Tornadoes.

By James Walter Smith.

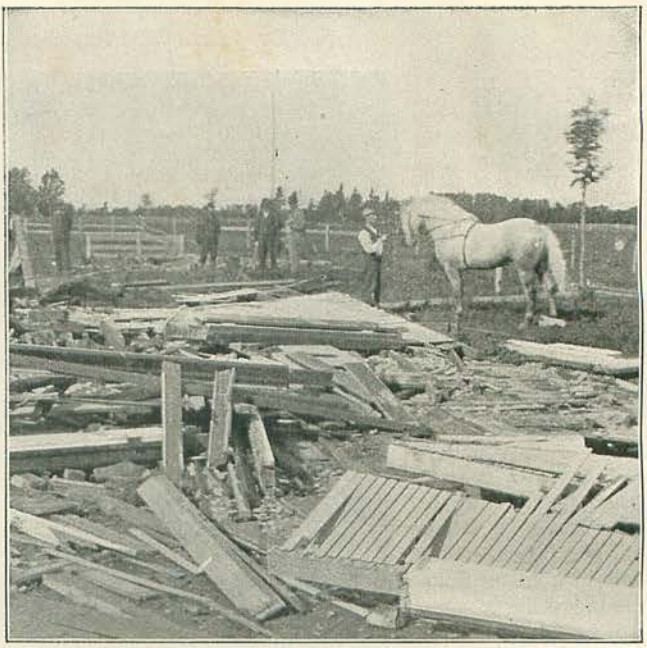
HE was a bold and clever man who took the photograph with which we open this article. Most people, when they get in the vicinity of a tornado, get out of it as quickly as their legs will carry them, or hustle into their "cyclone cellars" and hide. But this man bravely planted his camera in front of the storm, and caught the tornado cloud while it was doing its deadly work. A pretty thing it is, this photograph. It shows admirably the funnel shape of the tornado and the darkening sky—often called, from its odd, greenish tinge, the "tornado sky." It shows also the cloud of dust which invariably precedes the windy monster, and often hides its approach from view. How clearly it stands out, and how minute the funnel seems. Yet the tornado was about five miles distant when the photograph was taken in Oklahoma City, on May 14th, 1896, and the probable diameter of the funnel was roughly estimated to measure 1,000ft.

TORNADO AT OKLAHOMA CITY, O.T., MAY 14TH, 1896.
From a Photo. by T. Croft, Oklahoma City, O.T.

Now, those who have other engagements when a tornado is hurtling along are sensible men. The people of Wellington, Kansas, will bear witness

AFTER THE TORNADO AT WELLINGTON, KANSAS, MAY 27TH, 1893.
From a Photograph. Lent by Royal Meteorological Society.

to this, and our second illustration will support them. Kansas, by the way, is a favourite spot of the "twisters," as the Westerners playfully term their windy enemy, and in some of the schools there the children have tornado drills. When the dreaded funnel is seen, a bell rings and, in regular order under charge of the master, the children file downstairs into the cellar. When it's all over they march, like Humpty Dumpty, back again, or else go out to survey the ruins and hunt for their relatives and cows. At such times, a dreary and painful sight meets their eyes. Ruin on top of ruin, devastated homes, and countless dead beneath. At Wellington, the tornado of May 27th, 1893, cut a clean swath through the heart of the town, and search parties were at work for days amongst the ruins of the shattered buildings.



HORSE BLOWN 1,000FT., TIED TO A MANGER, AT GRINNELL, IOWA.
From a Photo. by W. F. Stallings, Grinnell, Iowa. Lent by Royal Meteorological Society.

