was not the lowest on record at any regular station of the Weather Bureau.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 110, Yuma (frequently); 109, Phœnix and Redbluff (9th); 106, Walla Walla (15th); 104, Sacramento (9th); 103, Fort Smith (28th), Little Rock (31st), Bismarck (11th). The lowest maxima were: 67, Point Reyes Light (frequently); 70, Tatoosh Island (21st), Port Angeles (19th), Eureka (31st); 72, San Francisco (9th). The highest minima were: 73, Galveston (11th); 72, Port Eads and Key West (7th), Corpus Christi (frequently); 70, Charleston (9th), Savannah and Jacksonville (7th), Pensacola (8th), New Orleans (1st). The lowest minima were: 38, Williston (22); 40, Havre (24th); 41, Pysht (3d); 43, East Clallam (1st) and Bismarck (22d).

The *years of highest maximum and lowest minimum temperatures* are given in the last four columns of Table I of the current REVIEW. During the present month the maximum temperatures were the highest on record at: Bismarck and Little Rock, 103; Meridian, 102; Memphis, 101; Pensacola, 99. The minimum temperatures were the lowest on record at: Williston, 38; Jupiter, 68.

The greatest daily range of temperature and data for computing the extreme and mean monthly ranges are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: San Luis Obispo, 45; Idaho Falls and Winnemucca, 44; Havre, 43; Carson City, 42; Miles City, 41; Fresno, 40. The smallest values were: Woods Hole and Galveston, 13; Corpus Christi and Jupiter, 14; Key West and Hatteras, 15; Port Eads and Block Island, 16; Nantucket, 17; San Diego, 18; Charleston, Pensacola, Eureka, Fort Canby, and Point Reyes Light, 19; Tampa, Mobile, San Francisco, and Tatoosh Island, 20.

Among the *extreme monthly ranges* the largest were: Denver, 66; Bismarck, 60; Havre, 58; Walla Walla, Carson City, and Fresno, 55; San Luis Obispo, Winnemucca, Williston, and Miles City, 54. The smallest values were: Corpus Christi, 18; Port Eads, 10; Point Reyes Light, 21; Key West, San Francisco, Tatoosh Island, and Woods Hole, 22.

The *accumulated monthly departures* from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
Middle Atlantic	+ 2.6	+ 0.4	New England	− 0.6	− 0.1
South Atlantic	+ 8.1	+ 1.2	Florida Peninsula	−11.7	− 1.7
West Gulf	+ 8.6	+ 1.2	East Gulf	− 0.9	− 0.1
Ohio Valley and Tenn.	+ 9.0	+ 1.3			
Lower Lake	+ 9.5	+ 1.4			
Upper Lake	+20.5	+ 2.9			
North Dakota	+ 8.1	+ 1.2			
Upper Mississippi	+19.9	+ 2.8			
Missouri Valley	+19.3	+ 2.8			
Northern Slope	+ 9.8	+ 1.4			
Middle Slope	+21.9	+ 3.1			
Abilene (southern Slope)	+21.4	+ 3.1			
Southern Plateau	+ 5.6	+ 0.8			
Middle Plateau	+ 3.0	+ 0.4			
Northern Plateau	+15.9	+ 2.3			
North Pacific	+ 1.4	+ 0.2			
Middle Pacific	+ 1.4	+ 0.2			
South Pacific	+ 6.0	+ 0.9			

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, 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 effects 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.

Measurements of evaporation within the thermometer shelters are difficult to make so as to be intercomparable at temperatures above and below freezing, and may be replaced by computations based on the wet-bulb temperatures. The absolute amount of evaporation from natural surfaces not protected from wind, rain, sunshine, and radiation, are being made at a few experimental stations and will be discussed in special contributions.

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. A complete expression for the relation between atmospheric conditions and nervous sensations 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 total precipitation for the current month was heaviest over small regions in Florida, North and South Carolina, Tennessee, Virginia, eastern Pennsylvania, West Virginia, western Pennsylvania, Indiana, Illinois, Iowa, and northern Missouri, in all of which totals of 10 inches or more were reported. It was least, viz, inappreciable, over the greater part of California, Washington, and Oregon, and was less than 1 inch nearly everywhere in Nevada, Idaho, and western Montana. The larger values at regular stations were: Louisville, 13.0; Mobile and Tampa, 12.3; Parkersburg, 11.5; Kittyhawk, 10.0.

Details as to *excessive precipitation* are given in Tables XII and XIII.

The *diurnal variation*, as shown by tables of hourly means of the total precipitation, deduced from self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was in excess in the Ohio Valley and the interior of the Atlantic States. It was deficient in the lower Mississippi and Arkansas valleys, the upper Lake Region, Washington, and Oregon. The large excesses were: Louisville, 9.2; Parkersburg, 7.1; Hannibal, 6.3; Columbus, Ohio, 6.2; Concordia, 6.1; Springfield, Ill., and Mobile, 5.8; Pensacola, 5.0. The large deficits were: Port Eads, 6.7; Meridian, 5.8; Vicksburg, 3.8; Fort Smith, 3.7; New Orleans, 3.6.

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: New England, 106; middle Atlantic,

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.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
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	+ 0.20	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	94
			South Pacific	— 1.90	77

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.
		Miles				*Miles*	
Amarillo, Tex	14	56	w.	Pensacola, Fla	7	72	n.
Cleveland, Ohio	26	66	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.