112	Upper Lakes	- 2.60	86
Middle Plateau	+ 2.20	128	Middle Slope	- 1.30	91
North Pacific	+ 4.20	112	Abilene (southern Slope) ..	- 4.50	70
Middle Pacific	+ 2.60	114	Northern Plateau	- 0.70	74
			South Pacific	- 1.90	74

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 22, 31. California, 20, 24, 27, 28. Colorado, 8, 9, 10, 13, 15, 17, 19, 21, 24, 25, 27, 28, 30. Connecticut, 13. Georgia, 18, 31. Idaho, 1, 12, 27, 29. Illinois, 21, 25, 26. Indiana, 3, 23, 28, 29, 30. Iowa, 21, 26, 27, 31. Kansas, 9, 28. Kentucky, 2, 4, 28, 30. Maryland, 27, 28, 29. Massachusetts, 3, 29. Michigan, 4. Minnesota, 2, 11, 12, 14, 19. Missouri, 4, 15, 31. Montana, 1, 2, 26, 29. Nebraska, 26, 28, 31. Nevada, 8, 11, 21, 23, 25, 29, 30. New Jersey, 30. New Mexico, 10, 28. New York, 3. North Dakota, 12, 17, 28. Ohio, 2, 6, 14, 27, 28, 30. Oregon, 11. Pennsylvania, 13, 23. South Dakota, 10, 14, 18, 25, 26, 28, 29. Tennessee, 2. Texas, 4, 6, 16. Utah, 13 to 17, 22, 26. Virginia, 28. West Virginia, 29. Wisconsin, 3, 14, 26, 29. Wyoming, 21.

WIND.

The prevailing winds for July, 1896, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The resultant winds, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

HIGH WINDS.

Maximum wind velocities of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	14	56	w.	Pensacola, Fla	27	53	n.
Cleveland, Ohio	25	56	w.	Philadelphia, Pa	27	53	n.
Kittyhawk, N. C.	16	54	w.	Sioux City, Iowa	26	52	nw.
New York, N. Y.	27	50	nw.				

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 17 regular stations of the Weather Bureau by its photographic, and at 24 by its thermal effects. At one station records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric sheets show seventy-fifth meridian time; for convenience the results are all given in Table XI for each hour of local mean time.

Photographic and thermometric registers give the duration of that intensity of sunshine which suffices to make a record, and, therefore, they generally fail to record for a short time after sunrise and before sunset, because, even in a cloudless sky, the solar rays are then too feeble to affect the self-registers. If, therefore, such records are to be used for determining the amount of cloudiness, they must be supplemented by special observations of the sky near the sun at these times. The duration of clear sky thus specially determined constitutes the so-called twilight correction (more properly a low-sun correction), and when this has been applied, as has been done in preparing Table XI, there results a complete record of the clearness of the sky from sunrise to sunset in the neighborhood of the sun. The twilight correction is not needed when the self-registers are used for ascertaining the duration of a special intensity of sunshine, but is necessary when the duration of cloudiness is alone desired, as is usually the case.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table XI.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the durations of effective sunshine whence the duration relative to possible sunshine is derived; the observer's personal estimates give the percentage of area of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for July, 1896, is 11 per cent for photographic and 12 per cent for thermometric records.

The details are shown in the following table, in which the stations are arranged according to the greatest possible duration of sunshine, and not according to the observed duration as heretofore.

