

## WEATHER, FORECASTS, AND WARNINGS, FEBRUARY, 1911.

By EDWARD H. BOWIE, in Charge, Forecast Division.

In the Icelandic area the barometric pressure was much above normal from the 1st to the 8th and near or below the normal thereafter. The principal depressions occurred on the 10th, 13th, 22d, and 28th, and on the last two dates the barometric readings were below 29 inches. The pressure over the middle latitudes of the north Atlantic Ocean, as shown by the daily reports from the Azores and Bermuda, fluctuated materially and was above the normal during the greater part of the month; the lowest pressure recorded in the Azores was on the 3d to 7th. High barometric pressure persisted over much of Europe until the 17th, when pronounced areas of low barometer attended by stormy weather prevailed over wide areas. Westerly gales on the 17th caused the loss of a number of vessels and lives along the German coasts, and on the 24th to 27th strong gales swept the North Sea.

Over Siberia the pressure averaged slightly above the normal for the month, and there were few well-defined barometric minima, although the pressure was considerably below the normal after the 21st.

In Alaska the barometric variations were large, but readings were generally below the normal except on the 1st, 3d to 5th, and after the 20th, except at Nome where low pressure continued until the close of the month. The principal disturbance of the month over Alaska prevailed on the 22d to 25th.

In the United States the month opened with a well-defined barometric depression over the middle Missouri Valley. This disturbance moved rapidly eastward and on the 2d was over Lake Ontario and on the 3d over the Canadian maritime provinces. During its eastward movement this depression caused high winds and heavy snows in the border States from North Dakota to New England, and was followed by a pronounced change to lower temperature on the 1st and 2d over the northern plains States, the upper Mississippi and Ohio Valleys, and the region of the Great Lakes. On the 1st and 2d unusually high temperature prevailed in the Southern States, and on the former date in the middle Mississippi Valley at a number of points the previous records of high temperature for the month of February (1871-1910) were broken. Cold-wave warnings were ordered on the 1st for the Chicago forecast district and Indiana, Ohio, and Michigan, and on the evening of that date storm warnings were displayed on the Atlantic coast from Sandy Hook to Eastport; and on the Pacific coast from Eureka to San Francisco, in connection with a disturbance that moved from the north Pacific coast on the 1st to Idaho on the 2d. On the 3d this disturbance was over Kansas and on the morning of the 4th over the lower lake region, whence it moved in 24 hours to the north Atlantic coast. During the night of the 3d and 4th this disturbance caused general precipitation east of the Mississippi River, which was in the form of rain and snow in the region of the Great Lakes and in the Middle Atlantic and New England States. An unusual number of thunderstorms occurred the night of the 3d in the Ohio Valley, the east Gulf, and in the Atlantic States as far north as southern New England. Storm warnings were ordered for the east coast of New England at 9.30 a. m. of the 4th, and high shifting winds followed during the afternoon. Another well-defined storm area made its appearance the night of the 3d on the California coast and on the morning of the 4th its center was over Nevada. Heavy rains fell in California and

rains and snows occurred in Nevada, Utah, western Colorado, and northern Arizona.

The following weekly forecast was issued February 5, 1911:

The coming week will be marked by a series of well-defined storm areas passing eastward across the United States from the Pacific Ocean in consequence of which periods of fair and foul weather will follow in quick succession. \* \* \* Marked variations in temperature will occur in practically all districts east of the Rocky Mountains.

