

ground and of the ice in the rivers on Monday of each week is also shown on the weekly charts of the Climate and Crop Service, published by the Weather Bureau during December to March, inclusive. Special reports of ice are quoted in connection with the section devoted to the River and Flood Service.

HAIL.

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

California, 22, 23, 25, 30. Indian Territory, 25, 26, 27. Iowa, 3. Louisiana, 3, 6, 28. Mississippi, 4. Missouri, 3. New Mexico, 25. Ohio, 5. Oklahoma, 25. Oregon, 12. Texas, 2, 25, 26, 27. Washington, 5. Wisconsin, 2.

SLEET.

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

Alabama, 29, 30. Arizona, 25. Arkansas, 19, 26, 27, 28. Colorado, 25, 26. Connecticut, 21, 22, 29. Delaware, 21, 29. District of Columbia, 20, 29, 30. Georgia, 21, 30. Idaho, 4, 5, 9, 10, 11, 13, 18, 19, 26. Illinois, 5, 10, 11, 19, 20, 27, 28. Indiana, 5, 20, 23, 26 to 29. Iowa, 9, 10, 16, 17, 18, 20 to 28. Kansas, 9, 10, 11, 17, 19 to 22, 24 to 27. Kentucky, 27, 28, 29. Louisiana, 30. Maine, 18, 26. Maryland, 8, 20, 29, 30. Massachusetts, 13, 21. Michigan, 4 to 8, 10, 11, 15, 18, 20, 21, 24 to 27. Minnesota, 2, 17, 23 to 27. Mississippi, 28, 29, 30. Missouri, 3, 4, 5, 9 to 13, 18, 19, 20, 23, 24, 26, 27, 28. Montana, 1, 8, 14, 15, 22. Nebraska, 17, 20, 22 to 27. Nevada, 23, 25. New Hampshire, 21, 25. New Jersey, 13, 21, 29. New Mexico, 9, 10, 11. New York, 13, 18, 21, 25, 28, 29. North Carolina, 1, 29, 30. North Dakota, 2, 3, 14, 15, 18. Ohio, 8, 9, 10, 12, 13, 20, 24, 27, 28. Oklahoma, 19, 27. Oregon, 4, 7, 10, 16, 17, 22, 23, 29, 30. Pennsylvania, 20, 21, 28, 29. Rhode Island, 13, 21, 29. South Carolina, 30. South Dakota, 1, 2, 3, 6, 24 to 27. Tennessee, 27 to 30. Texas, 29, 30. Vermont, 21. Virginia, 8, 9, 13, 20, 29, 30. Washington, 1, 4, 7, 9 to 12, 15, 18, 21, 22, 23, 27 to 30. West Virginia, 28, 29, 30. Wisconsin, 4, 10, 21, 23 to 26.

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 19 regular stations of the Weather Bureau by its photographic, and at 31 by its thermal effects. At one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records 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 observers' 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 November, 1896, is 7 per cent for photographic and 4 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 in previous years.

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.		
Tampa, Fla.	P	323.5	54	*	60	*	4	
Galveston, Tex.	P	321.7	51	44	7			
New Orleans, La.	P	319.7	50	52	2		1	
Savannah, Ga.	P	315.9	36					
Vicksburg, Miss.	P	315.9	67				2	
Phoenix, Ariz.	P	314.0	59	31	12			
San Diego, Cal.	P	314.0	73	78	5			
Atlanta, Ga.	P	312.2	62				1	
Los Angeles, Cal.	P	312.2	62					
Wilmington, N. C.	T	312.2				60	0	
Chattanooga, Tenn.	T	310.1	40			41	1	
Little Rock, Ark.	T	310.1	40			51	11	
Raleigh, N. C.	T	308.3	53			61	8	
Santa Fe, N. Mex.	P	306.3	69	85	16			
Fresno, Cal.	P	305.7	58			67	9	
Dodge City, Kans.	P	304.0	59	62	3			
Louisville, Ky.	P	304.0	31			43	12	
San Francisco, Cal.	P	304.0	51			50	3	
Baltimore, Md.	P	301.5	37			23	3	
Cincinnati, Ohio	P	301.5	36			38	3	
Kansas City, Mo.	P	301.5	48	53	5			
St. Louis, Mo.	P	301.5	36			46	10	
Washington, D. C.	P	301.5	44	47	3			
Columbus, Ohio	T	299.7				28	3	
Denver, Colo.	T	299.7	53	80	27			
Indianapolis, Ind.	T	299.7	42			50	3	
Philadelphia, Pa.	T	299.7	41			53	12	
Cheyenne, Wyo.	P	297.3	45	66	21			
Eureka, Cal.	P	297.3	41	43	2			
New York, N. Y.	P	297.3	39			51	12	
Omaha, Nebr.	P	297.3	47	51	4			
Salt Lake City, Utah.	P	297.3	23	42	19			
Binghamton, N. Y.	T	294.9	26			26		
Boston, Mass.	T	294.9	31			37	6	
Chicago, Ill.	T	294.9	36			36	0	
Cleveland, Ohio	T	294.9	20			26	0	
Des Moines, Iowa.	T	294.9	41			44	3	
Detroit, Mich.	T	294.9	27			35	8	
Dubuque, Iowa	T	294.9	52			28	4	
Buffalo, N. Y.	T	292.3	21			23	2	
Rochester, N. Y.	T	292.3	25			24	1	
Northfield, Vt.	T	289.7	21	22	1			
Portland, Me.	T	289.7	23			40	11	
Eastport, Me.	T	287.2	23	27	4			
Minneapolis, Minn.	T	287.2				23		
Portland, Oreg.*	P	284.1	35			23	12	
Bismarck, N. Dak.	P	284.1	35	23	12			
Helena, Mont.	T	281.0	31	30	1			
Seattle, Wash.	T	278.0	31	35	4	22	9	