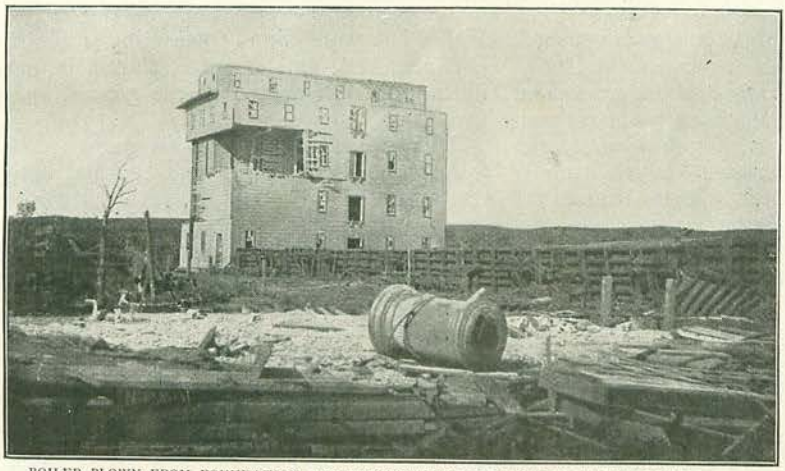
No language can exaggerate the fury of these winds. They come with an indescribable roar, which has been likened to the rattling of a thousand trains or the bellowing of a million mad bulls. After that the wreckage. In the Grinnell, Iowa, tornado, which occurred on June 17th, 1882, and was one of the worst on record, railroad trains were thrown from the line as if they were straws, and landed in the neighbouring fields upside down. Sixty people were killed, 140 injured, and 140 houses destroyed. The loss amounted to over £120,000. A very curious incident of this tornado is shown in the illustration given above. A horse was blown 1,000ft. from a stable, and was found alive, with the remnant of his manger on his halter. Needless to say, that horse has a reputation that will last as long as his pedigree, and after.

TRAIN WRECKED AT GRINNELL, IOWA.
From a Photo. by W. F. Stallings, Grinnell. Lent by Royal Meteorological Society.

But the freaks of tornadoes would fill volumes. Men and women are caught up and landed safe and sound miles away. Iron objects, 1,500lb. in weight, have been moved 20ft., pieces of tin roofing carried seventeen miles, letters carried forty-five miles, and houses lifted bodily and deposited on new

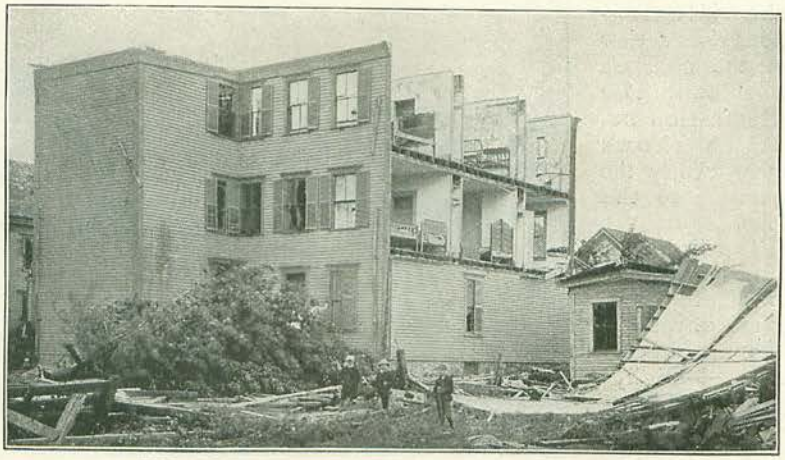
foundations. In Rochester, Minnesota, on August 21st, 1883, a boiler was carried out of a machine shop, and landed near a wooden building, from which the tornado considerately extracted a portion of one story, leaving the rest of the building intact. This freak was matched in a storm at Lawrence, Massachusetts, some years ago, when a piano was overturned, as shown in our illustration, and was still found fit for use. In this same storm, the top and side of a wooden house were blown to the ground, leaving the family beds in full view.

HOUSE WRECKED AND PIANO OVERTURNED AT LAWRENCE, MASS.
From a Photograph.