On the morning of the 5th the center of the disturbance that appeared on the California coast on the 3d was over Kansas and on the afternoon of this date heavy snows set in over the upper Mississippi and Missouri Valleys and during the following night the area of heavy snow spread eastward over the Great Lakes. On the morning of the 5th warnings of high winds and snows were sent to the upper lake region and advisory warnings of high winds and snow were issued for Lake Michigan. On the afternoon of the 5th, a warning of snow and probably sleet was issued for Indiana, Ohio, and western Pennsylvania. The disturbance moved directly eastward, being central over Illinois on the 6th and the lower lake region on the 7th. It caused heavy snows over the Northern States east of the Mississippi River on the 6th and 7th, warnings of which were issued well in advance of their occurrence. On the 6th, northeast warnings were displayed on the Atlantic coast from Delaware Breakwater to Eastport and on the 7th warnings were continued from Block Island to Eastport. On the night of the 6th the winds on the north Atlantic coast became northeast and east and increased to the force of a gale, with snow, and continued until the night of the 7th. On the 8th this disturbance had passed to the Grand Banks with diminished intensity. A minor disturbance crossed the northern Rocky Mountain Range the night of the 6th and moved in a southerly direction to the west Gulf States, whence a secondary disturbance moved to the upper Ohio Valley on the 8th. General rains fell on the 8th in the Ohio Valley, Tennessee, and the east Gulf States, and during the day overspread the Atlantic States. The rainfall was heavy in Tennessee and the northern portions of the east Gulf States. On the 9th the center of this disturbance was over the South Atlantic States and there were rains and snows on this date throughout the Atlantic States. Following this disturbance the pressure increased decidedly and on the 10th the temperature was below freezing as far south as Tennessee and near freezing in the extreme northern portions of Mississippi, Alabama, and Georgia.

On the 9th the pressure fell rapidly over southern Alaska, and on the 10th a disturbance was shown by the weather map off the coast of Washington. On the morning of the latter date storm warnings were displayed on the Washington and Oregon coasts and later in the day they were ordered for the California coast. High winds were recorded in the area covered by the warnings the afternoon and night of the 10th, the highest velocity reported being 60 miles an hour at North Head. This disturbance covered the plateau region on the 11th and on the same date a secondary disturbance developed over the western part of the Gulf of Mexico, which caused general rains in the Gulf and southern plains States, and snow and sleet in Tennessee, and the lower Ohio and middle Mississippi Valleys. At 9.30 a. m., southeast

storm warnings were displayed on the Mississippi, Alabama, and northwest Florida coasts. This secondary depression moved directly eastward and passed off the south Atlantic coast during the 12th, being attended by general precipitation throughout the Southern States. The pressure remained abnormally low during the 10th, 11th, and 12th over the Northwestern States, the north Pacific Ocean, and Alaska, and on the morning of the 12th a disturbance of considerable intensity was off the north Pacific coast. Storm warnings were displayed from San Francisco northward on the 12th and were continued on the 13th.

The following weekly forecast was issued February 12, 1911:

The barometric pressure distribution over the North American Continent and the adjacent oceans is such as to indicate that temperatures will average considerably above the normal in the region east of the Rocky Mountains during the greater part of the coming week; west of the Rocky Mountains, temperatures will average near or below the normal. The principal disturbance of the week will prevail during the next several days west of the Rocky Mountains, cross the Middle West Wednesday or Thursday and the Eastern States the latter part of the week. This disturbance will be attended by general precipitation and be followed by a change to colder weather in northern and central States east of the Rocky Mountains.

On the morning of the 13th a disturbance began to develop over the southern plains States, being quickly followed by a general increase in cloudiness in the Middle West and rains set in over the Mississippi Valley and the plains States. On the 14th the center of this disturbance was over Iowa and the area of precipitation had overspread practically all districts from the Mississippi and Missouri Valleys eastward, there being snows in the northern States from the lake region eastward and thunderstorms in the upper Mississippi Valley. Storm warnings were displayed on the 13th on the west Gulf coast, and on the 14th northeast warnings were ordered for the southern coasts of New England and advisory warnings were issued to the open ports on Lake Michigan. Low temperatures overspread the Pacific coast on the night of the 13th and snow fell in northern California, where temperatures were as low as the freezing point. Frost warnings were issued for all of California the night of the 14th and on the 15th and 16th, on which dates and also on the 17th abnormally cool weather prevailed at all California stations. The barometric pressure increased decidedly over the St. Lawrence Valley on the 15th and 16th and abnormally low temperatures were recorded in New England on those dates. On the 16th the pressure began to fall rapidly over the upper Mississippi Valley where there were rains and thunderstorms, and on the morning of the 17th a low appeared over the Great Lakes which moved rapidly eastward, attended by rains and snows in Northern States, and passed to the Canadian maritime Provinces on the 18th. The pressure remained low during the 16th, 17th, and 18th in the Southern and Western States, causing general rains in those regions and rains and snows in the middle plains States, the Mississippi and Ohio Valleys and the middle Rocky Mountain region. The precipitation that occurred in connection with this disturbance afforded much-needed relief from the long-continued drought in the southern plains States and western Texas.

