

MONTHLY WEATHER REVIEW,

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WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

The present review of atmospheric phenomena during February, 1876, is based upon—

FIRST. The simultaneous observations as telegraphed from one hundred and thirty-four stations and charted three times a day at this office for study, and the preparation of the published weather predictions.

SECOND. The reports of means and abstracts from four hundred and forty-two stations, which are classified as Canadian, Naval Hospitals, Army Post Surgeons, Civilian Volunteers, Marine Records, and those of the United States Signal Service.

THIRD. Manuscript and printed documents and reliable newspaper reports.

The principal features of the weather for the month have been: First, the average northerly courses of the areas of low barometer and the formation of barometric troughs and ridges; Second, the high barometer in the Southern States; Third, the high temperature in all districts except the extreme northern stations; Fourth, the gales of February 1, 2 and 15, and the tornadoes in Missouri, Illinois and Indiana of the 13th and 27th.

BAROMETRIC PRESSURE.

In general.—The general distribution of atmospheric pressure during the month is shown by the isobars upon Chart No. II. The general distribution of pressure resembles that of February, 1875, but the barometer has averaged from .05 to .15 of an inch lower in the extreme northern sections of the country, and the area of maximum pressure, (30.20) which, in the past month, covered a large portion of the Gulf States from Louisiana to Georgia, was, in 1875, confined to a very small portion of northern Georgia and Alabama. The isobars for February, 1875 and 1876, show that during these months the area of high barometer over the tropical portion of the Atlantic encroached upon the North American continent to a very much larger extent than in February, 1874. The areas of high barometer have advanced eastward over more extensive regions than in December, 1875, or January, 1876, but have not had the extent recorded in previous winters. The paths of the areas of low barometer differ in many respects from those recorded in February, 1874 and 1875: they have been confined to the northern half of our territory, and have moved eastward rather than northeastward.

In general it would seem that, during the present winter, extensive areas of cold air have pressed outward from the northern and interior portions of the Eastern and Western continents, but, owing to preponderating extent and influence of the former continent, the air over the Atlantic has been pushed westward, so that there has been a tendency towards higher pressures and moister, warmer air in the Southern and Atlantic States, while lower temperatures and higher pressures have prevailed in British America.

Arcas of Low Barometer.—No. I. Average movement, 37 miles per hour. The beginning of this depression was chronicled as area No. XII, in January, which, at midnight of the 31st, appears as a barometric trough, extending from Northern Texas northeastward to the Straits of Mackinaw and possibly still further. During the 1st of February this trough contracted into a well-defined oval area, which moved eastward to Pennsylvania and thence northeastward over Maine and the Gulf of St. Lawrence. The central barometric depressions were: February 1st, 7:35, a. m., 29.65; 4:35, p. m., 29.25; 11, p. m., 29.15; February 2d, 7:35, a. m., 28.75; 4:35, p. m., 28.25, or less. The velocity of the warm southerly winds that prevailed over a large extent of territory, in advance of this storm-center, was no where recorded as higher than 32 miles an hour, but remarkably severe north and northwest winds followed the depression, whose limits may be defined as follows: February 1st, 7:35, a. m., north and northwest winds, of from 25 to 35 miles per hour prevailed over the country between Lake Superior and northern Texas; February 1st, 4:35, p. m., north and northwest winds, from 25 to 40 miles per hour prevailed from central Michigan and Wisconsin, on the north, to the coast of Louisiana and Texas, on the south; February 1st, 11, p. m., north and northwest winds of 25 miles per hour, prevailed from central Michigan and Lake Erie to Tennessee, also, a northerly wind of 30 miles, on the Texas coast and a west or southwest wind, of 30 miles, on the Carolina and middle Atlantic coasts; February 2d, 7:35, a. m., the wind continued north, 30 miles, on the Texas coast and was

reported northwest, from 25 to 40 miles, on portions of Lakes Erie and Ontario and the upper portions of the St. Lawrence, and from 25 to 70 miles in the Middle Atlantic States, southeastern New York and Connecticut; a southeast wind, of 38 miles, prevailed at Eastport; February 2d, 4:35, p. m., north-west winds, 25 to 40 miles, prevailed on the middle and east Atlantic coast, the St. Lawrence valley and intermediate stations; southwest and south winds, 25 to 30 miles, prevailed in Nova Scotia and New Brunswick; February 2d, 11, p. m., north and west winds, 25 to 50 miles, prevailed in the lower St. Lawrence, New Brunswick and Nova Scotia.

