

accompanied this storm. Telegraphic communication was interrupted over a large territory for twenty-four hours, and the heavy snow delayed traffic on railroads and street car lines. A more detailed account of this storm is given on another page. Storm warnings were issued in all cases well in advance of the storm and were very generally appreciated and heeded.

Temperatures were generally below the average throughout the country during the first decade of the month, except in the upper Lake region and the upper Mississippi Valley, where they were above. During the second decade they were above normal west of the Mississippi and slightly below in the east. During the third decade temperatures were quite generally below the normal in all parts of the country. The first decided cold wave of the season made its appearance in Alberta on the morning of the 22d, and by the evening of the same date had advanced over Montana. On the morning of the 23d, it covered the Dakotas, and by night had advanced southward as far as Iowa and Nebraska and eastward over Minnesota. On the morning of the 24th the cold wave had reached Kansas, and by evening had extended over the upper Mississippi and Ohio valleys and the Lake region. On the 25th the cold wave reached the New England coast, although with diminished intensity and extent. The temperatures recorded during the passage of this cold wave were not remarkably low. The most important cold wave of the month was that which followed the storm of the 24th to 28th, and is treated in connection with that storm in another place. Ample warnings were given for both of these cold waves for all localities affected, and the favorable comments of the press showed the growing appreciation of this service. The following is from the Springfield, Ill., News of December 28, 1904.

One of the worst blizzards in many years has swept this country causing distress and damage. Life and property must be sacrificed to these storm monsters that no human ingenuity can control. The best that we can do is to send warning ahead and forewarn others of their approach. This is the work the Government has undertaken in its Weather Bureau. How much life and property has been saved by the Government's system of forewarning can not be computed. There is no branch of public service that is of such immense value to the people. This is attested by the widespread credit given it and the unanimity with which shipping, mercantile, railroad, manufacturing, and farming interests watch the weather forecasts. A twenty-four hour or even twelve hour warning of the approach of such a storm as that which swept upon us yesterday is often more than ample to protect life and property that are exposed.

Heavy frost occurred in northern Florida and along the east Gulf coast on the 13th, 16th, 18th, 19th, 20th, and 21st, and killing frost on the 29th and 30th. Heavy frost occurred as far south as Tampa, Fla., on the morning of the 21st, and killing frost on the 29th. On the latter date Jacksonville reported a minimum temperature of 30°, Tampa 34°, and Jupiter 38°. These frosts were all forecast and much loss was avoided by the timely frost warnings.

The month as a whole was unusually dry throughout the country. During the first decade light rains occurred in the Southern States and on the Washington coast and light rain and snow in the Lake region. During the second decade precipitation occurred along the Atlantic and north Pacific coasts and in the Lake region. During the third decade precipitation was more general, but still deficient in amount. The prolonged drought of the Mississippi Valley and the interior of the country was broken only by the heavy rains and snows which attended the passage of the storm of the 24th to 28th.

#### NEW ENGLAND FORECAST DISTRICT.

The weather was abnormally and continuously cold, the monthly mean temperature for the section, 18.3°, being 9.8° below normal and without a parallel in the twenty years of records since the establishment of the New England Section of the Climate and Crop Service. Reports from numerous observers, scattered over the district, with records dating back many years, state that a new low temperature record for December was made by the month just closed. The month

was characterized by several severe storms, but those of the first part of the month were of slight importance in the northern portion of the district. Those of the latter part, however, reached all sections. Along the coast the month as a whole was considered as unusually severe and blustering, with some storms and gales of unusual force. The most conspicuous storms were those of the 18-19th and 27-28th. During the former snow fell to an unusual depth throughout Cape Cod and well into Rhode Island and eastern Connecticut. The wind prevailed with hurricane force and there was great damage to shipping and to telegraph, telephone, and trolley wires, and much delay in railroad traffic. According to the published accounts of the damage from the storm, at least fifteen schooners were torn from their anchors and driven on shore in the Vineyard Haven Harbor. So far as reported, no vessel proved a total loss and there was no loss of life. The storm of the 27-28th was severe along the coast, and in some instances resulted in dense and persistent fog. Shipping was at a standstill and in great danger. Storm warnings were issued on fourteen days of the month and doubtless resulted in the saving of many lives and of much property. No storms passed during the month without warnings.—*J. W. Smith, District Forecaster.*

