The following is from the "Tennessee State Board of Health Bulletin" for November, 1887:

The percentage of verification of weather and temperature predictions, furnished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 92.3 per cent.; and temperature, 85.9 per cent.

ERRATA.

October, 1887, REVIEW, on page 281, in the table of "Deviations from the average precipitation," the heading of the third column, Total for October, 1877, should read Total for October, 1887. Same REVIEW, on page 295, in the "Table of miscellaneous meteorological data," in the column of elevations above sea-level, Tatoosh Island, 860 feet, should read 86 feet.

STATE WEATHER SERVICES.

The following extracts are republished from reports for November, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The weather during most of the month has been pleasant, and unusually mild for a winter season. The condition of the atmosphere has been fine for gathering the cotton remaining in the fields, and specially favorable for all the work required on the farm. The dry season has kept the roads in good traveling condition throughout the state.

Although the average temperature for the month was 2°.5 below the normal, still there were so many mild periods that the casual observer might overlook the few cold days that reduced the temperature below the normal. Killing frosts occurred in middle and south Alabama on the mornings of the 21st and 22d; in the extreme northern portions of the state killing frosts came as early as the 1st and 2d. There were two severe cold waves that swept across the state, the first on the 20th, the second on the 28th. The first was the most severe.

The rainfall was 3.28 inches below the normal.

The autumn just closed gives a temperature 3°.4 below the normal, the average for the period being 62°.9. There was also quite a deficiency in the amount of rainfall during the three months. The total precipitation was 7.48 inches; 3.91 inches below the normal.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.164; maximum observed, 30.68, at Auburn, on the 30th; minimum observed, 29.60, at Chattanooga, on the 19th; range for state, 1.08.

Temperature (in degrees Fahr.).—Monthly mean, 52°.9: highest monthly mean, 59°, at Oswichee; lowest monthly mean, 42°.1, at Demopolis; maximum, 84°, at Union Springs, on 1st; minimum, 9°, at Gadsden, on the 21st; range for state, 75°; greatest local monthly range, 69°, at Gadsden; least local monthly range, 37°, at Fayette.

Precipitation, including melted snow (in inches).—Average for the state, 1.12; greatest, 6.00, at Fayette; least, inappreciable, at Newton.

Winds.—Prevailing direction, northeast.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The drought of this remarkable season continued until the 23d, when copious rains set in and continued at intervals until the morning of the 27th, thereby removing the water famine that seemed so imminent. No rain fell until the 9th, when there was slight rain over the greater part of the state—more copious in the northern counties than either the central or southern. On the 19th there was a considerable snowfall in the northern counties, with light rain in a few of the central, but none in the southern. Although rain fell on fewer days in the southern than in the northern division, the precipitation in the latter was only one-third that of the former. Still considerable rain fell all over the state, but in some places there were remarkable downpours for this period of the year. At Vandalia, 5 inches fell on the 26th; Greenville, 3.40; Mattoon, 5.11; Pana, 3.25; Jordan's Grove, 3.25; Irishtown, 2.63; Saint Louis, 2.32, and Flora, 2.29. The heaviest rainfall of the month was at Vandalia, 8.95 inches, nearly all of which fell on three days; the least was 0.70 of an inch, at Ashland.

There was hardly any precipitation in this state until the 23d, when light rain began and continued at intervals until the 26th, when it changed to snow before the advancing "cold wave," and ended on the morning of the 27th. This rain was the first break in the drought of the season and has been of considerable benefit generally, especially to growing wheat and the wells that have been so long dry. Still the relief is only temporary, and much more is needed.

A record at this office of the annual rainfall in the state since 1840, a period of forty-six (?) years, shows that the average is 38.41 inches. The present year up to date falls about 18 inches below this; consequently, this year will be remarkable as the driest on record, for there is no probability that December will make up beyond a small fraction of this deficiency. There have been other years in which drought prevailed since the record commenced, but none anywhere approaching this. The greatest rainfall recorded since 1840 was 48.49 inches, in 1852, which was 10.17 above the general average of forty-six years; 1844 was next, with 48.17 inches; 1851 had 46.91; and 1862 had 46.30. The driest year was 1867, with 29.53 inches, which was nearly nine inches below the general level. Other dry years were 1870, with 29.90 inches; 1854, with 31.13; and 1856, with 31.89. The present year will therefore in all probability, fall five or six inches below the lowest on record.