The following weekly forecast was issued February 19, 1911:

The coming week will be one of low temperatures in practically all districts east of the Rocky Mountains and generally fair weather preceded, however, by snows in Northern and Central and rains in Southern States east of the Mississippi River Monday and Monday night. An extensive area of cold weather that covers the plains States and the

Northwest will advance eastward and southward and cause frosts and freezing temperatures Monday and Tuesday in the Gulf States and Tuesday and Wednesday in the South Atlantic States except southern Florida.

On the 19th the center of a disturbance was over the lower Mississippi Valley and the precipitation attending it was widespread; there being a continuation of heavy rains in the Southwestern States and snows in the southern Rocky Mountain region, the middle plains States, and the middle Mississippi Valley. On the morning of the 19th warnings of heavy snow were issued for Missouri, Illinois, Indiana, Ohio, western Pennsylvania, West Virginia, and northern Kentucky, and storm warnings were displayed on the middle and west Gulf coasts. This disturbance moved rapidly northeastward and reached the middle Atlantic States the morning of the 20th and passed to the Canadian maritime Provinces in the next 24 hours. Storm warnings were ordered for the Atlantic coast from Delaware Breakwater to Boston on the 19th. The barometric pressure continued to increase in the Northwest from the 18th to 21st, and on the latter date the highest reading, 31.10 inches at Miles City, Mont., was recorded. This high carried colder weather with freezing temperature and frosts to the Gulf and south Atlantic States. Ample warnings were issued to all interests likely to be affected by freezing temperature and frosts. The importance of such warnings was made most urgent because of the advanced state of vegetation throughout the Southern States due to an unusually long period of high temperatures in these States. At the time that the cold wave with freezing temperatures overspread the Southern States fruit trees were in bloom as far north as Arkansas and Tennessee. There was considerable damage because of the freeze, detailed reports of which will be found elsewhere in this number of the Review.

The following weekly forecast was issued February 26, 1911:

Low temperatures will prevail over much of the country during the coming week, as a result of abnormally high barometric pressure over Alaska and the British Northwest. The principal disturbance to cross the country during the coming week is now over the western plateau region; it will cross the Middle West Monday night and Tuesday and reach the Atlantic States Tuesday or Wednesday; it will be attended by snows in northern, rains and snows in middle, and rains in southern States from the Rocky Mountains to the Atlantic coast during the first half of the week.

A disturbance of moderate intensity developed in the Northwest on the 24th; on the 25th it was central over the Missouri Valley, on the 26th over the Great Lakes, and on the 27th over the lower St. Lawrence Valley.

This disturbance was preceded by a general rise in temperature and attended by local rains and snows in the Mississippi Valley and over the Great Lakes, and by rains over the Ohio Valley and at scattered points in the Gulf States. The pressure increased decidedly in the Northwestern States on the 25th and 26th and colder weather overspread this region on these dates, and by the 27th the area of falling temperature advanced eastward to the Atlantic States and southward to the northern portions of the Gulf States. Cold-wave warnings were issued the morning of the 26th for the extreme upper Mississippi Valley and northern Michigan and on the 27th for northern New England and extreme northern New York. On the 26th and 28th the southern Rocky Mountain Plateau was under the influence of low barometric pressure and snows were general over the southern Rocky Mountain and plateau regions and rains fell in California. Snow flurries occurred in central Cali-

ifornia on the 27th. On the 28th the area of snows spread from the Rocky Mountains eastward over the southern plains States to the Ohio Valley and Tennessee.

