

cold-wave periods east of the Rocky Mountains, areas of low pressure seem to develop over the Southwest. The month began with general rains. On the 3d thunderstorms were reported in southern California, with high southerly winds, and this showery condition continued until the 6th. On the 10th cold-wave warnings were issued for Winnemucca, Carson City, and Red Bluff, and on the 11th for Independence. Frost warnings were issued on the 11th for the morning of the 13th, thus giving forty-eight hours warning. Thin ice was noted at San Francisco on the morning of the 12th and heavy to killing frosts occurred generally in the State on the 13th. If any damage resulted it was not due to lack of warning.—*A. G. McAdie, Professor and District Forecaster.*

RIVERS AND FLOODS.

At the end of January, owing to the great depth of the snow over the greater portion of the country and the enormous quantities of ice in the rivers, there were well-founded fears of danger and disaster from flood, should there come a sudden thaw accompanied by warm and heavy rains. The snow line extended into the northern portions of the Gulf States, and over the principal river valleys the snow ranged from six to twenty inches in depth. At the same time there were eleven inches of ice as far south as Cairo and rather more in New York and Pennsylvania. Very fortunately, however, low temperatures prevailed almost continuously and evaporation and slow melting under the sun's rays by day steadily but slowly decreased the mass of snow and ice, any unusual decrease being prevented by the nightly freezing. Not much was lost during the first half of the month, but during the second half the sun's influence was more pronounced and at the end of the month the snow line had receded to the district extending from the upper Mississippi Valley eastward. There had also been some decrease in the thickness of the ice, although dangerous gorges persisted in the Ohio, Mississippi, and the rivers of the Middle Atlantic States. As compared with the corresponding date of 1904 there was less snow and ice in the upper Mississippi and Missouri rivers, but rather more in the East. The ice gorges in the Ohio, while not so extensive as those of the preceding year, were, nevertheless, of considerable magnitude and a source of much apprehension, it being apparent that they could not go out without causing considerable damage. At Cincinnati a gorge was formed on the 2d, and on the 4th people were crossing on the ice. On the 11th warning was issued that the ice would shortly move, and on the next day it started down, causing some damage to boats, etc., but soon stopped a short distance below. On the 13th the river had closed again and there were great gorges at Medoc Bar and North Bend. On the 24th the gorge at Maysville broke, and on the 28th the ice again started at Cincinnati but soon stopped, causing a sudden fall of about ten feet in the water, and leaving a number of steamboats and other craft stranded.

At Louisville the gorge moved at times, but navigation was seriously impeded throughout the month.

At Cairo navigation southward was resumed on the 15th, and the ice gorge in the Mississippi began to move out on the 28th.

In the Mississippi, at St. Louis, there were from one to thirteen feet of ice on the 13th, and dynamite was used to keep an open channel, but with partial success only; on the 26th the ice began to move and warnings were issued that a general breaking up was probable within a very short time. The break took place on the following day, with some minor disasters to river craft. On the 28th the last of the ice passed out and the ferry boats resumed their trips.

At Memphis navigation was resumed on the 10th, ceased on the 13th, and was again resumed on the 17th. The ice disappeared on the 20th.

At Chattanooga, on the Tennessee River, navigation was resumed on the 2d, and at Nashville, on the Cumberland, on the 6th.

At Riverton, Va., on the Shenandoah, the ice was seventeen inches in thickness on the 18th, the ice field extending for a distance of ten miles both north and south. Some gorges in the Potomac were also threatening, but no damage had been done at the close of the month.

There were two moderate freshets in the Tennessee. Both were well forecast, and neither caused any damage. At Florence, Ala., 70,000 cross-ties were taken out on the rises.

Heavy rains on the 12th and 13th, and again on the 20th and 21st, over the Pedee and Wateree watersheds, caused rapid rises to stages from one to seven feet above the danger lines. Warnings that were issued on the 13th and 21st were the means of saving a large amount of property. A number of roads and bridges were destroyed, and some cattle pasturing in the swamps were drowned, the water reaching them before they could be collected.

Danger-line stages were also reached in the eastern North Carolina rivers on the 22d and 23d, for which warnings were issued on the 20th and 21st.

The heavy rains of the 12th and 13th caused freshets in the lower portions of the Oconee and Ocmulgee rivers, and danger-line stages were general below Dublin and Macon, Ga. At Abbeville, Ga., the Ocmulgee River was above the danger line of eleven feet from the 14th until the 25th, inclusive, with a crest stage of 15.8 feet on the 18th and 19th. Warnings were issued on the 12th; they were very timely and accurate, and were of the greatest benefit to all interests concerned. Reports received show that property to the amount of at least \$200,000 was saved by the warnings. In the Apalachicola system the stages were also from two to nine feet above the danger lines.

The rains from the 7th to the 10th, inclusive, necessitated several warnings for the Coosa and Alabama rivers; the stages reached were within a fraction of a foot of those forecast, and property of the value of \$75,000 was saved. The stages of the Alabama River were from three to four feet above the danger lines.

About the same time warnings of a similar character were issued for the Black Warrior and lower Tombigbee rivers, and were well verified. At Demopolis, Ala., a stage of 55.4 feet, 20.4 feet above the danger line, was reached on the 18th, and the stage remained above 50 feet from the 13th to the 27th, inclusive. The first warnings were issued on the 10th from the new district center at Meridian, Miss., for the Chickasawhay, Leaf, and Pascagoula rivers, and additional ones on the 12th. The flood stages reached ranged from three feet above the danger line on the Pascagoula to fifteen feet on the upper Chickasawhay.

The highest and lowest water, mean stage, and monthly range at 275 river stations are given in Table VI. 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.*