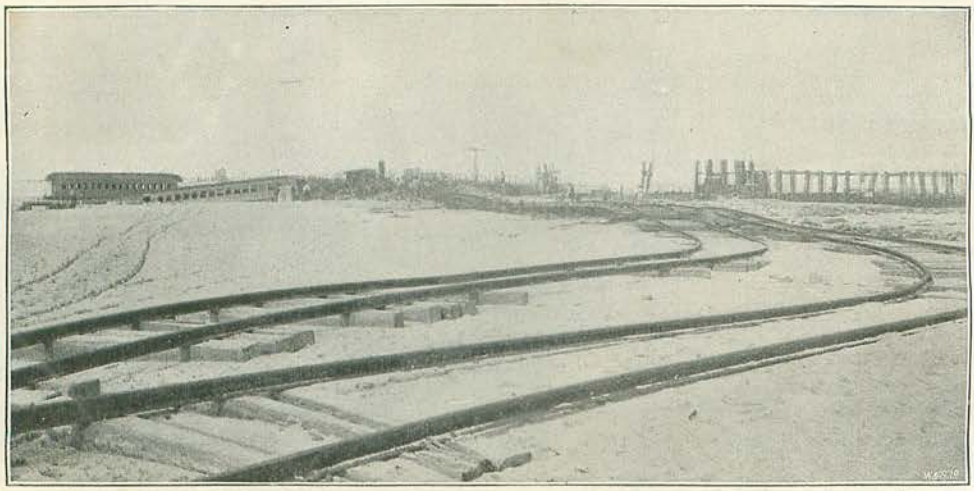


BOILER BLOWN FROM FOUNDATION AND HOUSE CURIOUSLY DAMAGED AT ROCHESTER, MINN.
From a Photo. by Charles A. Tenney, Winona, Minn. Lent by Royal Meteorological Society.

As many people know, there is sometimes a very sudden change of pressure in a tornado. For the technically-minded, I may add that this change is due, as the meteorologists put it, to the great depression of the isobaric surfaces, which diminishes the pressure near the centre of the tornado. This is the learned explanation of many of the explosive effects observed during the passage of a tornado, and some of the freaks mentioned above are due to the same cause. Corks are said to fly from empty bottles, cellar doors are burst open against the force of a strong wind blowing against them



ROOF AND SIDE OF HOUSE CARRIED AWAY AT LAWRENCE, MASS.
From a Photograph. Lent by Royal Meteorological Society.



RAILWAY STATION AT LOW MOOR, NEW JERSEY, WASHED AWAY BY THE GREAT CYCLONE OF SEPTEMBER, 1889.
From a Photo. by Pach Bros., New York City. Lent by Royal Meteorological Society.

on the outside, the walls of houses are pushed outwards on all sides, roofs are suddenly raised up and blown away, and the expansion of air under copper or tin coverings tears them up and carries them away. Window-panes have been blown out and sashes left untouched; and in a tornado at St. Cloud, Minnesota, some years ago, panels were torn from the doors, the house being otherwise undamaged.

For some days, beginning September 11th, 1889, a cyclone played havoc along the Atlantic coast from New Jersey to Cape Hatteras, in North Carolina. The sea broke its fetters and dashed upon the land with destructive violence. A railway station in New Jersey was swept away, and a powerful train wrecked. One of the illustrations gives a view of the cyclone's work, and the illustration beneath shows more closely the damage to the train.

The Rochester tornado, already mentioned, lifted a railway train into the air, and injured eighty people. Twenty-six lives were lost, and 300 buildings destroyed. Hailstones were found measuring 10in. in circumference, and a horse, shown in our illustration, was spitted to the ground by a flying tree.

