

The second of these snowstorms began during the night of March 14 in connection with another energetic disturbance which crossed the State from southwest to northeast on the 15th. This caused a snowfall which in central, eastern and southern counties averaged from 3 to 12 inches. In this storm the wind was not so high, but the snow was comparatively dry and drifted badly.

The third storm crossed Wisconsin on the 17-18th, causing snow which, in southern and eastern counties, ranged from 3 to 11 inches. In many localities this storm was described as the worst of the three. There was a fine, sleet-like snow, driven by a high wind, and accompanied by a rapid fall in temperature. At Milwaukee the temperature fell from 38° at 1 a. m. the 18th, to -3° at 6 a. m. the 19th. In this cold wave the temperature fell to -10° along the middle Illinois border, and to -20° to -30° or lower in the northern part of the State. At the end of this storm there were many snowdrifts in southeastern Wisconsin from 8 to 10 feet deep.

Prior to the second of these storms the snow had melted slightly and there was considerable soft snow, and in many places slush and water, on streets and highways and in railway cuts. On highways this had been cut

into deep ruts wherever the roads were passable. With the advent of severe cold this mass was frozen into solid ice, much of which remained on the highways until the middle of the first decade in April.

On railway and interurban lines the combined effect of the three snowstorms and the cold wave was to tie up traffic for a period ranging in different localities from one to eight days, the longer periods being on branch lines. Much of the delay was caused by the interrupted telegraph and telephone services, but many trains were stalled in snowdrifts and many cuts had to be shoveled out by hand, and some places had to be chopped out with axes or picks. The most serious delay in the movement of freight was caused by the blocking of the railway yards by snow and the freezing of the car wheels to the tracks.

After these storms there was again intermittent snowfall to the end of the month, but in southern counties the snow melted rapidly and on April 1 fields were bare over a wide area. However, there were still many drifts in southern localities 3 to 6 feet deep, while in northern counties the average depth in many places was 20 to 30 inches.

SNOWSTORMS OF MARCH 11-18, 1923, AT DUBUQUE, IOWA, AND VICINITY.

By H. MERRILL WILLS, Meteorologist.

[Weather Bureau, Dubuque, Iowa, March 26, 1923.]

Three rather remarkable snowstorms occurred in Dubuque and vicinity on March 11-12, 14-15, and 18.

First storm.—The snowstorm of the 11th-12th, in which 6 inches of snow fell within 24 hours, with 0.2 inch more added on the following night, was unusually heavy for the season and more than twice the greatest 24-hour fall of the present winter; but the outstanding feature of the storm was its peculiarly damaging effects. The storm attended the passage eastward near Dubuque of an area of unusually low barometric pressure, the lowest sea-level reading at Dubuque being 29.12 inches at 1:30 a. m. of the 12th. The storm began as rain on the evening of the 11th, gradually turning to wet snow. The temperature did not vary more than one or two degrees from freezing during the whole period of fall (8 p. m. of the 11th to 7 p. m. of the 12th), and the wet snow stuck to the trees, wires, poles, roofs, etc. The wind was only moderate, the maximum velocity being 23 miles from the north at 4:12 a. m., but the extreme weight of the clinging snow was sufficient to break down large branches of trees,—in some cases whole trees,—and telegraph and telephone wires and poles in all parts of Dubuque and vicinity; in many instances additional wires were broken down by the falling trees and branches. Practically every street was blocked in places by the debris. In some sections scores of broken branches could be seen from a given point and the appearance was such as to give the effect of a destructive windstorm.

Snowplows were used on the street railway lines all Sunday night, but the wet snow was difficult to remove, and all cars were off schedule Monday morning, some lines being blocked by snow and large branches or whole trees until about 9 a. m.

Electric light and power connections were destroyed in numerous sections of the city. Parts of the city were without electricity for hours. Telephone connection with the outside on Monday was entirely severed except for one toll line to McGregor. There were 43 poles down and 500 'phones out of commission in Dubuque County. All telegraph connection with the outside was cut off from 8 p. m. Sunday until 4:25 p. m. Monday when one

wire to Minneapolis began to function. No weather reports were received by wire and consequently no map was published, but State forecasts were received by radiophone and published on cards. The damage to telephone and telegraph lines was apparently greatest in Dubuque County and those adjoining and thence eastward through Jo Daviess, Stephenson, and Winnebago Counties in Illinois. Doubtless the greatest havoc in any one county was in Jo Daviess County, Illinois. One telegraph company reported a loss of 600 poles between Dubuque and Chicago, and it is not known how many the other company lost.

Trains on all roads were greatly delayed, partially by the snow on tracks, but mainly on account of the demoralized wire service and consequent lack of dispatching facilities. Tracks were practically all cleared of snow by Monday night, but it required several days to restore dispatching services, and trains were generally off schedule during this period. The Chicago, Milwaukee and St. Paul reported all trains off schedule for two or three days, and that their wires were broken down almost entirely by falling trees and branches. The Illinois Central reported trains delayed for a like period, and that their worst trouble was east of Dubuque, where 210 poles went down within the first ten miles. The Chicago Great Western suffered to about the same extent in delay to trains, and reported a loss of 150 poles. The Chicago, Burlington and Quincy being double-tracked, was not so hampered by the lack of dispatching service, but lost 200 poles between Dubuque and Savanna, Illinois.

Summarizing the effects of the storm in Jo Daviess and Dubuque Counties and adjoining territory, the monetary losses in such properties as steam and electric railways, electric light and power lines, and telegraph and telephone lines, alone, aside from the inconvenience and innumerable losses to the public through delayed shipments, delayed passenger trains, inability to communicate with the outside, etc., are conservatively estimated at \$120,000. Much of the repair work has been only temporary and it will be weeks before the work is completed. Not all estimates are yet available, and if the

losses in other counties of east-central Iowa and the northern tier of counties in Illinois were added, the total losses would doubtless reach several hundred thousand dollars.