Nos. II and III. Average movements, 36 and 44 miles per hour, respectively. Depression No. II. developed during the 2d of February, on the eastern slope of the Rocky Mountains, in the region between Nebraska and the Indian Territory, over which southeast winds were blowing, while high barometer, No. I, was central in Arkansas. The temperature rose rapidly in Kansas and Nebraska during the day and increasing winds at once set in towards this region, both from Dakota on the north and Texas on the south. This depression moved slowly southward and was in Indian Territory on the morning of the 3d, at which time rain prevailed in Texas, but snow was reported in Arkansas, Indian Territory, Missouri, Illinois and Michigan; the temperature had fallen rapidly with increasing westerly winds on Pike's Peak and at most stations west of the 97th meridian. February 3d, 4:35, p. m., the depression was central in Louisiana and had also fallen over the Lake region, over the northern portion of which a new storm-center appears, while snow prevailed over the belt, extending from Arkansas and Mississippi to Upper Canada. February 3d, 11, p. m., No. II had moved southeastward to the Louisiana coast, followed by a "norther" to the westward, while No. III had moved southeast into Upper Canada, with falling barometer. The lowest pressure, which at this time extended from Louisiana to Upper Canada, was bounded on the east by the remnant of high barometer, No. I, the maximum pressure being in Nova Scotia, and was bounded on the west by high barometer, No. II. Depression, No. II, seems during the next twenty-four hours to have moved eastward through the Gulf, and to have disappeared after degenerating into local rain-storms. No. III moved eastward over the Gulf of St. Lawrence (the pressure fell to 29.50 at Cape Breton,) and possibly developed into larger proportions on the Atlantic Ocean.

No. IV. Average movement, 50 miles per hour. The great development of high barometer, No. II, was as usual attended by a steady fall of pressure on the Pacific coast, which reached its minimum in Oregon at 11 p. m. of the 4th, at which time, also, the pressure was low in Dakota, Colorado and Nevada, this whole region being apparently on the southern border of a depression that extended far northward into British America. February 5th, 4:35, p. m. The central depression appears as extending from Nebraska northeastward over Minnesota, and at 11, p. m., stretched as a barometric trough from Kansas to Lake Superior, with decidedly higher pressures to the northwest. During the 6th the pressures fell, with warm southerly winds, followed by cloud and rain over the Gulf and South Atlantic States and Lower Lakes, and a small portion of the barometric depression disappeared in Texas, while the greater portion passed northeastwardly over the Upper Lakes into Canada, and was, on the morning of the 7th, beyond our cognizance.

Nos. V and VI. Average movements, 36 and 50 miles per hour, respectively. The pressure remained high throughout the country, and especially in the Atlantic States, and southeast winds prevailed in the Gulf States during the 7th, 8th and 9th, but northeast winds over the Upper Lakes and, to some extent, over the Northwest, while an area of very low pressure advanced upon northern California and Oregon. The resulting northeast and southerly winds, at 11 p. m., February 8th, met along a line of rain and strongly contrasted temperatures, extending from northern Kansas eastward to southern Michigan. As so frequently happens in these cases, the lowest pressure appeared at the western end of this belt; it is marked as area No. V on the accompanying Chart, and traveled rapidly eastward, passing over Lake Erie on the afternoon of February 9th, and disappearing off Cape Cod on the morning of the 10th. Meanwhile the barometer fell continuously at the Rocky Mountain stations, and area No. VI appears central on the 9th, at 11 p. m., in Wyoming Territory, whence it moved eastward into Dakota, and was, at 11 p. m. of the 10th, central on Lake Superior, while an extension of the depression southeastward into Indian Territory was accompanied by a rapid inflow of cold; northwest winds and a southward extension of the area of rain; rain prevailed on the 11th from the Gulf coast to the Middle States and New England, while the barometric depression moved northeastward, into Canada.

