

The limit of freezing weather is shown on Chart VI by the isotherm of minimum 32°, and the limit of frost by the isotherm of minimum 40°.

**MOISTURE.**

The quantity of moisture in the atmosphere at any time may be expressed by means of the weight contained in a cubic foot of air, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-points for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, are given in Table I.

The rate of evaporation from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer, but a properly constructed evaporometer may be made to give the quantity of water evaporated from a similar surface during any interval of time. Such an evaporometer, therefore, would sum up or integrate the effect of those influences that determine the temperature as given by the wet bulb; from this quantity the average humidity of the air during any given interval of time may be deduced.

*Sensible temperatures.*—The sensation of temperature experienced by the human body and ordinarily attributed to the condition of the atmosphere depends not merely on the temperature of the air, but also on its dryness, on the velocity of the wind, and on the suddenness of atmospheric changes, all combined with the physiological condition of the observer. The condition of the atmosphere as to moisture is so important that it has, by exaggeration, been sometimes considered as a controlling feature and the temperature of the wet-bulb thermometer, when whirled in the shade, has been called the sensible temperature, although this is often but a partial index of the sensation of temperature. In order to present a monthly summary of the atmospheric conditions on which hygienic and physiological phenomena depend, the moisture must be fully considered, and therefore Table VIII has been prepared, showing the maximum, minimum, and mean readings of the wet-bulb thermometer at 8 a. m. and 8 p. m., seventy-fifth meridian time. A complete expression for the relation between atmospheric conditions and nervous sensations is under consideration, but has not yet been obtained.

**PRECIPITATION.**

[In inches and hundredths.]

The distribution of precipitation for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III.

The precipitation for the current month was heaviest, 20.00 to 24.00, on the southeast coast of the Florida Peninsula; but least, namely, between 0.00 and 0.5, over all the region, with a few local exceptions, between the Lake Region and the Ohio Valley, westward to Wyoming and Montana, and thence throughout the Rocky Mountain Plateau and Pacific Coast regions.

The diurnal variation is shown by Table XII, which gives the total precipitation for each hour of seventy-fifth meridian time, as deduced from self-registering gauges kept at about 43 regular stations of the Weather Bureau; of these 37 are float gauges and 6 are weighing gauges.

The normal precipitation for each month is shown in the Atlas of Bulletin C, entitled "Rainfall and Snow of the United States, compiled to the end of 1891, with annual, seasonal, monthly, and other charts."

The current departures from the normal precipitation are given in Table I, which shows that there was an excess in the Florida Peninsula, but a deficiency everywhere else, a few localities only excepted. Large excesses were: Jupiter, 15.9; Meridian, 1.9; Pueblo and Abilene, 1.1. The large

deficits were: Tatoosh Island, 7.9; Neah Bay, 11.0; Astoria, 6.4; Fort Canby and Jacksonville, 5.1; Charleston and Hatteras, 3.6; Eastport, 3.5.

The average departure for each district is also given in Table I. By dividing these by the respective normals the following corresponding percentages are obtained (precipitation is in excess when the percentages of the normals exceed 100):

Above the normal: South Atlantic, 178; Abilene (southern Slope), 136; southern Plateau, 112.

Below the normal: New England, 69; Middle Atlantic, 73; South Atlantic, 36; east Gulf, 72; west Gulf, 64; Ohio Valley and Tennessee, 43; lower Lake, 54; upper Lake, 33; North Dakota, 22; upper Mississippi, 14; Missouri Valley, 12; northern Slope, 62; middle Slope, 78; middle Plateau, 40; northern Plateau, 1; north Pacific, 8; middle Pacific, 8; southern Pacific, 35.

The years of greatest and least precipitation for October are given in the REVIEW for October, 1894. The precipitation for the current month was the greatest on record only at Jupiter, 21.03. It was the least on record at: Eastport, 1.15; Northfield, 0.45; Port Huron, 0.85; Alpena, 0.77; Grand Haven, 0.43; Duluth, 0.09; Pierre, trace; Rapid City, 0.02; Omaha, 0.07; Kansas City, 0.12; St. Louis, 0.23; Salt Lake City, 0.24; Eureka, 0.05; Roseburg, 0.00; Portland, Oreg., trace; Astoria, 0.23; Fort Canby, 0.31; Tatoosh Island, 1.32; Neah Bay, 1.27; Port Angeles, 0.15; Spokane, trace; Walla Walla, 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.
	Inches.	Per cent.		Inches.	Per cent.
Florida Peninsula.....	+ 0.50	101	New England.....	- 6.60	82
Abilene (southern Slope)...	+ 6.10	125	Middle Atlantic.....	- 8.40	73
Southern Plateau.....	+ 0.50	106	South Atlantic.....	- 5.40	89
			East Gulf.....	- 5.10	90
			West Gulf.....	- 6.60	83
			Ohio Valley and Tenn....	- 11.40	71
			Lower Lakes.....	- 8.60	70
			Upper Lakes.....	- 8.40	71
			North Dakota.....	- 1.90	89
			Upper Mississippi.....	- 9.00	71
			Missouri Valley.....	- 5.20	82
			Northern Slope.....	- 0.70	95
			Middle Slope.....	- 1.60	92
			Middle Plateau.....	- 1.60	83
			Northern Plateau.....	- 4.10	79
			North Pacific.....	- 7.60	83
			Middle Pacific.....	- 3.60	88
			South Pacific.....	- 2.80	78

The total snowfall at each station is given in Table II. Its geographical distribution is given on Chart No. VI of "Total monthly snowfall." The isotherms of minimum 32° and 40° are also shown on this chart.

