

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for February, 1899, is based on about 2,762 reports from stations occupied by regular and voluntary observers, classified as follows: 162 from Weather Bureau stations; numerous special river stations; 32 from post surgeons, received through the Surgeon General, United States Army; 2,385 from voluntary observers; 96 received through the Southern Pacific Railway Company; 29 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 31 from Canadian stations; 10 from Mexican stations; 7 from Jamaica, W. I. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological and Magnetic Observatory of Mexico; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kim-

ball, Superintendent of the United States Life-Saving Service; and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

During the first half of February the most remarkable cold wave, or series of cold waves, in the history of the Weather Bureau traversed the United States from the north Pacific to the south Atlantic coasts, damaging crops and fruits in the Southern States to the extent of millions of dollars. During the first eight days of the month the lowest temperatures on record were reported at points in the north Pacific coast States; from the 9th to the 12th many places in the Central, Western, and Northwestern States reported the coldest weather on record. During the 13th and 14th the cold wave overspread the Southern and Eastern States, attended, on the 13th, by the lowest temperatures on record from the southern Rocky Mountain slope to the south Atlantic coast, by zero temperatures to the Gulf coast of Alabama, and by a snowstorm of unprecedented severity in the Middle Atlantic States.

The visible cause of this period of intense cold is found in a series of barometric depressions in the South, combined with an area of high barometer of great magnitude which persistently occupied the British Northwest Territory until the 11th, inclusive, when the highest sea-level pressure ever reported within the region of observation covered by the Weather Bureau and Canadian services, 31.42 inches, was telegraphed from Swift Current, Assiniboia. After the 11th this area of high barometer settled southward over the eastern Rocky Mountain slope and the central valleys, causing the severest winter weather ever experienced generally over the southern

half of the country east of the Rocky Mountains. The meteorological conditions presented by the daily weather maps during the eastern and southern advance of the cold wave are shown on Charts X and XI. It will be observed, by a comparison of these maps with the Weather Bureau forecasts and warnings issued, that ample and timely warning of the advance of the cold wave was given to all interests that were likely to be injuriously affected by intense cold. It will also be noted that special reports and newspaper comments made in connection with the cold-wave visitation give unquestionable evidence that the warnings prompted protective measures, whereby crops, live stock, and perishable goods and merchandise to the value of hundreds of thousands of dollars were saved.

As early as the evening of February 10, Santa Fe, Oklahoma, and stations in the interior of Texas were notified of the approach of a severe cold wave. On the 11th cold-wave signals were ordered for the Texas coast, New Orleans, Mobile, Meridian, Pensacola, Atlanta, and Montgomery, and the warnings were distributed throughout the States represented by the stations named. Jacksonville, Fla., was advised on the 11th that freezing temperature would probably occur over the northern third of Florida Sunday night.

On the morning of the 12th the truck-growing centers about Galveston, Tex., were notified, by telegraph and telephone, that a hard freeze was indicated for Sunday night and that

crops should be given all possible protection. The afternoon papers of New Orleans, issued at 1 p. m., published a special bulletin, in which the citizens of that city were informed that the temperature at New Orleans was likely to fall as low as 6° or 8° above zero, and that without doubt all records for cold weather in New Orleans would be broken Sunday night. Storm signals were displayed along the middle and east Gulf coasts, with warnings of high gales and freezing weather on the Gulf. Emergency warnings, stating that freezing weather would extend as far south as Tampa, were given the most complete distribution that was feasible with the existing telegraph, telephone, and mail facilities of Florida. Storm signals were displayed on the south Atlantic coast; from Wilmington to Eastport signals for northeast gales were ordered; and from New Jersey and Pennsylvania over New York and New England special warnings of heavy snow were telegraphed to all Weather Bureau stations, with instructions to notify railroad and transportation interests.