The average temperature for November, 40°.2, was one degree above the average of twelve years, and 2°.5 below the mean of November 1882, which was the highest during that period. The average for the northern division was 36°.2; for the central, 40°.4, and for the southern, 44°.1. The warmest day was the 3d, and the coldest was the 28th. On that day the temperature was recorded below zero in nineteen counties in the northern division, while three others recorded zero.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The mean temperature was slightly above the normal for six years, and slightly below the normal for fifteen years. Great changes from a higher to a lower occurred about the 20th and 28th, while the highest temperature everywhere in the state occurred on the 3d. The precipitation during the month was slightly in excess. The drought was ended about the 23d by steady rains, followed by snow, falling everywhere till the 27th; the deficiency since January 1, 1887, which on the 22d had reached 15.38 inches, was considerably lessened thereby. Hoar frost was very frequent, and snow fell everywhere in the state near the end of the month.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 39.4; highest monthly mean, 49.3, at Worthington; lowest monthly mean, 34.4, at Mauzy; maximum, 80.0, at Marengo on the 3d; minimum, —7.0, at Worthington, on the 28th; range for state, 68.3; greatest local monthly range, 82.0, at Worthington, least local monthly range, 55.0, at Angola.

Precipitation, including melted snow (in inches).—Average for the state, 3.97; greatest, 6.90, at Marengo; least, 1.43, at Crawfordsville.

Wind.—Prevailing direction, southwest.

The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

The temperature for this month is from 1° to 3° above the normal. Two warm and two cold waves have passed over the state during the month. The precipitation, as usual for the season, has been light and below the normal for the month, the greater amount fell during the storm of the 7–9th, and the balance from the 23d to the 26th.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 41.5; highest monthly mean, 49, at Sedan; lowest monthly mean, 35, at Eustis; maximum, 87, at Lebo, on the 3d; minimum, —19, at Eustis, on the 27th; range for state, 106; greatest local monthly range, 100, at Eustis; least local monthly range, 75, at Sedan; greatest daily range, 52, at Lebo, on the 3d; least daily range, 3, at Leavenworth, on the 25th.

Precipitation, including melted snow (in inches).—Average for the state, .90; greatest, 1.40, at Cawker City and Lawrence; least, .24, at Dodge City.

Wind.—Prevailing direction, south.

The "Louisiana State Weather Service," in charge of R. E. Kerkam, Sergeant, Signal Corps, at New Orleans:

The mean temperature of the state for November, 1887, was 57°.5, which was 0°.3 above the normal for the month. The means of the northern section, 55°.7, and of the southern section, 59°.3, were respectively 1°.3 below and 1°.8 above the November normals for those sections. The daily mean temperature of the state ranged from 56° to 67° from the 1st to the 18th of the month, and fell from 67° on the 16th to 39° on the 20th, when it rose to 70° on the 26th, falling to 40° on the 28th; the month closing with a daily mean of 50°. With the exception of the two cold waves mentioned the past month was remarkably mild and pleasant.

The maximum temperature observed, 81°, occurred in Madison parish on the 15th, and the range of the maximum temperatures reported was only 5°, the lowest, 76°, being reported from Saint Tammany parish on the 8th, 24th, and 26th. The minimum temperatures were reported on the 21st and 28–29th, and, excepting Novembers of 1877 and 1880, when minimum temperatures of 19° and 18°, respectively, were recorded in Caddo parish, the minimum of the past month is the lowest on record for the state, being 22°, and reported from Delta, Madison parish.

The average precipitation for the state, 1.98 inches, was 2.03 inches below the November normal, and the lowest on record for the month. The extremes of monthly rainfall reported were, 5.45 inches from the 23d to 25th, inclusive, and 0.52 of an inch in Orleans parish. The average number of clear days was 15; fair, 8; cloudy, 7; and on which appreciable precipitation fell, 4. From this it appears that the state received about 10 per cent. more sunshine during the past month than in the average November. The prevailing winds in the northern section were from the south, and in the southern section from the north.

The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

The meteorological features of the state are based upon reports received from seventy voluntary observers and eight of the United States Signal Service.

The month has been characterized by two areas of pressure, one low area on the 18th and 19th, and a high area which passed off on the 30th. The temperature has been but 0°.7 below the the normal of fifteen years for the state. The precipitation is below the normal about one-half inch for the month.

Temperature (in degrees Fahr.).—The mean monthly temperature, 34.9, is 0.7 below the normal. The temperature was below the normal 3.3 in the Upper Peninsula, 2.5 in the northern section, 0.1 in the central section, and 0.3 in the southern section. The highest mean daily temperature, 52, occurred on the 7th, and the lowest, 14, on the 28th. The highest daily temperature at any station, 56, occurred at Coldwater, Jonesville, and Marshall, on the 7th, and the lowest, —7.0, at Lothrop, on the 28th. Mean range of temperature for the state, 55.4.