Average temperatures and departures from the normal.

| Districts.                     | Number of stations. | Average temperatures for the current month. | Departures for the current month. | Accumulated departures since January 1. | Average departures since January 1. |
|--------------------------------|---------------------|---|-----------------------------------|---|-------------------------------------|
| New England.....               | 13                  | 23.2  | -2.5                              | + 0.8                                   | +0.4                                |
| Middle Atlantic.....           | 15                  | 34.4  | -1.7                              | + 3.1                                   | +1.6                                |
| South Atlantic.....            | 10                  | 51.5  | +3.7                              | + 8.3                                   | +4.2                                |
| Florida Peninsula*.....        | 8                   | 65.0  | +3.4                              | + 7.5                                   | +3.8                                |
| East Gulf.....                 | 11                  | 56.9  | +6.0                              | +12.3                                   | +6.2                                |
| West Gulf.....                 | 10                  | 55.6  | +6.4                              | +14.5                                   | +7.2                                |
| Ohio Valley and Tennessee..... | 13                  | 41.5  | +5.3                              | +11.2                                   | +5.6                                |
| Lower Lakes.....               | 10                  | 26.8  | +2.4                              | + 5.7                                   | +2.8                                |
| Upper Lakes.....               | 12                  | 24.6  | +5.6                              | + 7.4                                   | +3.7                                |
| North Dakota*.....             | 9                   | 6.1   | +0.3                              | - 6.8                                   | -3.4                                |
| Upper Mississippi Valley.....  | 14                  | 31.1  | +6.5                              | + 9.7                                   | +4.8                                |
| Missouri Valley.....           | 12                  | 29.6  | +5.2                              | +10.6                                   | +5.3                                |
| Northern slope.....            | 9                   | 19.3  | -2.2                              | - 0.4                                   | 0.0                                 |
| Middle slope.....              | 6                   | 34.7  | +2.4                              | +10.2                                   | +5.1                                |
| Southern slope*.....           | 8                   | 46.2  | +4.1                              | +11.9                                   | +6.0                                |
| Southern Plateau*.....         | 11                  | 41.7  | -2.2                              | + 2.9                                   | +1.4                                |
| Middle Plateau*.....           | 10                  | 38.2  | -1.0                              | + 4.5                                   | +2.2                                |
| Northern Plateau*.....         | 10                  | 37.6  | -3.0                              | - 2.1                                   | -1.0                                |
| North Pacific.....             | 7                   | 39.2  | -1.5                              | - 3.1                                   | -1.6                                |
| Middle Pacific.....            | 5                   | 46.5  | -3.2                              | - 2.6                                   | -2.3                                |
| South Pacific.....             | 4                   | 50.2  | -3.2                              | 0.0                                     | 0.0                                 |

\* Regular Weather Bureau and selected cooperative stations.

Average precipitation and departures from the normal.

