

Some Remarkable Phenomena of the Tornado in Montgomery County, Tennessee, April 29, 1909

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The general atmospheric conditions favoring the occurrence of tornadoes in the Mississippi Valley are fairly well known to meteorologists, so that it is possible to predict from six to thirty-six hours ahead, that tornadoes may be expected in certain general regions. Thus the observer at Nashville, after studying the telegraphic reports of weather conditions over the country, may announce, at 8 A. M., "Look out for tornadoes in North Louisiana, Arkansas and Mississippi this afternoon, and in Alabama and Georgia tonight and tomorrow." But, as the exact locality where a tornado is likely to occur cannot be predicted even within one hundred miles, nor the exact time, within several hours, such predictions are of little or no practical value, and are not published, as they would rather tend to terrify than to protect the people.

It is well known that the general movement of the atmosphere over the United States is from west to east, and that there is a constant procession of great vortices or whirls, whose rotary motion is counter-clock-wise, drifting eastward in the general movement of the air, like the eddies and whirls in the current of a great river. These are properly called "*Cyclones*," and are of great size, measuring from 500 to more than 1,000 miles in diameter. At the center of a cyclone the barometer is relatively "Low." These cyclones are more marked in the winter and spring seasons than at other times, and generally follow one another across the country at intervals of about three days, and are separated from one another by areas of *high* pressure, sometimes called "anti-cyclones."

It is the passage of these cyclones across the Mississippi Valley which generally brings about our changes of weather. Here in Tennessee the center of the cyclone generally travels on an eastward or northeast track lying to the north of us. The winds flow in toward the low center; so after a spell of clear, cool weather, as a cyclone approaches from the west the winds set in toward its center, thus passing over us from the east, changing to southeast and south winds as the center gets more nearly north of us, bringing moisture from the ocean and Gulf of Mexico, forming clouds and rain. As the center passes on, the winds whirl round, blowing from the west and northwest, the barometer rises and the temperature falls and we come under the influence of a high-pressure area or "anti-cyclone."

Now in the spring and early summer, when the sun is rapidly coming north, we find from experience that these atmospheric changes are intensified, and then it is that the dreadful "*Tornado*" is most likely to occur. It is a notable fact that tornadoes are not most frequent very close to the center of the cyclone where the pressure is lowest, but from two hundred to eight hundred miles south or southeast of that point—most frequently about six hundred miles distant. Usually, when conditions are favorable, a number of tornadoes, following approximately parallel paths, occur over the same general region on the same day. On February 19, 1884, there were as many as forty. The tornado has a narrow and comparatively short track, usually from five to twenty miles long and a quarter of a mile or less broad, and lasting altogether generally less than an hour, while its duration at any one point may be less than a minute.

The tornado near Clarksville, Montgomery County, on April 29, 1909, about 8:30 P. M., illustrated very clearly, in its general features, the laws just noted. On the morning of that day, as shown by the weather map published at Nashville, there was a marked cyclonic center in Eastern Kansas, close to Kansas City. By the next morning it had advanced to Northern Indiana and Southern Michigan, so that at the time of our tornado it must have been about central Illinois—some five hundred miles north of us. Also the weather records show there were several other tornadoes in our general region near the same time. Moreover, on the day of the storm, which occurred about 8:30 P. M., the tem-

perature had risen at Nashville to 20° above that of the preceding day for the same hour, and this was followed shortly by a fall of 24° .

The track of this tornado was followed and closely studied for six or seven miles. The beginning of its destructive work was at a point on the road from Clarksville to Nashville known as "The Telephone Road," four and a half miles southeast of Clarksville. Here the road runs up a creek valley. Some tree tops were twisted off to the south of the road here, but the destructive vortex seems not to have reached the ground until it crossed the road which runs along the base of the hill. Here was the house of Henry Brown, which seems to have been a little to the left of the central line of the storm track and was not much injured; outhouses and trees were overthrown.

From this point the track ascends the hill going through some open land. On top of the hill a log stable was torn to pieces and wreckage strewn over the surface of a pond. It is said that a fish supposed to have been sucked up and carried off with water from this pond was found on the ground several hundred yards further on.