No. VII. Average movement, 36 miles per hour. This depression appears on the morning of the 11th in Oregon, attended by southerly winds and rain in northern California. The pressure fell steadily at the northwestern stations till, at 7.35 a. m., February 12, the lowest barometer was in southeastern Dakota and northwestern Iowa, with rapidly rising temperature; and low pressures to the north of it. The storm-centre continued moving southeastward into Nebraska until the 12th, 4.35 p. m., whence it moved eastward over Iowa, and by the 13th, 7.35 a. m., covered an oval area, reaching from northern Illinois to Indian Territory. During the day this area trebled its dimensions, and, at 4.35 p. m., the lowest pressure, which had fallen .29, extended from Cairo to near Indianapolis. Its course now turned north-northeast over Lake Huron, and on the 14th, 4.35 p. m., it was beyond the limit of our maps. Between the 13th, 11 p. m., and the morning of the 14th, heavy rain fell in the Eastern Gulf States, and, during the rest of the 14th, in the South Atlantic, while the barometer fell decidedly from those regions to West Virginia, giving rise to the subsidiary storm-centre represented on Map No. I as passing eastward on the 14th over Virginia. During the 15th this latter

moved north-northeastward, and, like its predecessor, developed into a storm of remarkable severity; it moved with an average velocity of 30 miles per hour, and disappeared on the morning of the 16th to the north of the lower St. Lawrence. The tornado that accompanied the storm-centre on the 13th from Missouri to Indiana is mentioned in the chapter on local storms. The barometric depression attending the second branch of this storm was as follows: 14th, 11 p. m., 29.50; 15th, 7.35 a. m., 29.20; 4.35 p. m., 28.75; 11 p. m., 28.90, or less. The high winds attending this storm were as follows: February 15th, 7.35 a. m., northeast winds, 20 to 45 miles, over Maine and the St. Lawrence valley; northwest winds, 20 miles, from northern New York to North Carolina; southeast winds 20 to 30 miles, on the middle Atlantic coast; February 15, 4.35 p. m., northwest winds, 25 to 35 miles, in New York and Pennsylvania; southwest winds, 25 to 40 miles, in New Jersey and Connecticut; south and east winds, 25 to 50 miles on the coasts of Massachusetts and Maine; February 15th, 11 p. m., northwest winds, 25 to 35 miles, Lake Ontario; southwest winds, 25 to 35 miles on the New England coasts; northeast winds, 25 to 35 miles over New Brunswick and the lower St. Lawrence.

No. VIII. Average movement, 30 miles per hour. The pressure fell rapidly on the 17th in Dakota and Manitoba, while it rose also rapidly in Oregon, indicating that No. VIII was at that time moving southeastward toward Manitoba, if, indeed, it did not originate near that station. On the 18th, 7.35 a. m., while high barometer and calms prevailed on the Pacific coast, the depression moved eastward toward Lake Superior, over which its southern extremity was central at 4.35 p. m., while brisk, cold northwest winds and clear weather rapidly followed in its rear. In its farther progress this depression remained almost entirely to the north of our stations. It was, on the 20th, 7.35 a. m., north of the Gulf of St. Lawrence, after which it seems to have turned southeastward, as indicated by a rapid fall in the barometer at Cape Breton.

No. IX. Average movement, 29 miles per hour. This depression is first located on the 19th, 4.35 p. m., near the Black Hills of Wyoming and Dakota, and it most probably was initiated on the previous day in the country to the northwestward of that region. The central depression moved slowly eastward until, on the 20th, at 4.35 p. m., it extended from Kansas northeastward into the southern portion of Minnesota. On its eastern side warm southerly winds prevailed, while cold northwest winds were reported from stations a little further westward. In its eastward progress this depression rapidly developed into a very long trough, extending from Texas to beyond Lake Superior, which trough was, by the rapid advance of northwest winds, divided into two portions, of which the southern one appears only as an area of cloud and rain, moving southeastward over Texas and the Gulf of Mexico, on the 21st, 22d and 23d, while the northern portion pursued the course marked on Chart No. I, over the Lakes and the St. Lawrence valley. It was accompanied by rains and southerly winds over the Lower Lakes, and at 11 p. m., February 21st, while central near Lake Ontario, gave rise to a slight depression in North Carolina. On the 23d, when central over the Gulf of St. Lawrence, the barometer began there to fall rapidly, accompanied by very cold, brisk northwest winds in the Middle and Eastern States.