| Districts.                     | Number of stations. | Average.       |                       | Departure.     |                              |
|--------------------------------|---------------------|----------------|-----------------------|----------------|------------------------------|
|                                |                     | Current month. | Percentage of normal. | Current month. | Accumulated since January 1. |
| New England.....               | 11                  | 2.79           | 85                    | -0.5           | -1.5                         |
| Middle Atlantic.....           | 15                  | 2.02           | 63                    | -1.2           | -1.3                         |
| South Atlantic.....            | 11                  | 1.18           | 29                    | -2.9           | -5.3                         |
| Florida Peninsula*.....        | 8                   | 0.17           | 6                     | -2.9           | -4.8                         |
| East Gulf.....                 | 11                  | 2.53           | 53                    | -2.2           | -4.0                         |
| West Gulf.....                 | 10                  | 2.54           | 86                    | -0.4           | -2.9                         |
| Ohio Valley and Tennessee..... | 13                  | 2.68           | 75                    | -0.9           | -1.0                         |
| Lower Lakes.....               | 10                  | 2.63           | 108                   | +0.2           | 0.0                          |
| Upper Lakes.....               | 12                  | 2.07           | 124                   | +0.4           | -0.2                         |
| North Dakota*.....             | 9                   | 0.98           | 204                   | +0.5           | +0.9                         |
| Upper Mississippi Valley.....  | 15                  | 2.45           | 140                   | +0.7           | +0.3                         |
| Missouri Valley.....           | 12                  | 2.71           | 268                   | +1.7           | +1.1                         |
| Northern slope.....            | 9                   | 0.69           | 87                    | -0.1           | +0.4                         |
| Middle slope.....              | 6                   | 2.35           | 313                   | +1.6           | +1.0                         |
| Southern slope*.....           | 8                   | 2.92           | 288                   | +1.9           | +1.2                         |
| Southern Plateau*.....         | 11                  | 1.35           | 142                   | +0.4           | +0.9                         |
| Middle Plateau*.....           | 11                  | 1.61           | 133                   | +0.4           | +1.2                         |
| Northern Plateau*.....         | 10                  | 0.89           | 60                    | -0.6           | -0.9                         |
| North Pacific.....             | 7                   | 2.58           | 43                    | -2.9           | -3.3                         |
| Middle Pacific.....            | 7                   | 2.77           | 66                    | -1.4           | +4.9                         |
| South Pacific.....             | 4                   | 3.46           | 141                   | +1.0           | +5.4                         |

\* Regular Weather Bureau and selected cooperative stations.

Average relative humidity and departures from the normal.

| Districts.                     | Average. | Departure from the normal. | Districts.            | Average. | Departure from the normal. |
|--------------------------------|----------|----------------------------|-----------------------|----------|----------------------------|
| New England.....               | 73       | - 2                        | Missouri Valley.....  | 76       | + 1                        |
| Middle Atlantic.....           | 74       | 0                          | Northern slope.....   | 74       | + 3                        |
| South Atlantic.....            | 77       | + 1                        | Middle slope.....     | 67       | 0                          |
| Florida Peninsula.....         | 81       | + 1                        | Southern slope.....   | 63       | - 5                        |
| East Gulf.....                 | 76       | 0                          | Southern Plateau..... | 63       | +19                        |
| West Gulf.....                 | 73       | - 1                        | Middle Plateau.....   | 71       | + 7                        |
| Ohio Valley and Tennessee..... | 76       | + 2                        | Northern Plateau..... | 70       | - 5                        |
| Lower Lakes.....               | 79       | - 1                        | North Pacific.....    | 79       | - 2                        |
| Upper Lakes.....               | 80       | - 2                        | Middle Pacific.....   | 75       | - 1                        |
| North Dakota.....              | 90       | +10                        | South Pacific.....    | 71       | + 2                        |
| Upper Mississippi Valley.....  | 77       | 0                          |                       |          |                            |

Average cloudiness and departures from the normal.