Beyond the pond was the humble home of old man Stafford. It was completely wiped away and the ground swept clean. The old man was killed and his dog also. A little further on at the forks of the road stood Mt. Olivet schoolhouse, comparatively new and apparently strongly built; surrounded by a grove of fine tall trees. Here the track of destructive action seemed only about fifty yards wide. The building was torn to pieces, some parts of it carried backward, in the direction from which the tornado came, thus proving conclusively the rotary movement of the winds. Most of the trees were thrown toward the north, but some were piled crosswise on these.

In most places, all along the track, destructive action was more marked on the right or south side of the storm's path. But on both north and south sides the fallen trees generally pointed inward toward the path of greatest destruction. This seems to prove a strong *suction* toward the center along the surface of the ground. Portions of this schoolhouse and its furniture were carried forward and dropped many miles away. The storm track seems to make an angle at this point, changing for a while to an

almost due east course. Near here a piece of wood was found driven into a solid telephone post which was still standing.

After destroying the schoolhouse it seems that the tornado lifted a little, or became more diffused and less intense, as there was less evidence of destruction, and the house of Mr. Swift, which appeared to be in the line of the storm's path, was unhurt. From this point the track lay for some distance through open fields and nothing remarkable was noted.

About three miles from the starting place it crossed the Clarksville and Port Royal pike, at an acute angle, going northeast through the Anderson place, swept a cabin away, which was at the top of a slope, and, descending on the other side, it destroyed the Anderson barn, but only partially damaged the residence, which was a little to the left of the track. Just here it passed squarely over a deep sink-hole with very steep sides. This sink was estimated at fifty feet deep and perhaps two hundred feet in diameter.

The work of the tornado here was very remarkable. Instead of skipping across this deep hole, as might have been expected, its destructive power was manifested down to the very bottom of the sink, which was full of trees. The trees were smashed off and forced down into the hole on all sides, some of them falling in the very teeth of the advancing storm.

Just beyond this sink hole a large old house, occupied by Mr. Dunn, was torn to pieces and caught fire and burned up.

Next the track crosses a deep, but rather wide, valley or ravine. Here the trees were mostly twisted off some distance above the ground; but after ascending the slope and coming to the brink of a steep declivity, instead of jumping across, the blast of air seems to have rushed down the steep slope and the trees were destroyed down to the bottom, almost as in the sinkhole.

Going further, to the Henry Whitfield place, the tornado fell upon the house of Mr. Cox. Here houses and fences were swept clean away and a heavy grove of oaks nearby smashed and splintered in a wonderful manner. The family was blown out of the house and scattered about, one boy had a leg broken and another's skull was fractured, but neither fatally hurt. A little beyond this place a large sycamore tree stood to the right of the track in a low place. Most of the limbs and top were torn off

and large pieces thrown clear across the track and left on the other side.

Further on was the Welsh place, a strongly built log house, standing about fifty yards to the right of the storm track. It was not completely destroyed, but so badly twisted and wrenched as to require complete rebuilding. Parts of it were completely swept away. The family was not injured, though articles of furniture were blown or sucked out of the house and completely lost. Chickens had the feathers picked off them here and elsewhere and many of them were killed. Mr. Welsh stated that he heard the roaring sound as the storm approached and opened the door and saw the revolving funnel-shaped cloud mass, illuminated throughout by a constant play of lightning flashes. As already stated, the vortex of the storm did not strike this house; it passed about fifty yards north of it, through a bare field where there was a great deal of chert gravel on the ground, and it was wonderful to see how the blast had scooped up and carried forward this rough gravel and pelted small bushes and tough saplings a little further on, beating off every bit of bark and small twigs, completely skinning them, so that the countrymen said they had been *burned* (presumably by the electric fire in the funnel). But the skinning was evidently done by the sharp chert gravel. Here also were seen good sized cedar trees torn up by the roots and carried along in the whirl for some distance and cast aside completely stripped and peeled.