Two cold waves passed during the month, for which signals were displayed from twenty-four to thirty hours in advance. The first passed on the 20th, there being a fall of from 15° to 20°, and the second on the 27th and 28th; the average fall for this wave was 35° throughout the state.

Precipitation (in inches and hundredths).—The average monthly rainfall, 2.34, is 0.51 below the normal. The Upper Peninsula shows an excess of 0.47, while the northern section is below the normal 1.15, the central section 0.77, and the southern section 0.18. There was but little precipitation in the state until the 9th, but all above the southern section received precipitation on the 14th and 19th. The precipitation was general throughout the state on the 24th, 25th, 26th, and 27th, and the heaviest, which occurred on the 26th and 27th, will average more than one-half of the entire precipitation for the month. The greatest amount recorded at any one station was 1.82 on the 27th, at Petersburg, although greater amounts are recorded on the 26th and 27th. The average amount of snowfall for the month in the different sections is as follows: Upper Peninsula, 20.7; northern section, 7.1; central section, 5.7; southern section, 6.6. There were from 3 to 21 inches of snow on the ground at the end of the month in the Upper Peninsula; 2 to 7 in the northern section, and but a trace in localities in the central and southern sections. From March 1st to December 1st there has been a deficiency of rainfall of 7.56 for the entire state, the major portion of this deficiency occurring in the central and southern portions.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 34.9; highest monthly mean, 38.5, at Lansing and Marshall; lowest monthly mean, 28.0, at Sault Ste. Marie; maximum, 73.0, at Bad Axe, on the 7th; minimum, —7.4, at Escanaba, on the 29th; range for state, 80.4; greatest local monthly range, 21.4, at Corunna; least local monthly range, 11.1, at Mackinaw City; greatest daily range, 43.0, at Coldwater, on the 27th; least daily range, 1.4, at Saginaw, on the 25th.

Precipitation, including melted snow (in inches).—Average for the state, 2.34; greatest, 6.36, at Central Mine; least, 0.98, at Escanaba.

Wind.—Prevailing direction, southwest.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

Temperature.—The average temperature for the state was 48°.0. The average of maximum was 77°.6, and the average of minimum 5°.1, making an average range of 72°.5. The highest temperature reported was 81°.8, on the 2d, at Fayette, and the lowest —9°.5, on the 27th, at Oregon, this being the lowest November temperature observed at Oregon for thirty-two years. This makes a range of 91°.3 for the state during November. The greatest local monthly range was 89°.5, at Oregon, and the least monthly range was 63°.9, at the central station.

Rainfall (in inches).—The rain was quite evenly distributed over the state; the greatest having fallen in the east-central section, and the least in the north and west sections of the state. The average rainfall for the month was 2.72 inches. The greatest rainfall was, 6.34 inches, at Mascoutah, Ill., and the least, 0.63, at Kirksville, Mo.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The month of November has been one of prevailing pleasant weather, but with a few days of extreme temperatures both high and low. The precipitation has been normal, occurring almost wholly as snow in one or two slight falls.

Precipitation.—The snowfall over the state has shown little unevenness in distribution. Only a few stations report over an inch of precipitation, this area lying along the lower Platte and stretching up the Missouri. The greater part of the state was visited by but one slight fall of snow from the 23d to the 25th, although an earlier and heavier fall occurred in the eastern portion on the 8th and 9th.

Temperature.—The most notable feature of the month was the unusually early occurrence of a severe cold wave, which was observed in the regions north of Montana on the 25th, and extended southward and eastward over all states and territories east of the Rocky Mountains by the 29th, causing the temperature to fall below freezing in the central portion of the Gulf and south Atlantic states. The changes in temperature attending this cold wave ranged from 40° to 50° within twenty-four hours in the central valleys on the 27th and 28th. At Hay Springs the temperature fell from a maximum of 26° on the 25th to a minimum of —26° on the 27th; and at Valentine from 29°.2 to —31°.5, a range of over 60°. The mean temperature of the month has been 36°.7, which is only a trifle above the normal; the highest temperature was 87°, which exceeds by over 12° any previous November maximum for ten years; the minimum, —31°.5, was lower by about 25° than during the past ten Novembers; only twice, indeed, has November given temperatures below zero.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and fifty-four observers.