| Districts.                     | Average. | Departure from the normal. | Districts.            | Average. | Departure from the normal. |
|--------------------------------|----------|----------------------------|-----------------------|----------|----------------------------|
| New England.....               | 6.2      | +0.9                       | Missouri Valley.....  | 4.9      | -0.3                       |
| Middle Atlantic.....           | 6.3      | +0.8                       | Northern slope.....   | 4.4      | -0.7                       |
| South Atlantic.....            | 4.9      | -0.4                       | Middle slope.....     | 4.8      | +0.4                       |
| Florida Peninsula.....         | 3.6      | -0.7                       | Southern slope.....   | 6.2      | +1.4                       |
| East Gulf.....                 | 6.2      | +0.6                       | Southern Plateau..... | 4.5      | +0.9                       |
| West Gulf.....                 | 6.1      | +0.5                       | Middle Plateau.....   | 5.4      | +0.3                       |
| Ohio Valley and Tennessee..... | 6.5      | +0.3                       | Northern Plateau..... | 6.1      | -0.1                       |
| Lower Lakes.....               | 7.3      | +0.5                       | North Pacific.....    | 6.0      | -1.1                       |
| Upper Lakes.....               | 6.9      | +0.6                       | Middle Pacific.....   | 4.6      | -1.0                       |
| North Dakota.....              | 3.9      | -1.1                       | South Pacific.....    | 4.3      | 0.0                        |
| Upper Mississippi Valley.....  | 5.8      | +0.6                       |                       |          |                            |

Maximum wind velocities.

| Stations.               | Date. | Velocity. | Direction. | Stations.                | Date. | Velocity. | Direction. |
|-------------------------|-------|-----------|------------|--------------------------|-------|-----------|------------|
| Block Island, R. I..... | 4     | 52        | se.        | North Head, Wash...      | 10    | 64        | se.        |
| Do.....                 | 7     | 52        | e.         | Do.....                  | 12    | 84        | se.        |
| Do.....                 | 27    | 50        | nw.        | Do.....                  | 13    | 60        | sw.        |
| Buffalo, N. Y.....      | 2     | 56        | sw.        | Do.....                  | 24    | 55        | nw.        |
| Do.....                 | 23    | 64        | sw.        | Do.....                  | 25    | 50        | nw.        |
| Do.....                 | 24    | 52        | sw.        | Pensacola, Fla.....      | 19    | 60        | s.         |
| Burlington, Vt.....     | 17    | 54        | s.         | Point Reyes Light, Cal.  | 1     | 51        | s.         |
| Detroit, Mich.....      | 6     | 50        | e.         | Do.....                  | 10    | 65        | s.         |
| Duluth, Minn.....       | 21    | 55        | w.         | Do.....                  | 12    | 54        | s.         |
| Do.....                 | 22    | 56        | w.         | Do.....                  | 13    | 70        | nw.        |
| Eastport, Me.....       | 4     | 50        | se.        | Do.....                  | 23    | 52        | nw.        |
| Memphis, Tenn.....      | 3     | 50        | nw.        | Do.....                  | 24    | 83        | nw.        |
| Mount Tamalpais, Cal.   | 10    | 50        | sw.        | Do.....                  | 25    | 83        | nw.        |
| Do.....                 | 12    | 52        | sw.        | Do.....                  | 26    | 59        | nw.        |
| Do.....                 | 24    | 62        | nw.        | Do.....                  | 28    | 50        | sw.        |
| Do.....                 | 25    | 66        | nw.        | Sioux City, Iowa.....    | 1     | 51        | nw.        |
| Do.....                 | 26    | 50        | nw.        | Southeast Farallon, Cal. | 10    | 54        | sw.        |
| Mount Weather, Va.....  | 2     | 64        | nw.        | Do.....                  | 13    | 50        | nw.        |
| Do.....                 | 10    | 54        | w.         | Do.....                  | 24    | 53        | nw.        |
| Do.....                 | 20    | 68        | nw.        | Do.....                  | 25    | 62        | nw.        |
| Do.....                 | 21    | 54        | w.         | Syracuse, N. Y.....      | 2     | 55        | s.         |
| Do.....                 | 23    | 50        | nw.        | Tatoosh Island, Wash.    | 4     | 50        | s.         |
| Do.....                 | 24    | 50        | w.         | Do.....                  | 12    | 60        | s.         |
| Do.....                 | 28    | 52        | nw.        | Do.....                  | 13    | 62        | se.        |
| Nantucket, Mass.....    | 7     | 52        | e.         |                          |       |           |            |
| North Head, Wash.....   | 4     | 58        | se.        |                          |       |           |            |