

when a pressure of 28.88 was reported from Edmonton. In twenty-four hours the lowest pressure was in Manitoba. This storm cannot be traced farther, but it may have influenced or coalesced with No. Xa.

Xa.—First noted in southern Texas on the 23d, p. m. Its motion was very rapid north-northeast, and it was last noted to the north of Lake Superior on the 25th, p. m. A widely extended cold wave followed in the wake of this storm and continued behind low area No. XII. The heaviest rainfall was 1.52 inch in twelve hours at Kansas City, which is in marked contrast to the precipitation accompanying low No. VIII, though the two storms had almost exactly the same trajectory.

XI.—First noted to the north of Montana on the 25th, a. m. This storm either filled up in South Dakota on the 26th, p. m., or was absorbed by No. XIII. Only traces or very light rains accompanied it.

XII.—A trough-like depression extending from the Gulf of Mexico to Lake Huron was left by area No. Xa. On 25th p. m., the map shows a slight concentration of this trough in Mississippi. Over 2.50 inches of rain in twenty-four hours fell at Meridian. This storm moved rather rapidly in a northeast direction and was last noted at the mouth of the St. Lawrence on the 27th, p. m. Abundant rainfall characterized the onward progress of this depression. The highest wind of the month, 72 miles, was reported from New York, N. Y., on the 27th, a. m. The same velocity was again reported on the 31st, a. m. A continuation of the cold wave accompanying No. Xa caused a fall of 36° in twenty-four hours at Parkersburg. This was the most widely extended and united cold wave of the month in the eastern portion of the United States.

XIII.—This low was first noted to the north of Montana on the 26th, p. m. Its course was a little south of east, and it was last noted to the north of Lake Superior on the 29th, p. m. It was followed by a severe cold wave in the Missouri Valley and middle Slope, a fall of 34° in twenty-four hours and to 4° being reported at Cheyenne on the 28th, p. m., and one of 34° and to -2° at Moorhead on the 29th, a. m. A wind of 38 miles was felt at Marquette on the 28th, a. m., and at Duluth on the 29th, a. m. Almost no precipitation attended this low, though the pressure reached 29.00 near its center on the 27th, a. m.

XIV.—First noted in Colorado on the 28th, a. m., within a trough extending to and including No. XIII in Minnesota. Its course was southeast, reaching the Gulf of Mexico the next morning. Thence it moved northeast, reaching the mouth of the St. Lawrence on the 31st, p. m. The lowest pressure of the month, 28.84, was reported from Quebec on the 31st, a. m. Rather heavy rains attended this storm.

#### LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

No local storms, properly so called, were reported during December; the numerous cases of high winds are given under that heading.

#### TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperature is given for each station in Table II, for voluntary observers. Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the Weather Bureau.

The monthly mean temperature published in Table I, for the regular stations of the Weather Bureau, is the simple mean of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II.

The regular diurnal period in temperature is shown by the

hourly means given in Table IV for 29 stations selected out of 82 that maintain continuous thermograph records.

The distribution of the monthly mean temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart II; the lines are drawn over the high irregular surface of the Rocky Mountain Plateau, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The highest mean temperatures were: Key West, 67.8; Jupiter, 64.4; Tampa, 59.2; Port Eads, 58.4; Corpus Christi, 56.9. The lowest mean temperatures were: In Canada: Edmonton, 14.9; Battleford, 6.5; White River, 11.2; Winnipeg, 8.2; Minnedosa, 8.1; Qu'Appelle, 8.8. In the United States: St. Vincent, 10.2; Moorhead, 14.4; Williston, 16.0.

As compared with the normal for December, the mean temperatures for the current month were deficient throughout the Rocky Mountain Plateau Region, the Pacific Coast, and the South Atlantic and Gulf States, but were in excess throughout Canada, the Lake Region, the Middle States, and New England. The greatest excesses were: Pierre, 6.0; Minnedosa, 5.6; Medicine Hat, 5.4; Chatham, 5.3; Williston, 5.0. The greatest deficits were: Salt Lake City, 8.1; Santa Fe, 6.8; Winnemucca, 5.0; Pensacola, 4.3; Phoenix, 4.2; Lander, 4.0.

Considered by districts the mean temperatures for the current month show departures from the normal as given in Table I. The greatest positive departure was: North Dakota, 3.5. The greatest negative departures were: Middle Plateau, 4.7; Southern Plateau, 4.2.

The years of highest and lowest mean temperatures for December are shown in Table I of the REVIEW for December, 1894. The mean temperature for the current month was not the highest on record at any regular station of the Weather Bureau. It was the lowest on record at: Tampa, 59.2; Salt Lake City, 26.4; Fresno, 43.6; San Francisco, 48.6; Point Reyes Light, 48.0.

The maximum and minimum temperatures of the current month are given in Table I. The highest maxima were: 86, Los Angeles (frequently); 81, Jupiter (26th); 80, Jacksonville (2d), Tampa (1st), Key West (26th), Yuma (12th), San Luis Obispo (11th). The lowest maxima were: 38, St. Vincent (15th); 40, Dubuque (17th); 41, Idaho Falls (20th); 42, Minneapolis (17th); 43, Moorhead (28th); 44, Williston (27th). The highest minima were: 52, Key West (14th); 39, Jupiter (14th), San Francisco (30th), Point Reyes Light (frequently). The lowest minima were: -24, Havre (2d); -22, St. Vincent (26th); -18, Bismarck (2d); -17, Moorhead, (2d).