The month, as a whole, was normal in temperature, with a deficiency in precipitation. The former would have been in excess but for the strong cold-wave at the close of the month.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.00 (seventeen stations); maximum observed, 30.92, at Northfield, on the 30th; minimum observed, 29.10, at Portland, on the 11th; range for New England, 1.82; greatest local monthly range, 1.76, at Portland; least local monthly range, 1.42, at Nantucket.

Temperature (in degrees Fahr.).—Monthly mean, 37.7 (one hundred and eight stations); highest monthly mean, 45.3, at Block Island; lowest monthly mean, 31, at Berlin Mills; maximum, 75, at Olneyville, on the 27th; minimum, —7, at Berlin Mills, on the 29th; range for New England, 82; greatest local monthly range, 76, at Berlin Mills; least local monthly range, 32, at Nantucket; greatest daily range, 55, at Berlin Mills, on the 29th; least daily range, 2, at Woonsocket, on the 15th; Hartford, 16th; Middletown, 25th; Waterbury, 28th.

Precipitation, including melted snow (in inches.)—Average for New England, 3.13 (one hundred and thirty-three stations); greatest, 5.65, at Manchester, Vt.; least, 1.62, at Dalton.

Wind.—Prevailing direction, northwest (fourteen stations).

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

Summary.

Mean temperature, 41°; highest temperature, 67°.6, on the 27th; lowest temperature, 20°.9, on the 30th; absolute range of temperature, 46°.7; greatest daily range of temperature, 38°.8, on the 4th; least daily range of temperature, 8°.1, on the 15th; mean daily range of temperature, 17°.4; mean daily dew-point, 34°.9; mean daily relative humidity, 80.7 per cent.

Total precipitation, 2.35 inches. Number of days on which .01 inch or more of precipitation fell, 7; number of clear days, 10; number of fair days, 14; number of cloudy days, 6.

The "North Carolina Weather Service," Dr. Herbert Battle, of Raleigh, director:

Temperature (in degrees Fahr.).—Monthly mean, 48; highest monthly mean, 51.9, at Wilmington; lowest monthly mean, 45.3, at Weldon; maximum, 77, at Marion, on the 4th; minimum, 12, at Marion and Hot Springs, on the 21st; range for state, 65; greatest local monthly range, 65, at Marion; least local monthly range, 41, at Salisbury.

Precipitation, including melted snow (in inches).—Average for the state, 1.09; greatest, 2.87, at Hatteras; least, 0.17, at Davidson College.

Wind.—Prevailing direction, southwest.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

Temperature (in degrees Fahr.).—The mean temperature for the month was 39.3, or 0.9 below the mean for the past six years. The highest was 75, at Portsmouth, on the 26th, and the lowest, 8, at the Ohio State University and Westerville, on the 29th. This is the lowest temperature reported during November since 1880. The monthly range was 88; the mean daily range was 21.5; the greatest daily range was 48, at Logan, on the 6th, and the least, 2, at Hiram, on the 15th.

Precipitation (in inches).—The month opened with clear weather, and rain was not reported from any station until the 9th, on which date general, though mostly light, rains occurred. The precipitation continued through the 10th in all sections, and in the northern section on the 11th. It was in the form of snow in this section. The precipitation was general throughout the state on the 14th, 15th, 19th, 20th, 24th, 25th, 26th, 27th, and 28th. The greatest rainfall for twenty-four hours was 2.10, at New Bremen, on the 26th. The greatest monthly rainfall reported was 4.82, at New Bremen, and the least, 1.31, at Youngstown.

Snow.—Snow was reported from stations in the northern section on the 11th and 28th, and on the 19th, 20th and 27th, from all parts of the state.

Hail.—Hail was reported from Bangorville on the 15th.

Average number of clear days, 11.4; average number of fair days, 7.7; average number of cloudy days, 10.9; average number of days on which rain fell, 8.1; least number of days on which rain fell, 5, at Greenville, Celina, Napoleon; greatest number of days on which rain fell, 13, at Jefferson; mean monthly rainfall, 2.81 inches; average daily rainfall, .094 inch.

Prevailing direction of the wind, southwest.

"Oregon Weather Service," report prepared by B. S. Pague, Sergeant, Signal Corps:

Temperature (in degrees Fahr.).—At Roseburg the temperature was slightly above the normal and at the other stations slightly below; but at no station has there been any marked departure. The month was well divided into a warm and a cool period, the former extending from the 1st to the 15th, and the latter from the 16th to the end of the month. In general the highest temperature occurred on the 1st, and the lowest on the 25th. The highest reported in the state being 78, at Ashland, the lowest, 1, at La Grande. The mean of the state for the month is 41.