During the night of Sunday, the 12-13th, the cold wave swept southward to the Gulf of Mexico, breaking all previous low-temperature records in the South and Southwest, as shown in the following table:

Station.	Lowest previous temperature recorded.	Minimum temperature February 13, 1899.	Departure below lowest previous temperature.
Concordia, Kans.....	-25	-26	1
Dodge, Kans.....	-20	-24	4
Wichita, Kans.....	-14	-22	8
Oklahoma, Okla.....	-11	-18	7
Amarillo, Tex.....	-14	-16	2
Abilene, Tex.....	-5	-6	1
Palestine, Tex.....	-1	-4	3
San Antonio, Tex.....	6	4	2
Galveston, Tex.....	11	6	5
Springfield, Mo.....	-17	-26	11
Little Rock, Ark.....	-5	-12	7
Nashville, Tenn.....	-10	-12	2
Chattanooga, Tenn.....	-7	-10	3
Shreveport, La.....	1	-4	5
Vicksburg, Miss.....	8	zero	8
New Orleans, La.....	15	-7	22
Mobile, Ala.....	12	-1	13
Montgomery, Ala.....	5	-4	9
Atlanta, Ga.....	-2	-6	4
Savannah, Ga.....	13	8	5
Jacksonville, Fla.....	14	10	4

The situation the morning of the 13th was as follows: The line of zero temperature extended to central Louisiana, southern Mississippi, southern Alabama, and central Georgia. At New Orleans a minimum of 6.8° was registered, a reading which was 8.2° lower than any previous record. Throughout the Gulf States the minimum temperatures were 3° to 9° lower than ever before noted. Heavy snow was falling in the Atlantic coast States, the snowfall being particularly heavy in the Potomac Valley and Chesapeake region. In the morning additional warnings were telegraphed to Florida that temperature would be much below freezing again Monday night as far south as Tampa, and possibly freezing as far south as Jupiter, and a warning of a norther for the north coast of Cuba was sent to Havana, Cuba. Along the Atlantic coast from Breakwater to Eastport hurricane warnings, the extreme storm warnings of the Bureau, were displayed. Storm signals were continued southward along the coast to North Carolina. The night of the 13th a further fall in temperature occurred over southern Florida, the morning minimum of the 14th being 29° at Miami.

The following reports from along the line of the advance of the cold wave in the Southern and Southwestern States, where a temperature approaching zero is especially disastrous to live stock and products of the soil, as well as a source of serious discomfort to man, indicate the intensity of the cold experienced and the benefits derived from the warnings:

Galveston, Tex., I. M. Cline, Local Forecast Official, Weather Bureau:

About 800 warnings of a hard freeze Sunday night were distributed by telegraph and telephone Sunday morning, and many truck growers made heroic efforts to protect their crops. Conservative estimates place the value of crops saved as a direct result of the warnings at \$100,000. Besides, live stock to the value of \$200,000 was given all possible protection, and heavy losses in that direction were averted.

Referring to the warnings distributed throughout western Texas, the Abilene West Texas Sentinel, of February 23, 1899, remarks as follows:

The freeze was by all odds the severest ever known in this part of Texas. The local Weather Bureau office gave out the forecast twenty-four hours in advance of the arrival here of the cold wave. If every one interested, and who received or could have received the information, had taken prompt advantage of the warning there is no telling how much saving in the matter of live stock alone would have resulted. As it was many of our stockmen and farmers who have learned to rely largely on the weather forecasts took steps at once to protect their stock from the cold wave they knew was fast approaching. They didn't act upon the idea that a cold wave might be coming, but they knew it was coming when Mr. Oliver, the Weather Bureau Observer, said so, and went to work accordingly and secured their stock. Where the telegraph and telephone could not be used messengers were sent out to warn people to get ready for the cold wave.

New Orleans, La., Alexander G. McAdie, Forecast Official, Weather Bureau:

On the 12th a special bulletin and a special map were issued giving warning of still colder weather. In telegrams sent to different places in the State it was stated that zero temperature would probably be reached throughout the greater portion of the Gulf States. For New Orleans it was thought that the temperature might fall to about 8° by Monday morning. The lowest temperature recorded at New Orleans was 6.8° on Monday morning. This temperature is the lowest ever recorded in New Orleans by the Weather Bureau. Replies to a letter of inquiry sent to nearly 150 crop correspondents of the Weather Bureau showed that it was impossible to estimate the loss to crops by the freeze, but it is thought that it will amount to several millions of dollars. The early vegetable crop was entirely destroyed, the orange crop was a total loss, and trees were killed, the cane crop was considerably injured, and fruit, aside from oranges, was seriously injured. The freeze benefited the rice land. The evening of the 13th there was one inch of snow on the ground, and ice two inches in thickness had formed.