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: Northfield, 61; Nantucket, 59; Vineyard Haven, 62; Buffalo, 63; Fresno, 71; Carson City, 65; Roseburg, 66; Port Angeles, 64; Tatoosh Island, 60. The minimum temperatures were the lowest on record at: Columbia, 10; Fresno, 6; Eureka, 0.

The greatest daily range of temperature and the extreme monthly ranges are given for each of the regular Weather Bureau stations in Table I, which also gives data from which may be computed the extreme monthly ranges for each station. The largest values of the greatest daily ranges were: Carson City, 44; Lander and Pueblo, 43; Denver and El Paso, 42; Jacksonville, St. Vincent, Huron, Rapid City, and San Luis Obispo, 41. Among the extreme monthly ranges the largest values were: Havre, 84; Northfield, 74; Columbia, Mo., 69; Rapid City, 67; Bismarck, Huron, Pueblo, 66. The smallest values were: San Francisco, 21; Point Reyes

Light, 24; Fort Canby, 25; Astoria and Portland, Oreg., 27; Key West, 28; Tatoosh Island, 29.

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 conditions.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
New England .....	+ 4.6	+ 0.4	Middle Atlantic .....	- 7.3	- 0.6
Upper Lake .....	+ 0.2	0.0	South Atlantic .....	-17.7	- 1.5
North Dakota .....	+ 3.7	+ 0.8	Florida Peninsula .....	-16.6	- 1.4
Missouri Valley .....	+ 2.4	+ 0.2	East Gulf .....	-20.6	- 1.7
Northern Plateau .....	+ 0.8	+ 0.1	West Gulf .....	-20.6	- 1.7
			Ohio Valley and Tenn. ....	-13.1	- 1.1
			Lower Lake .....	- 6.9	- 0.6
			Upper Mississippi .....	- 1.9	- 0.2
			Northern Slope .....	-11.9	- 1.0
			Middle Slope .....	- 6.3	- 0.5
			Abilene (southern Slope) ..	-23.1	- 1.9
			Southern Plateau .....	-12.4	- 1.0
			Middle Plateau .....	-17.1	- 1.4
			North Pacific .....	- 4.0	- 0.3
			Middle Pacific .....	- 9.5	- 1.8
			South Pacific .....	-10.0	- 0.8

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 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 de-

termined 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, 20.00 to 25.00, on the immediate coasts of Oregon and Washington. A region of heavy precipitation, 10.00 to 12.00, extends from central Oklahoma, northeast to central Missouri. This latter feature in the distribution of rain and snow is due to the fact that the heaviest precipitation in this region occurred in belts extending northeast and southwest between a system of warm southeast winds and cold north winds on December 18th, 19th, and 20th.

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 northern Texas and thence northeastward over the Lake Region, also in western Oregon and Washington. There was a deficiency throughout the Atlantic and Gulf coasts, California and the Rocky Mountain Plateau.

Large excesses were: Neah Bay, 9.4; Tatoosh Island, 8.7; Springfield, Mo., 8.6; Astoria, 6.5; Columbia, Mo., 6.8; Springfield, Ill., 5.6; Chicago, 4.4; Jupiter, 4.3. The large deficits were: San Francisco, 3.8; Los Angeles, 3.7; Point Reyes Light, 3.6; Shreveport, 3.1.

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: Florida Peninsula, 128; Ohio Valley and Tennessee, 111; lower Lake, 155; upper Lake, 144; upper Mississippi, 149; Missouri, Valley, 281; Abilene, (southern Slope), 211; north Pacific, 146.

Normal: Middle Slope, 100.

Below the normal: New England, 86; Middle Atlantic, 91; South Atlantic, 66; east Gulf, 85; west Gulf, 83; North Dakota, 60; northern Slope, 65; southern Plateau, 56; middle Plateau, 57; northern Plateau, 86; middle Pacific, 55; southern Pacific 22.

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 .....	+ 0.70	101	New England .....	- 5.30	88
Abilene (southern Slope) ..	+ 7.30	126	Middle Atlantic .....	- 9.10	80
Southern Plateau .....	+ 0.40	104	South Atlantic .....	- 6.30	51
			East Gulf .....	- 8.60	85
			West Gulf .....	- 6.70	87
			Ohio Valley and Tenn. ....	-11.00	76
			Lower Lakes .....	- 5.80	88
			Upper Lakes .....	- 7.00	79
			North Dakota .....	- 1.10	94
			Upper Mississippi .....	- 7.80	78
			Missouri Valley .....	- 2.90	91
			Northern Slope .....	- 0.40	97
			Middle Slope .....	- 1.60	98
			Middle Plateau .....	- 2.60	80
			Northern Plateau .....	- 4.50	73
			North Pacific .....	- 4.10	93
			Middle Pacific .....	- 5.60	81
			South Pacific .....	- 5.40	68

The years of greatest and least precipitation for December are