Second storm.—By the evening of the 14th the snow of the 11th–12th had settled to a depth of 4.3 inches, when a second storm set in, amounting to 6.6 inches by 7 p. m. of the 15th, at which time the average depth of both old and new snow was 9.4 inches. This snowfall, while slightly larger than the first one, was not sufficiently wet to stick to surfaces and consequently had no such disastrous results. However, the snow on tracks caused considerable delay to trains and street cars, although the wind was light and there was but little drifting. The general effects of the storm could not be considered serious, especially when compared with the preceding one.

Third storm.—Before the damage from the storms of the 11th–12th and 14th–15th had been repaired, and with 4.5 inches of snow remaining on the ground from the two previous storms, the third heavy storm within a week occurred on the 18th. This fall averaged 6.7 inches and brought the total depth on ground to 11.0 inches—the greatest depth on the ground at one time during the present winter. The total fall from the three snows was 19.5 inches, as compared with the total previous fall for the entire winter of 13.9 inches, or about 40 per cent more. This phenomenal snowfall in so short a period is without precedent in this locality. Moreover, not since March, 1891, has there been so large a fall in any one month as that which fell from the 11th to the 18th, inclusive.

The fall occurred practically during the daylight hours of Sunday, and was of the type popularly regarded as a “blizzard.” The snow was dry and was accompanied by moderately high wind and a cold wave which was severe for the season, the temperature falling from 39° at 9 p. m. of the 17th to 1° above zero at 3 p. m. of the 18th, and continuing to fall gradually thereafter to 7° below

zero at 6 a. m. of the 19th. The heavy drifting snow, high wind, and severe cold wave obviously added new difficulties to the work of clearing away the effects of the previous storms, especially that of repairing the wire systems.

The most far-reaching consequences of this storm, however, were to be found in the constantly drifting snow on the electric and steam railway tracks. Trains were delayed for hours due to blocked tracks. One train from Chicago on the Illinois Central due Sunday night at 11 p. m. arrived on Monday 11 hours late, and an east-bound train was stalled in the drifts east of Freeport, Illinois practically all of Sunday night. All railway lines suffered alike from snow-blocked tracks, and some lines were bothered greatly by derailments due to the hard-packed snow.

Country roads were quite generally blocked by the deep drifts for more than a week, during which the snow settled slowly to a depth of 3 inches at this writing.

LATER NOTE (MARCH 29, 1923.)

A final estimate has just been received from Jo Daviess County, Illinois, giving the losses from the storms as follows:

Number poles down (all wire services).....	677
Time required to make repairs (weeks).....	8
Money loss from above items.....	\$9,000
Damage to trees, money loss.....	\$1,000
Average delay to trains, for a period of 48 hours (hours).....	6

These losses are for the entire county but the figures in money losses are believed far too low, judging from estimates and advices received from representatives of the four railroads passing through Dubuque; that is, the loss of 677 poles would entail a much larger expense than \$9,000. The number of poles is probably correct.

The wind was doubtless a large factor in breaking down the wires and poles but it is impossible to separate the contributing causes (wind and weight of snow on wires).—H. M. W.

THE STORMS OF MARCH 11-12, 1923, IN ILLINOIS.

By CLARENCE J. ROOT, Meteorologist.

[Weather Bureau Office, Springfield, Ill., Apr. 12, 1923.]

A deep barometric disturbance crossed Illinois during the night of the 11th–12th. At 7 p. m. of the 11th its center was located in southern Missouri and by the following morning the center had advanced to Chicago. The sea-level barometer reading at Chicago (28.70 inches) and Peoria (28.89 inches) were the lowest of record, and at Springfield (28.82 inches) the lowest but one. Heavy precipitation and strong gales were general throughout Illinois. The maximum wind velocity at Springfield was from the southwest, but at Chicago, Peoria, and Davenport the maximum velocity came from the northeast. The strong, general winds caused damage to property in nearly all parts of the State. Poles and wires were blown down, buildings unroofed or otherwise injured, farm structures and outbuildings destroyed, trees torn or uprooted, windows broken, and fences demolished. In a few cases livestock were killed, but so far as is known no person was killed or even injured. The damage to property was not particularly severe in any one locality, but it was so widespread that in the aggregate the loss was considerable. One of the features of the storm was the interference with electric light, telephone, and interurban services.

In the extreme southeastern part of the State there seems to have been several local winds within the general storm. These winds occurred between 8:30 p. m. and 9 p. m. of the 11th. The storm in Gallatin County was probably a tornado. It entered at the southwest corner and crossed the county diagonally. The path of principal destruction was 300 yards in width, and the money loss in the direct path of the tornado about \$10,000. In Hamilton and Johnson counties there is not enough evidence to classify the winds as tornadoes. In the latter county hundreds of fruit trees were destroyed. There are important commercial apple orchards in Johnson County.

In the northern part of the State rain and wet snow fell throughout the night. The rain froze as it fell and the snow adhered to all objects with which it came in contact. Trees, wires, and poles were covered with ice and snow. At Oregon the ice coating was 3 to 4 inches thick on the wires. Mr. N. V. Woleben, cooperative observer at Marengo, weighed the incrustation of snow and ice and found it to be twelve ounces to the foot of wire. This condition was general throughout that portion of Illinois lying within 50 or 60 miles of the Wisconsin border. With this accumulation of ice on the wires, the destructive