Montgomery, Ala., F. P. Chaffee, Local Forecast Official, Weather Bureau:

The month of February was not only the coldest of which the Weather Bureau has a record, but in all probability gave, on the 12th and 13th, the lowest temperature ever experienced in this section. The morning of the 13th the minimum at Montgomery was -5°, or 10° lower than any previous record. Several persons were frozen to death and streams that were never known to freeze before were covered with ice. At Montgomery there was sleighing for three days. The Weather Bureau cold-wave warning, which was issued about thirty-six hours in advance of the lowest temperature, was widely distributed, but the cold was so severe that ordinary protective measures availed but little, and the damage to crops and other interests in Alabama will approximate a million of dollars.

Atlanta, Ga., J. B. Marbury, Local Forecast Official, Weather Bureau:

The cold wave was by far the most severe on record. The temperature fell to zero almost to the southern limit of the State, while in the north portions it reached 10° or 12° below zero. The damage to crops in Georgia will amount to several millions of dollars. While the entire State suffered severely the damage was greatest in the southern half, where peaches, as well as a number of young trees, were killed. Grain was generally protected by a covering of snow. Stock suffered, and in some counties cows and goats were frozen to death. The cold spell, though disastrous in many ways, will be of much future benefit. The freezing and thawing will improve the condition of the soil and kill insects injurious to plant life.

Jacksonville, Fla., A. J. Mitchell, Local Forecast Official, Weather Bureau:

Freezing conditions covered the territory set forth in the warnings, and ample time was given all interested to take the necessary precautions. The warning was telegraphed to 118 points, and every possible avenue was utilized to apprise the public of the expected severe weather. Railroads notified fruit and vegetable growers along their lines, cold-wave and frost signals were sounded by locomotives and river steamers, and along the 400 miles of the Florida Coast Line every section was promptly served. The night of the 12th heavy sleet and snow prostrated telegraph lines north and cut off communication with Washington, and on the 13th reports were not received in time to be

of use. With a temperature of 10° at Jacksonville on the 13th, the official in charge sent the following warning throughout the central and southern portions of the State, the sections most vitally affected by a freeze at this time of year: "Severe freeze to-night throughout the Peninsula. Give widest possible distribution." The warning was lodged not only with every station and settlement, but special messengers were sent out by the Florida East Coast Line Railway notifying individuals throughout the extent of their lines. The action of this road was such that every point south of St. Augustine, except Key West, was notified. Other roads showed the same activity. The saving to fruit and vegetable growers was enormous. The methods of protection used varied with the object to be protected. Orange trees were wrapped, banked, and some groves were covered. Additional protection was given by building fires. Pineapple fields were protected by a covering of lattice work under which fires were distributed. In every case through the north and north-central parts of the State the most heroic measures were necessary to save anything. The cold was so severe over the western and parts of the northern districts that cattle, horses, and sheep died from exposure. The lowest temperature reported was 4° below zero over the western district. The temperature fell to 29° in the southern part of Dade County. The vegetable crop over central, northern, and western portions of the State has been destroyed; oats, peaches, and pears damaged, and probably the greater portion of young citrus trees over the north-central counties has been seriously damaged. Citrus trees between latitudes 29° and 28° are thought not to be severely damaged, excepting young growth. Those south of the twenty-eighth parallel will escape with no serious consequences.

The total value of fruit, vegetables, and property saved in Florida, as given by those who were benefited by the warnings, amounts to nearly \$60,000. The figures are, however, necessarily incomplete, as many groves were saved whose values are not included in the above estimate.

It is a matter of sincere congratulation that, with the severest freeze in the history of the State and with more property subject to loss or serious damage, the Weather Bureau so met the demands and expectations of the public that not one complaint has been received regarding the accuracy of the forecasts.

The Jacksonville, Fla., Daily Metropolis of February 17, 1899, contained the following editorial:

The splendid service rendered the orange growers of Florida by the weather reports sent out by Director Mitchell of the Weather Bureau predicting the recent extraordinary cold wave, is most highly appreciated by our people, and there is no branch of the Government service to-day that is more favorably commented upon.

The timely warnings sent out by Director Mitchell were heeded by the orange growers, who hastened to protect their trees by burning log fires and taking other precautions, and the result is that millions of dollars were saved to the State.

