



Fig. 2.—Curves for general interconversion of pluviometric coefficients and depths of rainfall, and rapid estimation of raininess.

TORNADO OF MAY 9, 1918, PEARL ROCK TO CALMAR, IOWA.

By HAL P. HARDIN, Observer.

[Dated: Weather Bureau, Charles City, Iowa, May 25, 1918.]

(75th meridian meantime used herein.)

A tornado passed east of this county, Floyd, during the afternoon of May 9, 1918. The storm had some features which have made it difficult to determine whether there was more than one tornado, or only one storm that zigzagged over a strip 2 miles wide and 54 miles long. A straight line through the middle of the zone showing wreckage runs due SW.-NE. and encounters as many buildings and groves untouched as it does objects destroyed, while the character of the wreckage at points a mile or less from such a median line leaves no doubt that a tornado had visited them.

The writer visited Pearl Rock during the afternoon of the following day, i. e., May 10. There the width of the storm's path of destruction was about 200 yards, and could be defined as such for a distance of 2 miles from southwest to northeast. There was no indication of a whirling wind outside that belt, nor for some distance at either end of it. A number of persons who went through the storm at Pearl Rock and other points have told me that they saw the funnel-shaped cloud, heard a roaring noise as that of a rapidly moving railway train, and witnessed an inward-and-upward movement of objects toward it.

Pleasant Valley.—A man who observed the first known formation of the funnel cloud at Lower Pleasant Valley, the point where the storm apparently originated, described to me what he saw, as follows: The weather had been warm, with thundershowers during much of the day. Shortly before 4 p. m. two thunderstorm clouds

moved rapidly from the west and the east toward each other; there was vivid lightning with loud thunder, and the heat became oppressive. There had been strong winds during the day, but with the gathering of these clouds the wind ceased until there was no surface air movement. Overhead the clouds seemed to be boiling; in each bank light and dark clouds seemed to be trying to climb over one another. The two banks met over a point about 1 mile northeast of where the observer stood. There was less lightning and thunder than before; the western cloud bank absorbed that bank which had come from the east, all light shades disappeared, and the whole mass turned blue-black in color. There was a roaring noise, and from the point where he judged the lower edges of the clouds had met a downward bulge appeared and quickly developed into the funnel. A twisting, gyrating motion was seen in the funnel, and he thought that he had noticed a revolving movement in the whole bulging portion of the cloud, but was not sure of it as he had not thought to look for it at the time. As the cloud started northeastward heavy rain and light hail fell where the observer stood, followed by light rain, high wind and cooler. This man was on an elevated piece of land, and says he could plainly see the funnel for 4 miles, and that it moved straight northeastward toward Pearl Rock. All the damage in that 4-mile stretch is within a belt half a mile wide. There then follows a long reach without a visible trace of the storm; but there, as elsewhere in the storm's track, the greater part of the country is in pasture land and fields on which there are now no crops. There are no trees except along the banks of streams and around farm buildings.

Pearl Rock.—Pearl Rock is a cluster of 8 or 10 farm houses at the crossroads forming the boundary lines between four counties—Butler, Floyd, Chickasaw, and Bremer; it is some 8 miles from the neighborhood known as Lower Pleasant Valley and lies northeast of the latter. The storm struck there (Pearl Rock) at 4:20 p. m., killing one woman and causing a property loss in and near the village estimated at \$50,000.

Nashua.—After leaving Pearl Rock there is a reach where the path of the storm is lost before it struck (4:30 p. m.) the eastern side of the town of Nashua, Chickasaw County, 3 miles northeast of Pearl Rock. I was given practically the same description of the formation of a tornado cloud before the Nashua damage began, as that given by the man at Lower Pleasant Valley. The people who witnessed the gathering of the clouds did not then know that a tornado had visited Pearl Rock and thought that one was originating over them. They had the same weather and subsequent changes as at Lower Pleasant Valley: Saw two thunder clouds meet; heard the same roaring and saw the funnel descend. Along the river bank, and at the apparent end of the storm track from Pearl Rock toward Nashua there is a heavy timber growth. The upper limbs of the trees are stripped of branches, foliage, and so much of their bark that their nakedness is noticeable as far away as the trees can be seen. None of the trees are uprooted or show damage near the ground. If the storm at Nashua was the same one that formed at Lower Pleasant Valley and later struck Pearl Rock, the funnel was receding into the cloud when it passed over those trees, and had lost its identity when the cloud approached Nashua.

In eastern Nashua and near by, one man was killed and about \$100,000 worth of property, mainly farm buildings and stock, was destroyed. The time is generally placed at 4:30 p. m.