Precipitation (in inches).—The most marked feature of the state has been the deficiency in precipitation at all stations, except Albany and Bandon. The deficiency ranges from 3.34 at Portland to 0.80 at Linkville. The precipitation for the season, from July 1st, is most decidedly below the average in all sections of the state, Portland being the most deficient.

Weather.—But one general storm passed over the state; it appeared off the coast of Washington Territory on the 27th and rapidly extended to the south. From the 24th to the 28th the weather was unusually cold.

Winds.—The winds were variable and light to fresh in force.

Snow.—Although it is unusual for snow to fall so early in the season in the interior valleys a light snow was reported in Flournoy Valley, twelve miles west of Roseburg, on the 15th, also again on the 24th. Two inches of snow fell at East Portand on the 25th. Very light snow at Eola on the 23d; on the 24th a few flakes fell at Roseburg, and on the 29th snow fell at "The Dalles" and in the southern part of the state.

Frosts.—From the 1st to the 16th occasional frosts occurred, and from the 16th to the end of the month killing frosts occurred in all sections of the state.

The "Pennsylvania State Weather Service," report prepared under the direction of the Franklin Institute, Philadelphia, by Sergeant T. F. Townsend, Signal Corps, assistant:

The mean temperature of the state for November was 39°.2, which is about normal. The highest temperature occurred on the 27th, and ranged from 65° at Girardville and Dyberry to 79° at Washington. This extreme was followed by a cold wave on the 29th and 30th, during which the following low temperatures were noted: Wellsborough, 1°; Drifton, 6°; Clarion, 8°; State College, 8°.5; Greenville, 8°.4; Indiana, 9°, and Philadelphia, 25°. This cold wave was general throughout the United States, and low temperatures extended to the southern parts. One of its notable features was its slow progressive easterly movement after reaching the Alleghanies. The greatest daily ranges of temperature during the month occurred about the 2d, and the least daily ranges on the 11th, 15th, and 24th. Until the last of the month the ground was not frozen so as to seriously interfere with ploughing. Frosts were numerous and general. The average rainfall for the state was 1.80 inches, which is but little more than half of the usual quantity for November. The stations reporting the most are, Erie, 4.13 inches; Dyberry, 2.60 inches; Clarion, 2.45 inches; Indiana, 2.44 inches; Wysox and Greenville, each 2.38 inches. The least occurred at Charlesville, 0.90 inch, and Carlisle, 0.96 inch. The dates on which general rains occurred were the 10th, 11th, 14th, 15th, 19th, 20th, 24th, 25th, and 28th.

Much inconvenience has been experienced in many counties from the drought. In Clearfield and Luzerne counties streams and wells are reported very low. In Northumberland the scarcity of water has been severely felt at the collieries. During the entire month the fear of a water famine was general in Berks county. Farmers were hauling water in barrels for home use and cattle were driven daily to running streams, often long distances from home. Springs that were never known to fail ceased to flow. It is said that the Schuylkill has not been so low for many years. Much damage has been done throughout several counties by forest fires. Light snows prevailed throughout the state on the 10th, 11th, 19th, 20th, and 30th. The greatest depth reported was six inches at Scranton and Grampian Hills.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The main features of the weather during the month of November were the small amount of rainfall, the almost entire absence of electrical disturbances, the large percentage of clear days, and the smoky atmosphere which prevailed during the second decade. The month taken altogether was remarkably pleasant.

The mean temperature was 47°.1, about the normal for November of the past five years. The highest temperature recorded was 80°, on the 4th, and the lowest, 10°, recorded on the 20th, 21st, and 28th, and was the lowest November minimum since 1883. The highest monthly mean was 62°.6, at Memphis, and the lowest, 32°.8 at Lawrenceburg. The daily ranges of temperature were generally much greater than usual, the greatest being the remarkable range of 51°, on the 27th, at Austin. During the month four cold-wave warnings were received, viz.: 17–18th, 19–20th, 23d–24th, 26–28th, all of which were fully verified, except the warning of the 23d, which did not materialize. There were two cold waves during the month for which no warnings were received, viz.: the 5–6th and 10–11th. In the first the temperature fell 30°, and in the second 27°.