Mr. Mitchell, the capable director here, has made his office a center of attraction, and he has by arduous work succeeded in establishing reliable correspondents all over the State. He has imparted his enthusiasm to these correspondents, and to-day a better established Weather Bureau can not be found in any State in the Union, and his reports on the condition of the weather and crops are always read with interest, as they are reliable.

In regard to the distribution of warnings along his line of road, Mr. R. T. Goff, Superintendent of the Florida East Coast Line, writes as follows:

The information was received by us about fifteen hours in advance of the cold wave, and was thoroughly distributed to every station on the line of our road, and in the vegetable region messengers were sent out to warn the people of the expected freeze. It is estimated that about half the crop of vegetables was saved by our receiving this warning. I believe the value of the vegetables is estimated at about one million dollars.

The following reports from Weather Bureau officials show that this cold wave was felt as a norther over, probably, the entire area of the Gulf of Mexico, and also on the north coasts of the islands of the Greater Antilles:

Havana, Cuba, William B. Stockman, Forecast Official:

13th. Unusually cold with temperature falling to 54° in the evening. Barometer rose rapidly and rain ended about 4 a. m. Wind veered to northeast 12:30 a. m. and increased to high and continued high until sunset; maximum 36 NW., 12:35 p. m.

Much damage by storm along coast front. The water and waves were the highest known in twenty-five years, and a number of houses were washed away, and many others, including their furniture, damaged or ruined. No estimate of amount of damage can be made. Camps and corrals of United States troops along the ocean front greatly damaged. No lives lost.

14th. Temperature remained below 60° until after 2 p. m., inclusive. Maximum, 54°.

The Times of Cuba, Havana, Cuba, February 14, 1899:

Yesterday winds and waves created sad havoc in many a household on the beach. The huge waves toppled over three houses at the ends of Aguila and Laza streets as if they were egg shells. Several persons in the houses were badly injured. From 6 to 7 in the morning those who live on the beach noticed the increasing height and periods of the waves, and by 8:30 a. m. the water was dashing upon the houses skirting the edge of the shore. The waves mounted higher and higher as the wind became more savage, and for a few hours it seemed as if a small sized cyclone was at work. The day was unusually tempestuous at sea.

Santiago de Cuba, W. I., A. V. Randall, Observer:

The norther of February 13-14 was quite severely manifested in this section, and I have been told by the native inhabitants that it was the severest ever known in this island. Its approach was first felt at about 5 p. m. of the 13th, the wind veering at that time from southwest to northwest, and at 10 p. m. to north, blowing from that time until midnight of 14th at a velocity from 9 to 18 miles per hour, then passing to the northeast, blowing with less force, and finally to southwest again at about noon of 15th.

Beginning with the change of wind to northwest, the temperature fell gradually, reaching the lowest point, 62°, at 3 a. m. of 14th, remaining nearly stationary until 8 a. m., then slowly rising to 74°, the maximum for the day, at 4 p. m. By 11 p. m. of 14th the temperature had nearly regained the normal for that time.

The barometer rose from 29.98 inches at 8 p. m. of 13th, to 30.02 inches at 9 p. m., and remained very nearly stationary until noon of 14th, then fell to 29.98 again at 1 p. m. and continued at about normal during the balance of that day.

Cold wave was preceded and accompanied by rain at intervals between 9:18 a. m. and 8:10 p. m. of 13th.

San Juan, Porto Rico, Mark W. Harrington, Section Director:

There was no sign of the cold wave in our skies or winds or waters, and only a doubtful sign in the fall of our minimum temperatures by a degree or two.

Kingston, Jamaica, R. M. Geddings, Observer:

The norther of the 13-14th was but little felt here, but reports from the north side of the island would seem to indicate that it was felt quite severely in that locality.

The mountain ranges which extend along the east and north of the station at a distance of but a few miles offer such protection that northerly winds attain usually but little force at this point.

Port Antonio, Jamaica, Mr. J. A. Jones, Boston Fruit Company:

We are subject to northers of more or less severity every year. They are not usually productive of much damage, except possibly loss of a few boats which are moored in open roadsteads, and making it rough and uncomfortable shipping fruit.

The norther of the 13th referred to was, perhaps, more severe than usual, but there was no particular damage done. A few surfboats were stranded on the beach and broken up, and one or two small sloops were driven on shore. Some bananas were blown down in different districts, a few here and there, but there was no general blow down in any one locality. There was no damage done to shipping, that is, steamers in the island for produce.