#### WEST GULF FORECAST DISTRICT.

Warnings of frost or freezing temperature were issued on several dates for parts of the sugar region, and while on some dates the subsequent temperatures at regular Weather Bureau stations did not verify the warnings yet temperature records in the sugar region showed 8° to 14° lower, and severe freezing. The first general cold wave of the season crossed the district from the 26th to the 28th, and timely warnings were issued. Storm warnings were issued on two dates. The warnings issued for the sugar region resulted in saving much sugar cane which otherwise would have been lost. This is shown by the following press comments which also show the popular appreciation and value of the service.

The Times-Democrat (New Orleans) of December 12, 1904, in commenting editorially on the sugar crop and freezes, says:

\* \* \* This, however, no longer causes the terror it did of old, when the freeze descended suddenly on the planters without the slightest warning, and if it came early cut down the yield of sugar 50 or even 75 per cent. The Weather Bureau now gives the planters two or three days' notice, ample time to protect themselves against any damage by a freeze.

The Picayune (New Orleans) of December 29, 1904, in speaking of the freeze of December 28, says:

While the temperature has been below freezing in the sugar and trucking region around New Orleans several times this season, the freezing mark at New Orleans was registered for the first time yesterday morning. Timely warnings were scattered broadcast by the Weather Bureau, stating that planters and the public should prepare for temperatures of 24° to 28° in the sugar region and 30° at New Orleans. The predictions were fully verified. The Weather Bureau issued warnings for every severe change in the weather, and the few failures were when certain conditions which were expected did not materialize. Farming interests consider the warnings of incalculable value, and they do not complain if a prediction sometimes falls short. One freeze without warning means the loss of many thousands of dollars, and perhaps of millions of dollars, while the expense of occasional protection when a predicted freeze does not come is a very small matter. So accurate and definite have the warnings become, that no planting interest in this State has suffered from weather conditions if the warnings are believed and action taken to prevent loss and damage.

*I. M. Cline, District Forecaster.*

#### NORTH-CENTRAL FORECAST DISTRICT.

The temperature was higher than usual throughout the district, and there were very few special features during the month. Regular navigation having closed on December 15, this date terminated the storm-warning season. No general storm warnings were issued during the first half of the month, the weather on the Lakes continuing moderate and uneventful.

The most severe storm of the month, and possibly of the

year, crossed over the Rocky Mountain region on the 25th. It moved thence southeastward to Texas, where it was central on the morning of the 26th. Its path was thence directly northeastward over the Central States and the Lake districts, reaching Illinois by the morning of the 27th. It was accompanied by rain, turning to snow, and shifting gales, and was followed by a well-marked cold wave. Cold-wave warnings were sent out well in advance of the fall in temperature, and all sections of this district had thirty-six hours notice of the cold wave. Advisory messages were sent to all open ports on Lake Michigan that maintain winter navigation, cautioning all vessels to remain in port. In consequence no wrecks resulted. Telephone and telegraph wires suffered much damage from the storm in this district, and it was several days before the telegraphic service was again satisfactory. The snowfall was heavy in the middle and upper Mississippi valleys, which resulted in great inconvenience and delay to transportation interests.—*H. J. Cox, Professor and District Forecaster.*

## ROCKY MOUNTAIN FORECAST DISTRICT.

On the morning of the 25th warnings were sent to points in Wyoming and northeastern Colorado for the cold wave that overspread the eastern slope of the Continental Divide. The following information was given transportation companies: "Cold wave to-night; temperature will reach zero or lower in Wyoming and 10°, or lower, in northeastern Colorado. High northerly winds with snow."