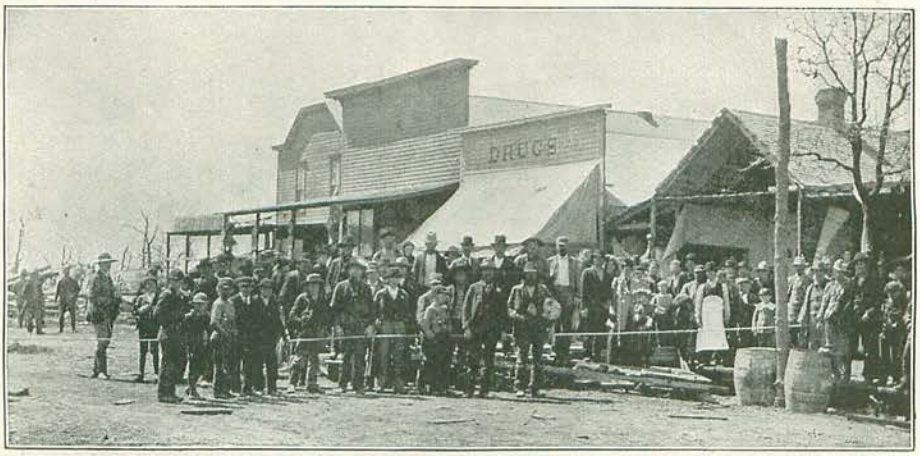
There has always been a strange confusion between tornadoes and cyclones, with the odds on "cyclones," where tornadoes were really meant. The newspapers have been mainly responsible for this confusion of terms, and in order to influence popular usage to conform more strictly to scientific usage, the United States Weather Bureau recently sent out a circular to the leading journals of that country, asking their co-operation. The circular ought to be pasted

TRAIN WRECKED BY THE ATLANTIC COAST CYCLONE OF SEPTEMBER, 1889.
From a Photo. by Pach Bros., New York City. Lent by Royal Meteorological Society.

HORSE SPITTED BY A TREE AT ROCHESTER.
From a Photo. by Charles A. Tenney, Winona, Minn. Lent by Royal Meteorological Society.

in every pressman's hat. It points out that a tornado is a sudden outburst of wind in an otherwise quiet, sultry atmosphere; ushered in by a loud roar; its path is very narrow—seldom more than 500ft. wide at greatest destruction; it moves generally from south-west to north-east, and rarely extends more than twenty miles; it very often rises in the air to descend again at a point a few miles ahead; it is often accompanied by thunder-storms, with often a bright glow in the clouds. The circular also mentions the "funnel shape," and adds that a tornado may be considered as the result of an extreme development of conditions which otherwise produce thunderstorms.

A cyclone, on the other hand, is a very broad storm, oftentimes a thousand miles in diameter, and sometimes can be followed half-way round the world; the winds circulate about it from right to left, or the way one turns clock-hands backwards, this motion being reversed in the southern hemisphere. The air-pressure falls as one approaches the centre, where, at sea, there is a portentous calm, with clear sky visible at times. The cyclone winds often rise to hurricane force, but are not to be compared with the extreme



THREE BUILDINGS LEFT IN CHANDLER, O.T.
From a Photograph.

BUILDING FROM WHICH CARPET WAS BLOWN, IN CHANDLER, O.T.
From a Photograph.

violence of the tornado, before which the most solid structures are razed.

The difference may also be clearly seen from the fact that on February 9th, 1884, over sixty tornadoes occurred in the United States, at differences of 500 to 2,000 miles. They were part of a tremendous cyclone which destroyed 10,000 buildings, killed 800 people, and wounded 2,500.

But let us again to the freaks. A recent tornado at Chandler, in Oklahoma Territory, swept away the town with the exception of the three buildings shown on the previous page. These three were totally unharmed, not even a rip in an awning being found. This was one of the almost inexplicable wonders of the storm. In this tornado another very curious incident occurred. A gust of wind entered a small wooden building and, lifting the carpet from the floor as neatly as if it had

THE CARPET LODGED IN A TREE 1,500FT. AWAY, AT CHANDLER, O.T.
From a Photograph.