No. X. Average movement, 19 miles per hour. A rapid fall in the barometer, on the 23d, in Manitoba and Dakota and a much more moderate fall in Oregon and Montana, indicates that depression No. X was on that day in British America, on the eastern slope of the Rocky Mountains. On the 24th, 7.35 a. m., it was central in western Dakota, at 4.35 p. m., in eastern Dakota, and at 11 p. m., in southern Dakota; the temperature had risen decidedly in Minnesota, Dakota and southward to the Gulf States. During the 25th and 26th its course was south-southeastward until at 7.35 a. m., of the 27th, it was central in northwestern Missouri. Up to this time northeast winds, increasing to a gale on Lake Superior, stationary or rising barometer, with cloud and rain or snow, had prevailed over the Lake region and Minnesota, and on the 26th, at 11 p. m., the belt of strongly contrasted temperatures separating the area of warm southerly from that of cold north and east winds extended from Pennsylvania and Lake Ontario westward over Iowa and thence southward over Nebraska and Kansas. On the 27th the storm-center moved rapidly eastward over northern Illinois, Indiana and Ohio, accompanied by high northeast winds on the Lakes and by local storms or tornadoes in southern Missouri, Illinois, Indiana and Ohio, which are referred to in their appropriate places. During the 28th a subsidiary depression was formed on the Middle Atlantic coast, and the original one seems to have disappeared in passing over the Alleghanies.

No. XI. This depression appears off the coast of California on the 27th, at which time the barometer rose at most of the Rocky Mountain stations, apparently under the influence of the flow of air from the northeast. The minimum pressure was experienced at San Francisco and Portland, Or., during the evening of the 27th and the early morning of the 28th. Brisk and high southerly winds prevailed on the California coast, with rain throughout its whole extent. The depression became sensible by 11 p. m., of the 28th, in Colorado, Wyoming and Montana; a high pressure was then prevailing, with cold northeast winds in Dakota and Manitoba and eastward; while northerly winds and high pressure continued to prevail in these latter territories, the barometric depression extended rapidly southward into Texas, but was, at 11 p. m., of the 29th, central in eastern Kansas and Nebraska. The subsequent history of this depression belongs to March.

Areas of High Barometer.—The great depression recorded as storm-centre No. I was accompanied not only by an inflowing air and temporary rise of pressure on the Atlantic coast, but by a still more marked rise at the Pacific and some of the Rocky Mountain stations. On the morning of the 1st, the maximum

pressure probably extended from Fort Garry southwestward into Dakota, the lowest temperatures being -37° , or lower, and the winds nearly calm, while to the southward brisk northwest winds prevailed, as has been previously stated. February 1st, 4:35 p. m., the area of highest pressure and calms was confined to the northeastern corner of Dakota; at midnight the area of calms included pretty much all of Minnesota, while the area of highest pressure had moved rapidly southward into Missouri and northern Texas. February 2d, 7:35 a. m., the highest pressure of 30.50 was central in Arkansas; 2d, 4:35 p. m., the highest pressure, 30.40, was central from Tennessee to Ohio; 2d, 11 p. m., the highest pressure, 30.50, was central in Pennsylvania and northern Virginia; 3d, 7:35 a. m., the highest pressure, 30.60, was central off the middle Atlantic coast.