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
Bismarck, N. Dak.	P.	479.6	59	53	+ 4	87	87
Helena, Mont.	P.	479.6	57	73	+ 6	87	87
Portland, Oreg.*	P.	475.7	32	87	+ 5	87	+ 5
Eastport, Me.	P.	471.7	40	51	+ 11	87	87
Minneapolis, Minn.	T.	471.7	40	51	+ 11	65	65
Northfield, Vt.	P.	468.4	35	45	+ 10	60	+ 23
Portland, Me.	T.	468.4	37	45	+ 10	64	+ 6
Rochester, N. Y.	T.	465.2	58	41	.....	69	+ 23
Buffalo, N. Y.	T.	465.2	41	.....	.....	51	+ 5
Boston, Mass.	T.	461.6	46	.....	.....	66	+ 8
Chicago, Ill.	T.	461.6	58	.....	.....	66	+ 8
Cleveland, Ohio	P.	461.6	46	59	+ 13	62	+ 3
Des Moines, Iowa	T.	461.6	59	.....	.....	64	+ 5
Detroit, Mich.	T.	461.6	59	.....	.....	69	+ 25
Dubuque, Iowa	T.	461.6	44	.....	.....	69	+ 25
Eureka, Cal.	P.	458.6	39	37	- 2	.....	.....
New York, N. Y.	T.	458.6	54	.....	.....	53	- 1
Salt Lake City, Utah.	T.	458.6	40	71	+ 31	48	+ 11
Columbus, Ohio.	T.	455.2	37	.....	.....	48	+ 11
Denver, Colo.	P.	455.2	53	63	+ 10	73	+ 36
Philadelphia, Pa.	T.	455.2	37	.....	.....	48	+ 11
Baltimore, Md.	T.	453.0	37	.....	.....	81	+ 27
Cincinnati, Ohio	T.	453.0	54	.....	.....	72	+ 16
Kansas City, Mo.	P.	453.0	52	61	+ 9	75	+ 24
St. Louis, Mo.	P.	453.0	56	.....	.....	76	+ 9
Washington, D. C.	P.	453.0	40	52	+ 12	91	+ 3
Dodge City, Kans.	T.	450.1	55	63	+ 8	83	+ 29
Louisville, Ky.	T.	450.1	61	.....	.....	34	+ 13
San Francisco, Cal.	T.	447.4	67	.....	.....	58	+ 16
Fresno, Cal.	T.	447.4	88	.....	.....	83	+ 29
Santa Fe, N. Mex.	T.	444.3	37	55	+ 18	83	+ 29
Little Rock, Ark.	T.	442.0	54	.....	.....	76	+ 9
Atlanta, Ga.	T.	439.7	47	.....	.....	89	+ 4
Wilmington, N. C.	T.	439.7	42	.....	.....	89	+ 4
Phoenix, Ariz.	P.	437.2	50	73	+ 23	66	+ 2
San Diego, Cal.	P.	437.2	66	62	- 4	65	+ 1
Savannah, Ga.	T.	434.5	46	61	+ 15	89	+ 4
Vicksburg, Miss.	T.	434.5	85	.....	.....	66	+ 1
New Orleans, La.	T.	429.6	65	.....	.....	89	+ 4
Galveston, Tex.	P.	427.4	68	83	+ 15	.....	.....

* Record by both methods.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which reports of thunderstorms for the whole country were most numerous were: 3d, 224; 4th, 202; 13th, 209; 15th, 338; 22d, 205; 27th, 247.

Thunderstorm reports were most numerous in: Illinois, 239; Iowa, 201; Missouri, 275; North Carolina, 241; Ohio, 482; Pennsylvania, 202.

Thunderstorms were most frequent in: North Carolina, 31 days; Colorado, 30; Georgia and New Mexico, 29; Florida and South Carolina, 28; Kansas, Tennessee, and Texas, 27.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 20th to the 28th, inclusive. On the remaining twenty-two days of this month 104 reports were received, or an average of about 5 per day. The date on which the number of reports especially exceeded this average was: 11th, 58.

Auroras were reported by a large proportion of observers in: Montana, 38; North Dakota, 28; Wisconsin, 17 per cent.

Auroras were reported most frequently in: Montana and North Dakota, 6 days; New Jersey, Ohio, and Wisconsin, 4 days.

CANADIAN REPORTS.