**HAIL.**

The following are the dates on which hail fell at one or more stations in the respective States:

Arizona, 3, 4, 27. California, 15, 16, 20. Illinois, 11. Indian Territory, 27. Iowa, 11. Kansas, 22, 26. Kentucky, 11, 27. Maine, 28. Massachusetts, 17. Michigan, 8. Missouri, 24, 26. Nevada, 15, 19, 20. New York, 9, 17. Ohio, 9, 11, 15, 27. Oklahoma, 27. Utah, 3, 19, 22. West Virginia, 31.

**SLEET.**

The following are the dates on which sleet fell at one or more stations in the respective States:

Arkansas, 30. California, 21. Colorado, 22. Georgia, 30. Illinois, 24, 31. Indiana, 31. Iowa, 11. Kansas, 22, 30. Mary-

land and Massachusetts, 31. Michigan, 7, 8, 14, 16, 18, 19, 20, 25, 29. Minnesota, 14. Missouri, 22, 23, 24, 29, 30. Montana, 13. Nebraska, 1, 30. New Hampshire, 17. New York, 8, 15, 16, 17, 19, 20, 23, 28, 29, 31. Ohio, 1, 8, 9, 19, 20, 31. Oklahoma, 23. Pennsylvania, 31. South Dakota, 10. Utah, 4, 21. Vermont, 9, 17. Virginia, 31. Wisconsin, 12.

**WIND.**

The prevailing winds for October, 1895, 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 II, 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 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.
Buffalo, N. Y.	19	54	w.	Cleveland, Ohio	19	50	sw.
Do.	28	59	w.	Jupiter, Fla.	23	55	ne.
Chicago, Ill.	10	52	s.	Kittyhawk, N. C.	4	52	ne.
Do.	18	56	sw.	Williston, N. Dak.	18	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 largely upon the absorption by the atmosphere, and varies with the distribution of cloudiness. The sunshine is now recorded automatically at 15 regular stations of the Weather Bureau by its photographic, and at 22 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 mean local 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 clear sky from sunrise to sunset in the neighborhood of the sun. The twilight correction would not be needed if the self-registers were used for ascertaining the duration of a special intensity of sunshine, but is necessary if the duration of cloudiness is alone desired, as is usually the case.

The cloudiness is determined by numerous personal obser-

variations at all stations during the daytime, and is given in the column of "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 duration of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of area of clear sky. It should not be assumed that these numbers should agree, and for comparative purposes they have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentages of duration of sunshine is almost always larger than the observers' personal estimate of percentages of area of clear sky; the average excess for October, 1895, is 6 per cent for photographic records, and 10 per cent for thermometric records. The details are shown in the following table:

*Difference between instrumental and personal observations of sunshine.*

Photographic stations.	Instrumental.			Thermometric stations.	Instrumental.		
	Personal.	Difference.	Personal.		Difference.		
Phoenix, Ariz.	88	71	17	Cincinnati, Ohio	84	70	14
Denver, Colo.	83	64	19	Des Moines, Iowa	83	71	12
Santa Fe, N. Mex.	80	63	17	New Orleans, La.	80	80	0
Washington, D. C.	79	84	-5	Vicksburg, Miss.	80	78	2
Dodge City, Kans.	77	70	7	St. Louis, Mo.	79	70	9
Helena, Mont.	77	62	15	Atlanta, Ga.	78	74	4
Salt Lake City, Utah	77	61	16	Louisville, Ky.	78	74	4
Kansas City, Mo.	76	72	4	Chicago, Ill.	77	65	12
Savannah, Ga.	76	69	7	Philadelphia, Pa.	76	69	7
Galveston, Tex.	75	74	1	Little Rock, Ark.	75	65	10
Bismarck, N. Dak.	71	58	13	Wilmington, N. C.	73	73	0
Portland, Oreg. t.	66	56	10	Baltimore, Md.	72	76	-4
San Diego, Cal.	65	56	9	New York, N. Y.	70	64	6
Cleveland, Ohio	61	54	7	Detroit, Mich.	67	57	10
Eastport, Me.	52	36	16	San Francisco, Cal.	64	62	2
				Portland, Oreg. t.	62	56	6
				Boston, Mass.	61	54	7
				Rochester, N. Y.	60	52	8
				Columbus, Ohio	56	47	9
				Portland, Me.	52	44	8
				Buffalo, N. Y.	38	35	3
				Marquette, Mich.	31	21	10

\* No thermometric report.

† Records kept 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.

The dates on which reports of thunderstorms for the whole country were most numerous were: 11th, 24; 15th, 27; 26th, 26; 27th, 59.

Thunderstorm reports were most numerous in: California, 44; Colorado, 23; Missouri, 22; Nevada, 27; Ohio, 36.

Thunderstorms were most frequent in: California, 10 days; Colorado, 9; Texas, 8.

*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 1st to the 7th, inclusive, and also the 28th, 29th, 30th, and 31st. On the remaining twenty days of this month 574 reports were received, or an average of about twenty-nine per day. The dates on which the number of reports especially exceeded the average were: 12th, 215; 15th, 132; and 16th, 52.

Auroras were reported by a large percentage of observers in: Minnesota, 119; Wisconsin, 103; and Iowa, 57.

Auroras were reported most frequently in: North Dakota, 16 days; Minnesota, 15; Montana, 13; and Wisconsin, 10.