No. II. The cold air on the northern side of low barometer No. III on the morning of the 3d formed a well-defined area of high pressure, which was central in the afternoon in Dakota and at midnight in Nebraska. On the morning of the 4th a pressure of 30.60 is recorded in Missouri, while the area of 30.55 extended thence as a barometric ridge northward to Minnesota and southwestward to Texas. February 4th, 4:35 p. m., the highest pressure, 30.60, was central in southern Illinois; by 11 p. m. an influx of very cold air from Canada gave the area of 30.60 an oval outline, extending from Arkansas to Virginia, thence northward over Upper Canada. February 5th, 7:35 a. m., very remarkable increase in the extent of this area had taken place, the isobar of 30.60 having scarcely changed its position on the west, but having pushed rapidly to the southeast and northeast, the highest pressure was now 30.95 in northern New England; by 4:35 p. m., the isobar of 30.60 had moved decidedly eastward, and the highest pressure, 30.98, was off the New England coast. During the remarkable rise in pressure which had taken place during the preceding 24 hours over the Middle and Eastern States, the temperature remained abnormally low on the summit of Mt. Washington, as compared with stations at sea-level, and the wind continued north and northwest from 80 to 40 miles. February 5th, 11 p. m., the isobar of 30.90 included the middle and east Atlantic coasts, New Brunswick and Nova Scotia, while a higher pressure prevailed to the eastward, as shown by the reports of 30.99 at Halifax, 30.96 to 30.99 on most stations on the east Atlantic coast, and 31.01 at Wood's Hole. It is therefore evident that the pressure in this area of high barometer was the highest on record for that portion of the United States. After this the pressure rapidly diminished.

No. III. This area followed closely in the rear of low barometer No. VI, but passed to the southeastward, and, on the morning of the 12th, reached the Atlantic coast.

No's. IV and V. The flow of cold air from the north in the rear of low barometer No. VII produced a maximum pressure of 30.59 at 4:35 p. m., on the 15th, while the pressure was simultaneously rising both in California and the Northwest. The maximum (30.45) was reached in the latter section on the 16th, at 11 p. m., by which time the pressure had fallen in Oregon to 30.29. The central area of highest pressure was rapidly transferred to the south and east, being, on the 17th, at 11 p. m., over the Gulf States and Tennessee, while a new depression, No. VIII, was developed in Dakota and Manitoba. The barometer continued high during the 18th over the Southern and Atlantic States, the highest pressure extending, at 11 p. m., from Mississippi to Virginia. During the 19th, this area moved slightly eastward, and was joined by a small area of high barometer, No. V, which had moved southeastward over the upper Mississippi in the rear of low barometer No. VIII. The conjoined areas, No's. IV and V, extended, on the 20th, at 11 p. m., from Upper Canada to Virginia, whence they moved slowly southeastward, and were, on the 21st, at 11 p. m., east of New England and New Brunswick.

No. VI. This area followed closely in the rear of depression No. IX, which, as before stated, extended, on the 21st, as a trough from Texas to the Upper Lakes. The high pressure appeared at 4:35 p. m., of the 21st, to extend from Manitoba to Kansas and Missouri; its southern portion, however, moving rapidly southeastward, was, on the 22d, at 4:35 p. m., in Texas, while the northern portion continued stationary with rising pressure, and was, on the 23d, 7:35 a. m., central in Minnesota, with a maximum pressure of 30.85; moving southeastward it was, at 4:35 p. m., central in the upper Mississippi valley with a pressure of 30.60; and, at 11 p. m., central at Cairo, pressure 30.50. During the 24th it moved southeastward, and disappeared on the 25th off the South Atlantic coast.

No. VII. The rising barometer in the rear of depression No. X extended from the Upper Lakes and Northwest southward to the Gulf during the 28th and morning of the 29th, and seems to have been hindered in its progress eastward by the presence of a very remarkable depression (No. XI) on the California coast.

TEMPERATURE OF THE AIR.

The general distribution of the temperature of the air is shown by the isothermal lines upon Chart No. II. The average temperature has been above its normal value, except for stations in the extreme northern part of Minnesota and the St. Lawrence valley. A tendency has been apparent during the month to the formation of an area of cold northeast winds at our northern stations, simultaneously with the prevalence of warm southerly winds at stations south of the Lake region; the dividing belt passing generally eastward from Iowa to New York and Pennsylvania.

Maximum Temperatures.—Northern stations. At Pembina, 32° ; St. Paul, 46° ; Pike's Peak, 29° ; Mount Washington, 34° ; Escanaba, 39° ; Eastport, 45° ; Breckenridge, 34° . Southern stations: Jacksonville, Fla., 83° ; Key West, 85° ; Savannah, 80° ; Brownsville, Texas, 83° .