

sections nearby the number of days with measurable precipitation averaged about 15.

Until the 12th the precipitation was comparatively light, averaging less than one-half inch in many sections. However, there were frequent light snows in this period in all parts of the district excepting the regions farthest from the coast, where precipitation occurred on only 1 or 2 days. Even in Virginia snow fell on several dates at most stations, particularly on the 1st, 3d, 4th, and 6th.

Heavy rains turning to snow fell on the 12th-13th and excessive rates of precipitation were observed at several stations in Maine, New Hampshire, Connecticut, New York, Pennsylvania, and New Jersey. Much of the coast region from Maryland to Massachusetts received more than 3 inches of rain within these 2 days. However, the principal storm of the month was the one that occurred on the 15th. On that date rain fell at excessive rates over large areas near the coast, especially from New Jersey to Massachusetts. More than 2.50 inches of rain were recorded at 8 stations in Massachusetts, 1 in Connecticut, 3 in New York, 5 in Pennsylvania, 6 in New Jersey, 5 in Maryland, 2 in Delaware, and 1 in Virginia. The greatest 24-hour precipitation for the month was 4.06 inches at Tuckerton, N. J., on the 15th.

The weather was fair in most sections from the 16th to the 19th, but a storm reached the western part of the district on the 19th and did not pass beyond the coast region until the 21st or later. This caused 4 to 8 inches of snow in the interior of New York and New England and heavy rains elsewhere, while from 1 to 3 inches of snow, in addition to the rain, fell in New Jersey. A storm of similar character, though attended by less snowfall, reached the district about 3 days later, but moved more rapidly eastward, so that the precipitation was confined chiefly to the 24th. This was followed by colder weather with snow as far south as Maryland and Virginia, where several stations reported from 1 to 3 inches. The storm of the 29th was preceded by a marked rise in temperature that caused the precipitation of that date to assume the form of rain throughout the district. Heavy rains again set in over the extreme western sections on the 31st.

SNOWFALL.

The total snowfall was not unusual in the northern States, but it was much above the March average in the southern part of the district. More than 6 inches of snow fell at most of the stations in Virginia, Maryland, Delaware, and New Jersey. At Solomons, Md., the snowfall of the month amounted to 13.5 inches. Over much of New York and northern New England the snowfall exceeded 15 inches; the greatest amount was 23 inches at Alstead Center, N. H. Southward to Pennsylvania, except over the coast region, the ground remained well covered with snow until the warm period of the 18-20th. In the southern States of the district the snow melted soon after falling and had practically disappeared by the end of the first decade.

RIVER CONDITIONS.

In the interior of the northern sections the precipitation of February and March was not sufficient to produce unusually high river stages during the latter month. But the mild weather of the middle of the month produced a peculiar condition in the Hudson River near

Albany and Troy, causing the ice to break up and gorge below these cities on the 16th. This condition was foreseen by the official in charge of the Weather Bureau office at Albany and a warning was issued at 2 p. m. on the 15th stating that the water would reach and pass the flood stage of 12 feet at Albany and 14 feet at Troy. Although it was said that there was not sufficient water in the upper watersheds to justify a flood warning, the ice gorged as expected and the water rose to the height of 13.2 feet at Albany at 1.20 p. m. of the 16th and to 16.5 feet at Troy at 7.45 a. m. of the same date. So sudden and dangerous a rise of water is unusual in a stream like the Hudson, but the warning was so generally heeded that there was very little loss of property that could have been avoided.

The following abridged report of the official in charge, local office United States Weather Bureau, Harrisburg, Pa., is given to illustrate the conditions that prevailed on the rivers in the southern part of the district:

A number of ice gorges formed in the Susquehanna River below Sunbury and in the North and West Branches near the close of February, due to the fact that there was not sufficient water in the streams to float the ice. The two most important of these were located in the main river at Safe Harbor, and in the West Branch above Williamsport. Owing to the cold weather and the scarcity of rain during the first half of the month, there were no important changes in river conditions from March 1 to 15. The rains and mild weather of the 15th caused a decided rise in the Susquehanna River and its tributaries, lifting and floating the gorges at Linden and Safe Harbor, as well as all the smaller gorges, and dislodging practically all ice from along the river shores and on the islands. Some flooding occurred in the gorged districts before the ice started, but the damage was confined to a limited area and was not serious. The heavy rains and warm weather of the 28-30th caused rapid melting of snow in the mountains and a decided rise resulted in all the streams of the system. The month closed with high waters in all the rivers, but the flood stage was not reached at any station except Wilkes-Barre, where the water rose to the height of 22 feet, 2 feet above flood stage, about noon on the 31st. Considering the unusually large quantity of heavy ice in the streams at the opening of spring, it is surprising that so little damage was done.