PLANK DRIVEN THROUGH SIDE OF BARN INTO FLOOR, AT GRINNELL, IOWA.
From a Photo. by W. F. Stallings, Grinnell, Iowa. Lent by Royal Meteorological Society.

been done by human agency, carried it to a tree near by, where it lodged in the branches and resisted the buffeting of the elements, while trees, houses, and carriages were flying in all directions.

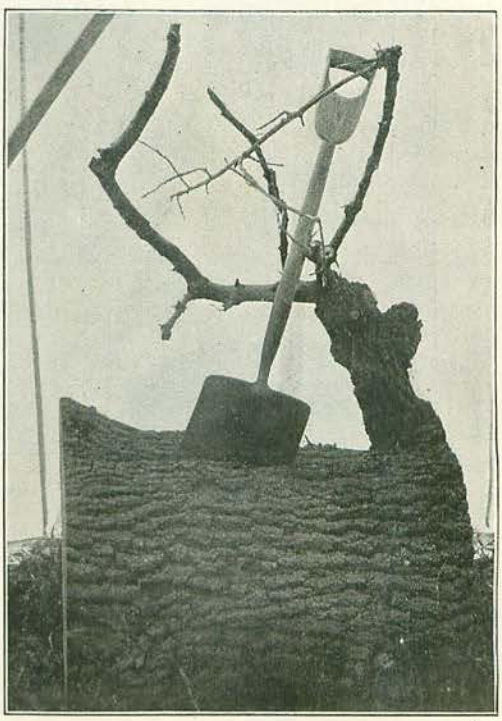
The velocity is frightful. In most cases, the tornado travels thirty miles an hour. The wind in the vicinity of the whirling funnel is estimated to be 300 or more miles an hour. Objects are gathered up, sucked in, whirled around, and finally shot out with gigantic force and deadly result. Horses are stripped of their harness, bedding and clothing are torn to tatters, and mud is blown into blankets with such velocity that it cannot be washed out.

At Mount Carmel, in Illinois, June 4th, 1877, a brick entered a house through the weather-boarding, lath, and plastering, crossed two rooms, a distance of 27ft., and lodged in a rear wall without breaking even the corners from the brick. So great, indeed, was its velocity, that the laths were cut quite smoothly without cracking the adjoining plastering. During this same storm, I may mention, the spire, vane, and gilded ball of the Methodists' Church was carried through the air for fifteen miles.

All accounts go to show that a tornado never forgets the chickens. It strips the feathers from their backs as cleanly as if they were plucked by hand. In order to estimate the force necessary to do this, an American professor once loaded a six-pounder with five ounces of powder, and used, instead of a ball, a chicken newly killed. He shot upward, as if in the funnel of a tornado, and the feathers rose some thirty feet. They were pulled out clean, no flesh adhering, but the chicken was torn to pieces. The velocity was 341 miles an hour. Upon this basis the professor argued that with a slightly less velocity the feathers might be torn from the chicken without injury. Whether or not this argument is correct (and some contend that the feathers are ejected owing to the expansion of air in the quills) it is certain that plucked chickens are a regular feature of tornado devastation.