New Hampton.—From Nashua the storm's track lies northeastward to New Hampton, in Chickasaw County and 18 miles from Nashua. The time it struck New Hampton is placed at 5 p. m. Between the two towns the destruction of property was great in localities, with no trace of the storm at other points within the reputed 2-mile width of its path. One woman was killed 6 miles southwest of New Hampton, one man on a farm a mile north of where the woman was killed, and a boy 1 mile south of the town. The property loss in and near New Hampton is estimated at \$160,000, mostly in farm buildings and stock; the loss in the town was only a few thousand.

Calmar.—From New Hampton the storm track lies northeastward to Calmar, in Winneshiek County, 25 miles from New Hampton and 54 miles from Lower Pleasant Valley. The postmaster at Calmar places the time of the storm's arrival at 5:30 p. m. Two people were killed in the town and one on a farm 1½ miles east of town. The property loss is estimated at between \$200,000 and \$250,000, mainly in farm buildings and stock. The path of the storm is reported as 1 mile wide and 15 miles long at Calmar. Between Calmar and New Hampton there are the same breaks in the continuity of the track and lack of evidence to sustain its reputed width, as exist between New Hampton and Nashua, and Nashua and Pearl Rock. At points between Nashua and Calmar there are communities within short distances from the reputed storm track where only black, threatening clouds were seen.

General character of weather along path.

Over the entire length of the track wherever there is trace of the storm in fallen trees, poles, and wrecked buildings the fall of objects was toward the north on the southeast side of the track and toward the south on the northwest side, except that some groves and buildings appear to have been uprooted or torn to pieces and then dropped in a confused heap. Probably the latter distributions occurred in the center of the vortex; owing to the predominance of open fields, one can not locate the exact center of the track.

All along the line reports agree that fresh winds and thundershowers occurred previous to the storm; that its approach was heralded by sharp lightning, loud thunder, tumbling light and dark clouds which changed to blue-black with pendent funnel; that a roaring noise was heard; that still air and excessive heat immediately preceded the blow which whirled around the funnel; that rain and hail accompanied the blow and light rain and falling temperature followed it. No damaging hail is reported.

If the same storm was concerned throughout, it progressed northeastward 54 miles in 1 hour and 30 minutes, a little better than ordinary automobile time. Its actual path was between 200 and 400 yards in width, but it seems to have ranged over a course 2 miles wide, in much the same way as a sailing vessel tacks over a wide course when beating to windward.

Injuries to population along route.

There were 8 lives lost, about 20 people injured, and about \$500,000 worth of property destroyed. All but two of the people killed were on farms, and all but a small portion of the property loss was in farm buildings and stock.

The dead lost their lives in the following ways:

Mrs. A. C. Carpenter, Pearl Rock: Struck by flying board while in the yard, unreasonably refusing to enter the cellar under the house as her companion wished her to. Results proved that she would have been safe in the cellar.

Mr. Roy Husband, near Nashua: Struck on head by falling cement block while in the cellar under building which was wrecked. The cellar was filled with wreckage; there were five others in it and all were more or less injured, but none have since died.

Mrs. Alice Dowd, 6 miles southwest of New Hampton: Manner of death unknown. Eighty-four years old and alone in building. Body found within foundation of barn, which had been blown away, badly broken and bruised. That she was killed while within the home near by was established through a piece of the frame of her dead son's picture which she still retained in hand. The picture had hung in the living room, and when she felt the house going she probably tried to save it.

Mr. Albert Smith, 5 miles southwest of New Hampton: Struck on the head by a block from the chimney when the house was demolished. Wife and child with him escaped with bruises.

Theo. Krueger, jr., 1 mile south of New Hampton: Killed by falling barn in which he had just placed horses. He and his father were bringing school children home in a wagon. When they saw the storm approaching they drove into a farmyard and sent the children into the cellar under the house. They then drove the team into the barn. The father remained outside; when the storm struck him he clung to an apple tree and escaped with bruises.

Mr. and Mrs. Peter Anderson, Calmar: Killed when their house fell to pieces and the wreckage of other buildings was piled on its ruins.

That more lives were not lost is partly because the storm did not cross the crowded parts of the few towns that it touched; and partly because its slow forward movement gave people time to seek cellars and other relatively safe places after they saw it approaching. Some such reported instances in illustration, follow:

Miss Vera Deisler, teacher at the Pearl Rock school, formed her pupils in a chain of clasped hands and led them to a hedge to which they all clung with the strength of desperation until the storm passed. The school building was scattered far and wide.

At one schoolhouse, totally wrecked, it is claimed that the change in time, daylight saving, probably saved many little children from death or injury. School had been dismissed for the day long enough for the children to have reached their homes. Under normal time they would have been in the building.

At another schoolhouse they were having a picnic in celebration of the end of the term. It was filled with women and children. When the storm was seen approaching they fled to a near-by farmhouse cellar. The house over the cellar was completely blown away, but not one of the thirty occupants of the cellar was injured.