The mean precipitation was 1.57 inches, much below the November normal, and the smallest November mean during the past five years, except in 1884, when it was about the same. Of this amount the eastern division received an average of only 0.75 inch, the middle division receiving a little less than an inch and a half, and the western division a little less than an inch and a half. In the eastern division only two stations reported as much as one inch, while at one station (Parksville) no rain was reported during the month. There were ten days on which a measurable quantity of rain fell. The greatest daily rainfall occurred on the 27th, and was, in most parts of the state, followed immediately by a fall of sleet and snow. The greatest monthly rainfall was 4.06 inches, reported at Memphis, and the greatest daily fall was 1.59 inches, on the 25th, also reported at Memphis, and 1.60 inches on the 26th, at Nunnelly. With the exception of the 7th, 9th, 10th, 14th, 23d, 24th, 25th, 26th, 27th, and 28th, no measurable rain or snow fell during the month. There was a very light fall of snow in the western part of middle division on the 20th.

The protracted drought was peculiarly favorable to the extensive forest fires, which prevailed to a greater or less extent over the entire state, but which were particularly prevalent in the western division, doing much damage. These fires caused a densely smoky atmosphere for more than a week, culminating on the 19th, when it was so dense that it became painful to the eyes and rendered breathing disagreeable. This day will long be remembered as the "smoky day." The cold wave which came on the 20th cleared the atmosphere.

Prevailing winds, north and east.

NOTES AND EXTRACTS.

RAIN AND SNOW FROM CLOUDLESS SKY.

[By Junior Professor T. RUSSELL, Signal Service.]

The 7 a. m. maps of the Signal Service have been examined for the weather conditions prevailing in the vicinities of places where rain or snow from a cloudless sky have been reported. Where the place happens to be a Signal Service station the rainfall during twenty-four hours at the place is always small, rarely exceeding 0.03 inch. But it does not follow that all of that very small amount fell from a cloudless sky. There may have been other rainfalls during the day. The maps almost invariably show rain or snow in the vicinities of these places at 7 a. m. More than half the cases were found to occur on the southwest side of an area of low barometer prevailing in some part of the country at the time, and at a distance of about 500 miles from its centre. In many cases where snow has been reported winds were sometimes as high as twenty-five miles per hour. As there has always been snow in the vicinities of the places, presumably from cloudy skies, this suggests that the snowfall from a cloudless sky may sometimes be snow carried in the upper air from a place where it is cloudy. Some of the cases of snow occur in areas of high barometer with light winds. In these the isothermal lines on the map are usually crowded in the vicinity of the place. Nine out of the eighty-one cases occurred at Burlington, Vt. This might be taken to indicate that the observer there takes a special interest in that class of occurrences and watches for them closely. Probably rain or snow from cloudless sky is a frequent occurrence at many places, but passes unnoticed.

It would seem as if rain or snow from a cloudless sky might occur at any time when a considerable volume of warm air saturated with moisture ascended and mixed with cooler air above, also saturated. Air mixing in this way, a fog or cloud would be formed which might disappear before the rain or snow reached the earth. The transition from cloud to rain would depend on the rapidity of mixing, and this would be greater, the greater the difference in temperature of the mixing volumes of air. A warm current of air above a cold one, if both were saturated, might cause a fall of rain without perceptible formation of cloud. The tendency of the clouds to mix would be caused by the friction of the currents on each other and the diffusion of moisture from the warmer to the colder current where it solidifies or liquifies. Ordinarily in the formation of cloud and rain the warm current is near the surface of the earth and the tendency to mix, which is caused by a difference in density, goes on through a great thickness of air as the warm currents ascend. The rainfall from a cloudless sky is always small. It would require mixing throughout a layer of air seventy feet thick and a reduction in its temperature from 80° Fahr. to 60° Fahr. at saturation to produce 0.01 inch of rainfall. But a fall of 0.002 inch of rain, lasting half a minute, would be very perceptible to a person out of doors, while not measurable with the ordinary rain-gauges in use. A much smaller amount of precipitation in the shape of snow would be very noticeable. One flake of snow to a cubic yard of air for a height of 200 yards for only five seconds would be a conspicuous snow storm, totally inappreciable as depth of rainfall.

Rain from a cloudless sky is frequently observed at Mauritius Island in the tropics. In the far north of the Arctic regions snow without clouds, or fine frost particles, as it is called, occurs almost daily.

In an area of low barometer or cyclone the rainfall extends principally in front, or to the east of the lowest barometer, and only a short distance back of it. The circulation of winds in a cyclone at the earth's surface is around the lowest barometer, contrary to the direction of motion of the hands of a