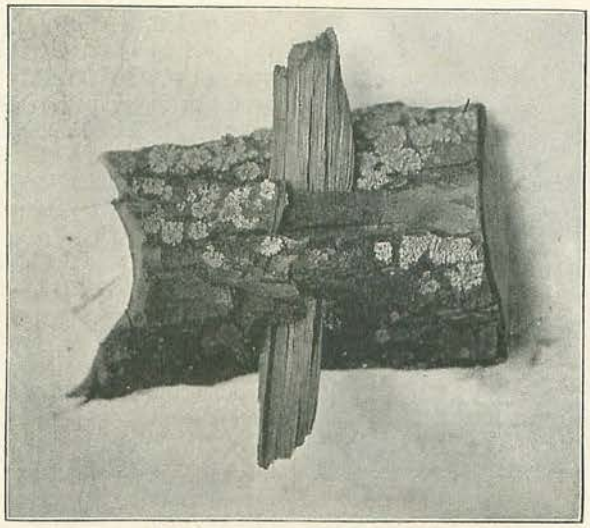
Many observers have noted that nails are often driven into boards head-first, and rafters have been seized by the wind and shot through the sides of houses. In the disastrous Grinnell tornado of '82, a large plank, shown in our illustration, was driven slant-wise through a solid flooring. So neatly was the incision made, that it was with difficulty the plank could be dislodged. In a recent tornado at Norman, Oklahoma Territory, a shovel was embedded half its length in a large tree. The section of the tree containing the shovel, as shown herewith, has lately been on exhibition in Oklahoma, and has attracted wide attention.

Boards have been driven into the ground with a velocity, it is stated, of 682 miles an hour. It is, morever, no unusual sight

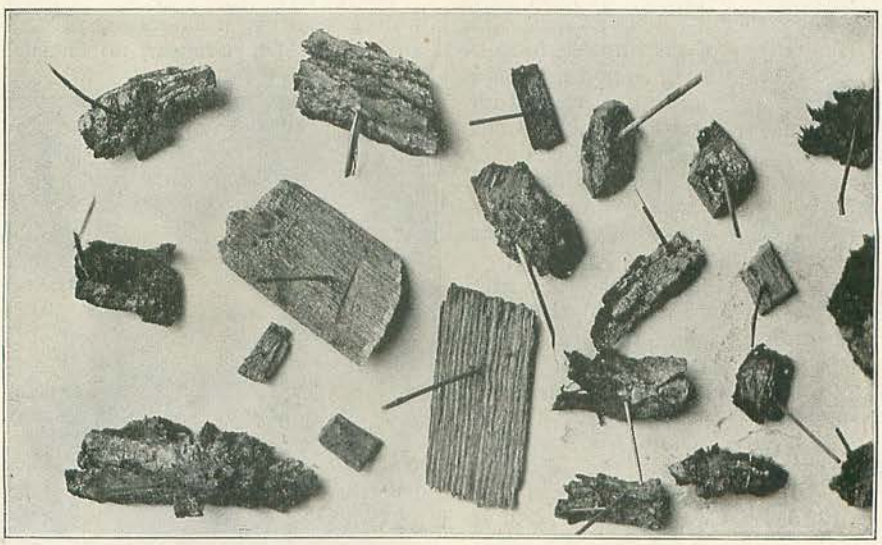


SHOVEL DRIVEN INTO TREE AT NORMAN, O.T., APRIL 25TH, 1893.
From a Photo. by T. Croft, Oklahoma City, O.T.

to find flying splinters firmly lodged in the bark of trees. A very striking photograph of such a sight is reproduced at the top of this page. The splinter—if one can call a good-sized piece of wood a splinter—has cut its path neatly under the bark, and is tightly held in place as if in a vice. More remarkable, however, is the photograph reproduced at the end of this article. Here we see numerous straws sticking strongly in different sorts of bark. As in the case of the chickens, experiments have been made to find out what velocity is necessary to drive such straws into wood. A mechanical air-blast has been used, and with a velocity of 135 to 160 miles an hour, the straws have been shot into the bark a distance of one-tenth of an inch. When mere straws can thus be turned by a tornado into darts of deadly aim, is it any wonder that cities should be devastated, and that man's cheek should blanch at the sight of the on-rushing storm?



SPLINTER DRIVEN THROUGH BARK.
From a Photo. by Charles A. Tenney, Winona, Minn. Lent by Royal Meteorological Society.



STRAWS DRIVEN INTO BARK OF TREES AT ROCHESTER, MINN.
From a Photo. by Charles A. Tenney, Winona, Minn. Lent by Royal Meteorological Society.