Montego Bay, Jamaica, Mr. Maxwell Hall:

The wind set in from the north-northwest at Montego Bay between 4 and 5 p. m., February 13, 1899, 15 miles per hour, and gradually increased to a maximum of 20 to 25 miles and blew from that direction all through the night with squalls of rain. Two or three lighters went ashore; a fine schooner in the open harbor sailed out (very near the wind) and made Luce a close harbor; but the sea did a great deal of damage to the wharfs which were in bad state of repair. The temperature fell very little. The barometer was high, say 30.10.

News Letter, Kingston, Jamaica:

In consequence of the heavy norther which prevailed at Montego Bay the schooner *Ocean Flamer* had to slip anchor and leave port without clearance. She came on to this port yesterday. She had a narrow escape and had her sails torn and other damage.

Bridgetown, Barbados, P. McDonough, Observer:

Brisk east winds; sharp fall in temperature between 9 and 10 a. m. 15th.

Basseterre, St. Kitts, W. I., George Kingsbury, Observer:

On the 12th the weather was cloudy, a rapid rise in pressure, high easterly winds 30 miles, and a heavy sea swell; 13th, weather clear and conditions normal; 14th, continued heavy sea swell and higher

pressure; brisk easterly winds; 15th, continued high pressure and heavy sea swell, and high easterly winds 30 miles; 16th and 17th high pressure; heavy sea swell and high easterly winds, with velocities of 28 and 30 miles.

Colon, Colombia, Charles F. Tallman, Observer:

On the 13th a moderate storm of the norther type prevailed in the afternoon. The weather became threatening at noon, with a sudden increase in the wind, and a few drops of rain fell. The sky cleared partly at 12:15 p. m., but the wind continued to increase, and after 2:30 p. m. varied between north and northwest, with a velocity of 16 to 20 miles an hour. The sea became high during the evening. The wind decreased somewhat during the night of the 13th, and gradually shifted to northeast during the morning of the 14th, backing to north in the evening. The sea continued high, and steamers left their wharves in the early morning and sought anchorage in the mouth of the harbor.

This was the only disturbance of this type during the present norther season.

The character of the storm along the middle Atlantic and New England coasts is shown by the following reports of observers and remarks by newspapers:

New York, S. L. Mosby, Assistant Observer:

Monday, February 13, a blinding snow storm, in conjunction with vast fields of moving ice, closed New York bay and brought ocean traffic to a full stop.

On Saturday morning, February 11, snow was forecast for Saturday night and Sunday. This forecast was published by the afternoon papers, and again by the Sunday morning papers. At 9:10 p. m. (11th), light snow commenced and continued without intermission during Sunday. At 12 o'clock Sunday (12th), warning of heavy snowfall was received, and the warning was repeated in the morning forecast of Monday, February 13. This warning was sent out Sunday afternoon by telegraph and telephone to all lines of railroad whose interests are centered here.

During Sunday night and Monday heavy snow fell without intermission. Up to midnight Sunday (12th), owing to light winds there had been but little confusion on account of snow, notwithstanding the ground was covered to an average depth of 14 inches. About 4 a. m. Monday (13th), a gale came on from the northeast, which continued with increasing force till 4:30 p. m., when it shifted to northwest and continued throughout the night with hurricane velocity. The snow was very dry, and drifted badly; street traffic, which before had not been interrupted, was maintained with great difficulty, and finally abandoned altogether, with the exception of two cable lines. At 8 p. m. (13th), the conditions were worse. The average depth of snow on the ground was 23 inches, and it drifted to a depth of 6 feet in many places. After 8 p. m. the snowfall became lighter, and ceased during the early morning of February 14, with a fall of 15.6 inches during the storm, and a total depth on the ground of 24 inches.

The railroads received most ample warning of the conditions which prevailed on Monday, but they were powerless in the face of such overwhelming odds.

Monday was very generally observed as a holiday, and all business was suspended. When Tuesday morning came, with clearing weather and a resumption of business, the scene in lower Broadway was one of indescribable confusion. All traffic was confined to the narrow space covered by car tracks, while snow was piled on either side to a depth of 8 feet.

The hurricane winds which prevailed Monday night were forecast in ample time, and every effort was made by the station force to distribute the warning.