East of Nashua there is a group of Piersons, father and sons, on adjoining farms. All took to cellars, and while some of the houses went away no one was hurt. Mr. E. D. Pierson, his wife and five children went into the cellar. Before they realized that their house had been hit they were looking up into the very heart of the tornado, which was trying to lift them out of their refuge. By clinging to each other and to the wall of the cellar they managed to stay on the floor till the storm passed.

Some children alone at their home remained in the yard until they saw a neighboring place going, then took to their cellar. The house and outbuildings were wrecked, but when the parents returned they found the children safe.

But a cellar under a building is not always a safe refuge. In the above accounts, it is related that one man was killed and others injured by falling débris while in such a cellar. Some of the reported instances where the cellar was unsafe were:

Mr. Cecil Gray, near New Hampton, would not risk the cellar because it was shallow. He, his wife, and child clung to some lilac bushes and escaped. The house tumbled into the cellar and the wreckage caught fire.

Mrs. McGrath, near Nashua, led her children into a plowed field where all lay in furrows with safety. Had they gone into their cellar they would probably have been killed, as the house collapsed and fell into the cellar.

Mr. Strawson, near Nashua, had a new modernly constructed home, one of the best farm buildings in this section of rich farms. Before going into the basement he took the precaution to throw water on the furnace fire to guard against that possible danger, thinking the basement otherwise safe. When the storm began tearing the house to pieces he and his family huddled together in the northwest corner.

Suddenly a section of the roof dropped over them, one edge resting on the foundation wall, and at the same time the rest of the basement was filled with wreckage and their section of roof was piled high with it. But for the lucky falling of that piece of roof they would all have been killed.

Evidently the safe cellar is one located far enough away from buildings to be reasonably safe from falling wreckage and having a sod roof.

Some reported tornado freaks:

Mr. Smith, fishing from a boat on the Cedar River near Nashua, was thrown from the boat. He clung to some bushes and was whipped about by the wind until his arms were nearly torn from his shoulders, but saved his life. The boat was broken up.

A family caught in a plowed field lay the storm out in furrows. There was a dog with them. As the cloud approached, the dog was seen to be desperately trying to dig himself into the ground. When the cloud was over them the suction was so great that the people had all they could do to stay in the furrows and did not see what happened to the dog. After the storm he was gone. The next day he limped into the farmyard, footsore and exhausted; much of his hair was gone and the remnant twisted or on end. Those people think that the dog was sucked up into the cloud and dropped a long way from home.

That this explanation of the dog's appearance and long absence is not improbable is evidenced by the mud deposited on buildings and other objects struck by the storm. This mud had been picked up from wet plowed land and carried along, possibly many miles. Also, along the path of the storm dead chickens were found, their bodies crushed flat and entrails protruding. It is claimed that a strong man could not throw a full-grown hen against the ground hard enough to produce that result. Apparently the storm picked them up and then threw them down with great force.

A large silo at Pearl Rock had its staves pushed in, but not broken. The roof was merely pushed partly off. The silo had a small quantity of ensilage in it. The staves were raised off the bottom boards some 10 to 18 inches. There are the usual number of rod-iron hoops on the silo. None of these broke.

The Cedar Valley Electric Co. has a power circuit of large copper wire on poles along the road through Nashua and Pearl Rock. In places the poles were torn out of the ground, the wire pulled from the poles and twisted into every possible shape, whole spans of it being compressed into 2 or 3 foot lengths. The company estimated their loss in material to be \$6,000. None of the recovered wire can be used again and much of it has not yet been located.

METEOROLOGY IN NORWAY FOR 50 YEARS.¹

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The volume before us, published in celebration of the 50 years' existence of the Norwegian Meteorological Institute, commences with brief sketches of the lives of Prof. Henrik Mohn and Director Aksel Steen, to both of whom the institute, to a large extent, owes its development. A very interesting account is given of the history of meteorology in Norway. Owing to the peculiar geographical position of the country, meteorology was early found to be of special importance and observations were taken from the end of the seventeenth century; but it was not until the beginning of the nineteenth century that regular observations in the modern sense of the word were commenced. In 1811 Prof. Esmarck began them in Christiania, and in 1837 Prof. Hansteen took daily observations of pressure, temperature, wind direction, and force, cloud amount, and appearance of the sky. A scheme was then put on foot for organizing daily observations in the different parts of the country, but these gradually fell off, until in 1850, with the exception of the unbroken records at Christiania, meteorological work in Norway was almost at a standstill.

It was the great storm of 1854, which overtook the French and English fleets on the Crimean coasts, that gave a new impetus to meteorology in Europe, and in

¹ *Norway Meteorologiske Institut. Meteorologien i Norge i 50 aar: Festschrift utgitt av det Norske meteorologiske institut i anledning av dets 50-aars jubilaum*, 1. December, 1916. Kristiania, 1917. 138 p. illus. 28 cm.