

SEEING THE INSIDE OF A TORNADO

By ALONZO A. JUSTICE

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Although the incidents herein set forth occurred nearly two years ago, it is thought that they are sufficiently interesting to be reported even at this date. It was just 16 months to a day from the time the events happened that the writer heard a direct account of them from the man whose extraordinary experience forms the basis of this story.

Mr. Will Keller, a farmer of near Greensburg, Kans., is the man to whom reference is made, and the following is substantially his story:

It was on the afternoon of June 22, 1928, between 3 and 4 o'clock. I was out in my field with my family looking over the ruins of our wheat crop which had just been completely destroyed by a hail-storm. I noticed an umbrella-shaped cloud in the west and southwest and from its appearance suspected that there was a tornado in it. The air had that peculiar oppressiveness which nearly always precedes the coming of a tornado.

But my attention being on other matters, I did not watch the approach of the cloud. However, its nearness soon caused me to take another look at it. I saw at once that my suspicions were correct, for hanging from the greenish-black base of the cloud was not just one tornado, but three. See Figure 2.

One of the tornadoes was already perilously near and apparently headed directly for our place. I lost no time therefore in hurrying with my family to our cyclone cellar.

The family had entered the cellar and I was in the doorway just about to enter and close the door when I decided that I would take a last look at the approaching tornado. I have seen a number of these things and have never become panic-stricken when near them. So I did not lose my head now, though the approaching tornado was indeed an impressive sight.

The surrounding country is level and there was nothing to obstruct the view. There was little or no rain falling from the cloud. Two of the tornadoes were some distance away and looked to me like great ropes dangling from the clouds, but the near one was shaped more like a funnel with ragged clouds surrounding it. It appeared to be much larger and more energetic than the others and it occupied the central position of the cloud, the great cumulus dome being directly over it.

As I paused to look I saw that the lower end which had been sweeping the ground was beginning to rise. I knew what that meant, so I kept my position. I knew that I was comparatively safe and I knew that if the tornado again dipped I could drop down and close the door before any harm could be done.

Steadily the tornado came on, the end gradually rising above the ground. I could have stood there only a few seconds but so impressed was I with what was going on that it seemed a long time. At last the great shaggy end of the funnel hung directly overhead. Everything was as still as death. There was a strong gassy odor and it seemed that I could not breathe. There was a screaming, hissing sound coming directly from the end of the funnel. I looked up and to my astonishment I saw right up into the heart of the tornado. There was a circular opening in the center of the funnel, about 50 or 100 feet in diameter, and extending straight upward for a distance of at least one half mile, as best I could judge under the circumstances. The walls of this opening were of rotating clouds and the whole was made brilliantly visible by constant flashes of lightning which zigzagged from side to side. Had it not been for the lightning I could not have seen the opening, not any distance up into it anyway.

Around the lower rim of the great vortex small tornadoes were constantly forming and breaking away. These looked like tails as they writhed their way around the end of the funnel. It was these that made the hissing noise.

I noticed that the direction of rotation of the great whirl was anticlockwise, but the small twisters rotated both ways—some one way and some another.

The opening was entirely hollow except for something which I could not exactly make out, but suppose that it was a detached wind cloud. This thing was in the center and was moving up and down.

The tornado was not traveling at a great speed. I had plenty of time to get a good view of the whole thing, inside and out. It came from the direction of Greensburg, which town is 3 miles west and 1 mile north of my place. Its course was not in a straight line,

but it zigzagged across the country, in a general northeasterly direction.

After it passed my place it again dipped and struck and demolished the house and barn of a farmer by the name of Evans. The Evans family, like ourselves, had been out looking over their hailed-out wheat and saw the tornado coming. Not having time to reach their cellar they took refuge under a small bluff that faced to the leeward of the approaching tornado. They lay down flat on the ground and caught hold of some plum bushes which fortunately grew within their reach. As it was, they felt themselves lifted from the ground. Mr. Evans said that he could see the wreckage of his house, among it being the cook stove, going round and round over his head. The eldest child, a girl of 17, being the most exposed, had her clothing completely torn off. But none of the family were hurt.

I am not the first one to lay claims to having seen the inside of a tornado. I remember that in 1915 a tornado passed near Mullinville and a hired man on a farm over which the tornado passed had taken refuge in the barn. As the tornado passed over the barn, the door was blown open and the man saw up into it, and this one like the one I saw, was hollow and lit up by lightning. As the hired man was not well known, no one paid much attention to what he said. [Mr. Keller thought that this tornado was the one shown in photograph opposite p. 448 of MONTHLY WEATHER REVIEW of 1919.]

According to Mr. L. E. Wait, president of the Greensburg State Bank, the tornado passed the outskirts of Greensburg, striking and demolishing some outhouses. As it passed Greensburg it swept the ground and made a noise like distant heavy hail. Mr. Wait and others watched it as it traveled eastward toward the Keller farm and saw it rise from the ground. Mr. Wait said that from the rear it looked like a "sawed-off cylinder."

From Mr. Wait the writer first heard of Mr. Keller's experience. Mr. Wait made a trip from Greensburg to Dodge City, a distance of 50 miles, bringing Mr. Keller with him for the express purpose of having him relate his experience to the writer.

From Mr. Wait and members of his family and from Mr. Corns, cashier of the Greensburg State Bank, the following additional account of the actions of the tornado was gathered.

After leaving the Evans farm it continued to "bounce" (as one witness described it) its way across the eastern half of Kiowa County and was last heard of in Pratt County. It left a path here and there where it struck the ground, not of wrecked buildings, for there were no more buildings in its path after the Evans farm, but of torn-up ground. It tore holes and plowed furrows from a few inches deep to several feet deep.