Apart from the low temperature that prevailed from the 26th to the 28th over the greater part of the district, the weather conditions were generally fine during the month.—*F. H. Brandenburg, District Forecaster.*

## SOUTH PACIFIC FORECAST DISTRICT.

The month as a whole was one of deficient rainfall in California. At San Francisco hardly one-third of the normal rain fell. In the southern part of the State cloudy weather prevailed about the beginning of the month, and rain fell from a disturbance that apparently traversed the northern portion of Lower California, northwestern portion of Mexico, and the Valley of the Colorado. During this period no rain fell in northern California. A marked winter storm appeared on the northern coast on the night of December 8, and gave general rain in northern and central California. The disturbance passed rapidly eastward, as indeed did nearly all of the northern disturbances during the month. Another disturbance appeared on December 11, on the northern coast, causing, as before, rains only in the northern part of the State. An area of high pressure over the intermountain section and extending well to the west was the predominant feature of the pressure distribution during the month. A marked storm appeared off the Washington coast on December 22. By December 23 the disturbance was well marked over the northern half of the coast. On December 24 there appeared off the coast of southern Oregon and northern California a depression which subsequently traversed the entire country, causing heavy rains in northern California and high winds along the coast, in the valleys, and in the mountains. Its passage over Nevada was followed by a cold wave in that State on Christmas morning. Frost warnings were issued for California. It is also interesting to note that heavy frost was reported at Mount Tamalpais, although the wind blew from 45 to 60 miles an hour. Another storm appeared on the Washington coast on the morning of December 28, and moved slowly southward, causing rain by the end of the month as far south as San Diego.

It may be noted that in the San Francisco Bay section dur-

ing the month of December an unusually large number of earthquakes occurred.—*Alexander G. McAdie, Professor and District Forecaster.*

## NORTH PACIFIC FORECAST DISTRICT.

December in the North Pacific States was not so stormy as the preceding month, although several gales occurred the most severe of which was the one that swept the district on the 28th and 29th, at which time a maximum wind velocity of 76 miles from the south was recorded at North Head. Timely warnings were issued for this, as well as for all the other storms and they were undoubtedly of great benefit to shipping as the casualties reported were all of a minor character.

No cold-wave warnings were issued during the month, and the only zero weather reported lasted but an hour or two and occurred in southeastern Idaho on the morning of the 26th.—*Edward A. Beals, District Forecaster.*

## RIVERS AND FLOODS.

There were no floods during the month, although the heavy rains of the last ten days of the month over the Willamette and Sacramento watersheds started a rise that gave promise of danger-line stages over their lower portions during the first few days of the succeeding month. Warnings to this effect were issued on the 30th. About the same time substantial rains over the Ohio Valley caused a general rise in the Ohio River, and navigation was resumed between the 27th and 29th. On the upper Tennessee navigation was possible at intervals.

The ice situation during the month may be summarized as follows: Red River of the North at Moorhead, Minn., increase in thickness from seven to eighteen inches. Missouri River, open throughout the month from Sioux City southward; closed at Pierre on the 12th. Mississippi River, practically closed during the latter half of the month above Davenport; at the end of the month there were twelve inches of ice at St. Paul and six inches at La Crosse. There was much heavy floating ice from below Davenport to the mouth of the Ohio River, necessitating a suspension of navigation from the 16th to the 22d, inclusive. The Ohio River was not frozen over, but there was considerable floating ice, with an occasional gorge between Portsmouth and Cincinnati.

The rivers of New England were generally frozen, the Connecticut at Hartford having closed on the 10th. The Hudson and its tributaries were also frozen, and at the close of the month there were from nine to twelve inches of ice at Albany. The Susquehanna closed earlier than usual, and the entire river above Harrisburg was frozen over by the 12th. General rains on the 27th caused a thaw and a break-up, and the ice passed down the river doing some damage. A gorge that was formed in Cecil County, Md., remained intact at the end of the month, and proved a source of serious apprehension to all who remember the great gorge of January, 1904. Warnings of the thaw and break-up were issued on the 27th, and they were the means of saving considerable property.

The highest and lowest water, mean stage, and monthly range at 257 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*