Thunderstorms were reported as follows: St. Johns, 11th; Grindstone, 15th; Halifax, 31st; Grand Manan, 13th; Yarmouth, 13th, 15th, 16th; St. Andrews, 11th, 13th; Charlotte-town, 13th, 16th; Chatham, 2d, 12th; Father Point, 12th, 22d; Quebec, 12th, 17th, 22d, 27th, 30th; Montreal, 5th, 6th, 13th, 15th, 22d, 30th; Rockliffe, 22d; Toronto, 6th, 12th, 28th, 29th; Port Stanley, 4th, 13th, 14th, 15th, 26th to 29th, 31st; Saugeen, 4th, 13th; Parry Sound, 9th, 14th, 22d; Port Arthur, 2d, 12th, 22d, 26th; Minnedosa, 4th, 14th, 15th, 17th, 19th; Qu'Appelle, 16th, 19th, 29th; Medicine Hat, 1st, 2d, 16th; Swift Current, 1st, 7th, 9th, 12th; Calgary, 24th, 28th; Prince Albert, 8th, 16th, 24th, 30th, 31st; Battleford, 8th, 10th, 16th.

Auroras were reported as follows: Sydney, 11th; Grand Manan, 11th; Charlottetown, 11th; Father Point, 11th; Quebec, 10th, 11th, 13th, 23d, 31st; Montreal, 11th; Toronto, 11th; Winnipeg, 2d, 6th; Minnedosa, 4th, 8th, 10th, 11th, 12th; Prince Albert, 3d.

INLAND NAVIGATION.

The extreme and average stages of water in the rivers for the current month are given in Table VIII, from which it appears that the Congaree, at Columbia, S. C., rose to 3.2 above danger line on the 8th, and the Willamette, at Portland, Oreg., rose to 8.5 above danger line on the 3d. In addition to these the Wabash, at Mount Carmel, Ill., was within 0.7 of the danger line from the 29th to 31st, and the Savannah at Augusta was within 2.4 of danger on the 10th. The Missouri at Kansas City was within 1.9 on the 6th.

LOCAL FLOODS.

Very many reports of high water and great damage due to local rains in small streams have come to hand; these are summarized in the following brief list arranged by dates. Most of these reports are culled from telegrams in the daily papers and are liable to occasional errors of one day.

5th.—Bellaire, Belmont County, Ohio; Ohio and Marshall counties, and Moundsville, W. Va.; Pipe Creek, Ohio, opposite Moundsville; Four Mile, near Jackson, Ohio; Frankfort, Ky.

6th.—New York, N. Y., and vicinity; Newark and Flemington, N. J.; Laurel Hill, L. I.

10th.—Iredell, Yadkin and Catawba Rivers, Scotland Neck, Tillery, and Roanoke River, N. C.

12th.—Weldon, N. C.

14th.—McArthur, Ohio; Pittsburg and Alleghany City, Pa.; Phoenix, Ash Fork, Martinez, Congress, and Kyrene, Ariz.

15th.—Pittsburg, Alleghany City, Turtle Creek, Wilmerding, Greensburg, Export, Delmont, and Crabtree, Pa.; New York, N. Y.; Grantsville, Yellow Creek, Carrollton (7.30 p.m.), Marietta, and Lima, Ohio.

18-19th.—Kansas City, Kans. (local paper called this a cloud-burst, although only three inches of rain fell in two hours); Warrensburg, Macon, Shelbina, Blue Springs, and Hannibal, Mo.; Warsaw, Valparaiso, and Anderson, Ind.; Fairbury and Percy, Ill.; Erie, Pa.

20th.—Portsmouth, Bowling Green, Wood County, and Wauseon, Ohio; Pittsburg and Alleghany City, Pa.; Centralia, Ill., 20th, 10 p. m. to 21st, 10 a. m., very heavy rain; Evansville (8.25 a. m. of the 20th to 8 a. m. of 21st, heavy rain), and Brazil, Ind.

20th-21st.—Bensons Creek, four miles from Frankfort, Shelbyville, Lexington, Louisville, Shelby, Fayette and Woodford counties, Lawrenceburg, Ky.; Manchester, Newton, Winchester, Aberdeen, and West Union, Ohio.