It is most gratifying to know that the unprecedented weather conditions which prevailed from February 8 to 13, inclusive, were forecast accurately, in ample time to protect all endangered interests. The cold wave was heralded nearly twelve hours in advance; the beginning of snow about the same length of time; more than twelve hours notice of heavy snow; and about eight hours notice of hurricane winds.

Through the afternoon and evening papers these warnings were given to more than a million people engaged in every field of business interested in, and affected by, weather changes. Full credit has been given the Weather Bureau; and the fact that protection was thus afforded the enormous interests concentrated here, will compensate for many minor failures.

The Times Union of Albany, N. Y., of February 13, 1899:

In accordance with the warning sent out yesterday afternoon by the Weather Bureau, this city is to-day experiencing one of the heaviest snowfalls of the year. It is seldom that the Weather Bureau fails in predicting a big storm, and it has been more than successful this year. At the office of the Central Hudson Railroad this morning it is stated that the warning of yesterday saved them thousands of dollars in getting freight that was of a perishable nature under cover.

Boston, Mass., John W. Smith, Local Forecast Official:

A prompt and thorough dissemination of the warning was made by telegraph, telephone, bulletins, and the press. Especial care was taken

to notify all transportation companies and the shipping interests generally. Copies of the message were furnished to officials of the United States Revenue Service, United States Life Saving Service, Light House Service, etc. Great and general interest was manifested. While the wind at this station attained a maximum velocity of only 40 miles from the northeast, it reached hurricane force, and hurricane conditions generally prevailed in the vicinity of this city, especially along the coast. The warnings were timely and fully verified. All shipping remained in port.

Boston Herald, February 15, 1899, editorial:

The Weather Bureau is entitled to distinguished consideration for its services anent the late great storm. It foretold the widespread disturbance with remarkable accuracy, and gave everybody a chance to take a reef.

Portsmouth, N. H. Displayman:

Storm very severe, but shipping was warned in time to prevent sailing. A large number of vessels were notified and remained in harbor, and 13 fishing vessels, manned by crews which aggregated 88, and valued at \$21,300, were detained.

Eastport, Me., D. C. Murphy, Observer:

Hurricane signals on the 13th were posted in all conspicuous places in the city, and the railroad and steamboat lines were notified. Two steamers and two steam ferryboats, valued at about \$150,000, were the only vessels in port, with cargoes valued at about \$25,000, and with crews and passengers numbering about 100 persons. No damage to vessel property is reported. Travel to and from the city was entirely suspended for two days. The snow drifted badly, some drifts being 12 to 15 feet high. The wind reached a velocity of 70 miles from the northeast at 11:30 p. m. on the 13th.

CHICAGO FORECAST DISTRICT.

The severe cold weather which prevailed in the district the last week in January continued during the first half of February, caused by the persistence of high pressure areas of great magnitude in the Western and Northern States and the movement of low areas southward of the district. Temperatures, lower than previously recorded at many stations, occurred on the 8th, 9th, 10th, 11th, and 12th. The continued cold weather was, as a rule, accurately forecasted, and on the afternoon of the 10th a special bulletin was issued as follows:

Noon specials show that the cold wave in the extreme northwest is moving rapidly eastward and southward, thus preventing appreciable moderation in the temperature. Severe cold weather will continue several days.

The warnings must have been of great value to the public. Under date of February 12, Mr. J. C. Piercy, North Platte, Nebr., writes:

The norther and cold-wave warnings of the 10th instant were of inestimable benefit to Mr. Max Beer, a ranchman of this city, who had 200 cows and calves, valued at \$5,000, on cars and on the road. The warnings enabled him to save them, as they could not have stood the storm. It was 35° below zero this morning, the lowest temperature recorded in twenty-six years.

The shipment of perishable goods was almost entirely suspended for three weeks, not even the most improved refrigerator cars affording safety.

On account of the absence of snow the ground in the vicinity of Chicago was frozen in many places to the depth of five and one-half feet, causing great damage by the freezing up of the water and gas mains and service pipes. Plumbers have been unable to meet the demands for their services, and the exigency has brought forward the novel method of thawing out frozen pipes by the use of an electric current. Great suffering was caused by the severe cold among the poorer classes, and many people were frozen to death. Several steamboats which maintain winter service on Lake Michigan were blocked by the thick ice and unable to reach port for three or four days.

Over the greater portion of the district the weather during the second half of the month has been moderate and even mild, but interrupted by the movement of two cold waves,