Beyond this the tornado reached the top of the high bluff of Red River, striking it obliquely. Here also the blast descended the steep, high bluff with tremendous violence smashing the timber down to the very water's edge, and some of the trees were thrown backward as in the sink-hole at Anderson's.

The storm then followed the river for several hundred yards, destroying trees on both sides of the stream (which is narrow) until a bend was reached, when it ascended the bluff and pursued its way across the fields, and the track could be seen about a mile further on ascending a wooded slope and cutting a path through the forest growth. It is said to have gone straight on and into Robertson County ten miles or more.

GENERAL OBSERVATIONS.

1. The destructive track of the storm was about fifteen miles long in this county (Montgomery), varying in width and intensity, generally from two hundred to four hundred yards.

2. Occasionally trees and buildings a good distance from the center of the track suffered more than some that were nearer—showing “flaws” in the winds.

3. As nearly as can be inferred, the whirl was “counter-clockwise,” or “laevo-gyrate” (left-handed), with most destruction on the *right* or southeast side of the track.

4. No evidence of very excessive rainfall appeared, though in some places along the center of the track there is evidence of a mixture of water, light trash, chaff, etc., plastered against trees and bushes.

5. There is no doubt of the whirling character of the storm. Trees on each side of the line of greatest destruction have fallen inward towards that line, and fragments of houses and other things are scattered out on each side of the track, often beyond the region where the trees are broken. These seem to have been thrown out from the top of the funnel after having been drawn in below and carried up.

6. Two persons claim to have seen a revolving funnel-like form, with lightning playing through it incessantly. Many report hearing a great roaring sound. As the time of occurrence was after dark, most people were shut up in their houses at the time.

7. All agree that the duration of violence was not more than a minute or two, which is probably a full estimate, as observers, under such circumstances, are more likely to overestimate the time than the contrary. This proves it was advancing swiftly, but there were no data proving exactly how fast.

8. The most singular thing of all was the condition of the deep sink-hole at Anderson's, where all surrounding objects seem to have been thrown into the sink, many large trees, on the north-east edge of the sink, being thrown *back* in the teeth of the advancing storm. We venture as an explanation of this the following: The revolving funnel hugging the surface of the ground as it moved along, formed a very strong partial vacuum by centrifugal force, at the same time forming a sort of *wall* around the

central vacuum, preventing the ready inrush of air from the outside. But as the friction against the ground would check the velocity at that point and the irregularities of the surface of the earth would from time to time make gaps under this "wall," blasts of air of great force would, in a somewhat irregular manner, rush into the central vortex with destructive violence. This explains the "flaws" already alluded to so that trees standing quite near together were sometimes very unequally damaged. Now, as this vortex comes suddenly over the deep sinkhole the lower edge of the "wall" of revolving air suddenly leaves the surface of the ground, on account of the rapid sloping of the ground downward into the sink; this allows surrounding air to rush from all sides, with tremendous violence into the vacuum, "diving under the wall," so to speak; and as these blasts are much more swift than the progressive motion of the funnel, trees are even overthrown backward.

9. It was noted that when the funnel passed suddenly over the edge of a steep bluff where the ground dropped suddenly downward, instead of skipping over as might have been expected, the destruction was worse than usual, even down to the bottom of the slope. This phenomenon may be explained on the same principle as in the case of the sink-hole.

10. It seems strange that there are not more lives lost in these terrible storms. Many times isolated houses are completely destroyed, and yet the occupants, though scattered about and much shaken up, escape serious injury. Contrast the destruction of a town by a tornado and by an earthquake. The loss of life is vastly greater in the earthquake; in this the house is shaken down upon the occupants like a "dead-fall" on a rat. But the tornado generally lifts the roof, bursts out the walls, scatters the materials of the house, often without damage to its inhabitants. The probable explanation of this is as follows: Suppose the house is tightly shut up, as is usually the case during the storm. Now when the vortex suddenly envelops the house, the air inside being much denser than that constituting the partial vacuum of the vortex, suddenly expands, lifting the roof and bursting out the walls. Calculations based on the probable difference of pressure inside and outside the house show force amply able to produce such results.