SUNSHINE.

The percentage of the possible sunshine averaged 56, which, excepting the month of February, is the highest average for the district since last September. In the southern part of the district the amount of sunshine was unusually small, even less than in the northern States, where it was much in excess of the normal. The amount of clear weather in the several sections was more uniform than usual, the extremes in sunshine being 238 hours at Boston, Mass., and 161 hours at Mount Weather, Va. There was an average of 12 days with 80 per cent or more of the possible sunshine, and 9 with 20 per cent or less. The average number of clear days was 12, partly cloudy 9, and cloudy 10.

SOME EFFECTS OF AIR DRAINAGE IN RIVER VALLEYS.

[By JOHN R. WEEKS, Local Forecaster, Binghamton, N. Y.]

In a paper devoted to the influence of air drainage on the temperature of certain stations in the Rocky Mountains, Prof. A. J. Henry says:¹

It is probable that few places on the globe afford the opportunities for air drainage that are to be had in the parks of Colorado. To the effects of this drainage of cold air from the mountain sides and down the numerous small ravines, locally known as "draws," must be added the effect of the powerful nocturnal radiation which takes place under the clear skies and dry air of Colorado.

In the same article, speaking of two stations, Corona and Frazer, Colo., the one at an elevation of 11,660 feet

¹ Bulletin Mount Weather Observatory, vol. 4, pt. 3, pp. 104 and 105.

and the other 8,560 feet above sea level (3,100 feet difference in elevation), he says:

In individual cases the temperature at the lower station may be as much as 40° F. lower than at the upper station.

In New York and New England we have no such differences of elevation as are to be found in Colorado, and consequently the differences in temperature due to drainage of cold air in the valleys are less marked. But there are cities, such as Binghamton, N. Y., and Northfield, Vt., placed in river valleys with a gentle southerly slope, where the temperature on "radiation" nights may fall to 10° or 15° lower than elsewhere. Binghamton, N. Y., for instance, is at the junction of two valley slopes—the Chenango River from the north and the Susquehanna River from the northeast. With an area of high pressure over and north of this locality and the resulting increase of nocturnal radiation, streams of cold air flow gently down the valleys and unite at Binghamton. The occasional extreme low temperatures at that point are caused in this way. Good examples of such temperatures are, March 23, 1912, 5° above zero; March 6, 1912, 7° below zero; February 11, 1912, 14° below zero, and January 13, 1912, 20° below zero.

It is the purpose of this item to very briefly invite attention to certain phenomena, not evidenced by statistics, that are caused by this surface cooling and that are not so frequent in the western mountains, where the air is much drier.

(a) *Valley fogs.*—These are most frequent in September and are only found here in connection with this form of

cooling. The number of days with dense fog may equal 10 in one month, while, with the addition of light fog, the total number may in exceptional months equal 20 or more. The fog disappears with the increasing warmth of the sun after sunrise, usually being gone by 9 a. m.

(b) *Pogonip, or frozen fogs.*—These occur on days when the temperature is below freezing and are less common, though not infrequent, owing to the greater dryness of the air in winter. The ice crystals may, and often do, collect on exposed objects in the form of hoar frost. It is not uncommon to have hoar frost in the Chenango Valley and not in the Susquehanna, or vice versa. Fog composed of water droplets may occur with the temperature below freezing.

(c) Rain may precipitate from the fog layer, but it is always light—never more than one-hundredth of an inch in amount.

(d) Snow may precipitate from the fog layer, but such snow is very light and clings to the branches of trees, even the smallest twigs, until after sunrise, when it drops off little by little. Snowfalls of this kind occurred from 5 a. m. to 9.15 a. m. of January 4, 1912, and on March 23, 1912, at a temperature of 5°. The total depth of snow, melted, was one-hundredth of an inch, although owing to its fluffy nature it had the appearance of being much more. During a fall of snow of this nature blue sky may be seen above the fog layer, which is usually 400 to 600 feet thick. The flakes fall slowly and are perfect in shape.