Mr. Corns said that he saw a furrow which it plowed across a field of wheat. The furrow was from 2 to 3 feet wide and as deep as the ground had been plowed, about 6 inches. The dirt was thrown over on each side of the furrow just as it might have been if a plow had made it.

A farmer whose land had been marked by the tornado said that it made a furrow "deep enough to bury a horse in."

Mr. William Cobb, resident of Greensburg and owner of a number of farms in Kiowa County, said that the tornado crossed one of his pastures of buffalo-grass sod and that it plowed a furrow a mile long, in places from 4 to 6 feet deep, and that the whole thing looked like "where there had been a grading for a railroad." The dirt was piled along the side of the furrow, just as if thrown there by hand or plow or dragged there by scrapers. It was reported that farmers used scrapers

and horses to level up the ground where the tornado had disturbed it.

Mr. Wait made a trip from Greensburg eastward along the path which the tornado traveled, for the purpose of obtaining, if possible, photographs of some of the torn-up ground. But the trip was made 18 months after the occurrence of the tornado and the land includ-

ing the Cobb pasture, had all been twice sown in wheat and only a few faint traces could be found.

Mr. Keller is a man apparently between 35 and 40 years of age. His reputation for truthfulness and sobriety is of the best. Apparently he is entirely capable of making careful and reliable observations.

TORNADO AT GRAND RAPIDS, MICH., MAY 2, 1930

By WILLIAM H. TRACY

[Weather Bureau Office, Grand Rapids, Mich.]

The most destructive local windstorm of which there is any record struck this city during the early morning of May 2. Storm was of true tornado or "twister" type and was apparently one of a series of similar storms that occurred in southern Michigan during the night of May 1-2.

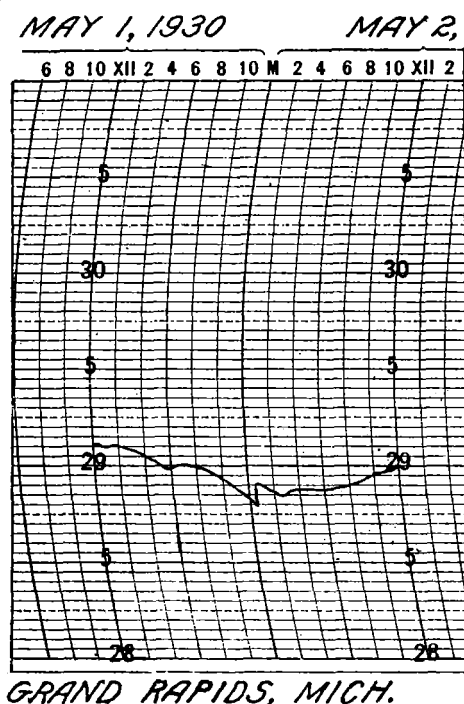


FIGURE 1.—Barograph trace during passage of the tornado

The maximum force of the storm struck this city at 12:32 a. m., central standard time, when the Weather Bureau anemometer on the roof of the Grand Rapids National Bank Building registered an extreme velocity of 72 miles an hour from southwest. Anemometer is located $1\frac{1}{4}$ miles from the nearest point in the storm's path. Pressure had been falling steadily since noon of May 1, due to a storm center of considerable magnitude over northern Manitoba; during the passage of the storm there was an abrupt rise of 0.12 of an inch. (See Fig. 1). Wind was from south-southwest prior to the storm and veered to west-northwest after its passage. Heavy rain began at 12:29 a. m., and 0.23 of an inch fell in 9 minutes; rain continued, but at a slow rate; hail accompanied the rain from 12:32 a. m. to 12:37 a. m.; hailstones were about one-quarter inch in diameter and caused no damage. Thunderstorms and high temperatures for the season were

general throughout the middle and upper Mississippi valleys during the afternoon and night of May 1.

The first point where material damage occurred is in the southwest portion of the city about one-half mile from the eastern bank of the Grand River. The storm followed a course that was somewhat southeast of northeast, passing from the factory district through part of the best residential section, and the last indication of tornadic action was in the Hodenpyle woods, near the northern shore of Reeds Lake; the path was approximately 4 miles long and its width about 350 feet.

Due to darkness no "funnel" cloud or other peculiar cloud formation or glow was observed, although progress of the storm was carefully noted by observer on duty at this office. That this storm was a true tornado is indicated by the fact that destruction was not uniform along the path, but showed several points of maximum damage; the roar or rumble that is typical of tornadoes was reported by several parties, and was distinctly heard by the undersigned, who resides about 750 feet from the path. Felled trees along the path were lying with their roots to the southwest and their tops to the northeast on the north side, and with their roots to the northwest and tops to the southeast on the south side of the path. Another excellent indication of its tornadic character is shown in the damage at the Luce Furniture Co.'s factory and the building of the Columbian Storage Co.; both of these cases the walls were blown out by the exertion of the inside pressure, and the debris thrown into the street; several large plateglass windows along the path showed this same influence.

The total estimated damage of \$1,000,000 as given in the newspaper reports has been checked as far as possible and seems reasonably correct. The greatest damage was in the factory district, where the storm struck first, and to telephone, electric power, and street railway lines; about 70 per cent of the total damage occurred here. The loss to the individual property owner was relatively light, but the area affected was large. It is estimated that 1,500 shade trees were either thrown down completely or seriously damaged.

No loss of life occurred, and only two persons were slightly injured, both by falling debris. The fact that the storm occurred at night when factories were closed and few people were on the street accounts for no deaths and few injuries.

Only four well-defined tornadoes have been recorded in this city since the establishing of a Weather Bureau station here. The damage occasioned by that of May 2, 1930, is much greater than occurred in any of the previous storms.