

Correspondence.

A Correction.

To the Editor of the *Scientific American*:

Will you permit me to make a correction of an erroneous statement in my short notice of our Geological Hall in your last issue? It has arisen through an elision of the MS., and leaves an impression quite the reverse of the meaning intended.

Trilobite is a name applied to this class of crustacea, not from their sectional division into glabella, thoracic segments, and pygidium, but from the presence of a trilobed character extended through all these parts, from the tail to the head—a longitudinal or lengthwise, not a transverse, feature. L. P. GRATACAP.
American Museum of Natural History.

Frozen Petroleum for Steamers.

To the Editor of the *Scientific American*:

It seems to me the question of fuel for steamers—I mean the substitution of petroleum for coal—can easily be solved. The drawback to petroleum is its liquid nature and consequent danger of listing. If petroleum be turned from a liquid into frozen bricks of any desired size, the objection disappears. It can then be packed as safely as coal, even more so. Small tanks heated by steam can be provided to feed the furnace burners, and into these tanks may also run pipes from the bunkers to carry away all leakage from thawing. In this manner, frozen petroleum can be carried by a steamer that will furnish considerably more fuel for the space occupied than the same bulk of coal. I think that the cost of petroleum in this form would also be a great saving on the present fuel.

E. F. DE CELIS, *Editor La Cronica*.

Los Angeles, Cal., April 10, 1886.

A DETACHABLE BILLIARD CUE TIP.

This tip for a billiard cue is composed of layers of leather or other suitable material, in which is secured a bushing which serves as a means of uniting the layers, and which may be used with or without glue or cement. The tip is united to the cue by a fixed screw, which remains in the end of the cue when the tip is removed, the bushing remaining in the tip. By this arrangement an injured or worn tip may be readily replaced by a new one, and tips may be changed from one cue to another to suit different players, who may thus easily detach and keep separately the tips of private cues.

This invention has been patented by Mr. John A. Tracy, of Weston, W. Va.

The Tornado at St. Cloud.

BY H. C. HOVEY.

Minnesota has had more gratuitous advertising lately than was desirable; and the evil has been increased by the habit of styling tornadoes by the larger name of cyclones. There are points of resemblance, such as the fact that both move vertically around an advancing center, the motion being from right to left, or in a direction opposite to that of the hands of a watch, and both are violent agents of destruction and objects of dread. But there is also a marked difference between the phenomena. The true cyclone starts with a diameter of from 50 to 300 miles, spreading as it advances to one of from 500 to 3,000 miles. Its usual birthplace is amid the tropics, and its fury is exhausted before it reaches this more northern realm. Moving over a large body of water, it piles up mighty tidal waves that finally inundate the land. The tornado, on the other hand, is purely a local affair, originating in some collision of opposing storm currents, assuming a funnel-shaped form, its tail now touching and then rebounding from the earth, and again sweeping along over it like a huge wet blanket, but its greatest diameter rarely exceeding 500 yards. Thus it proceeds in a serpentine way for from a few rods to 25 or 30 miles, when it bursts in some sort of local storm of rain or hail. Should it strike the water, it then becomes a waterspout, as was demonstrated in the case of a tornado in 1883, that swept out of Wisconsin upon Lake Michigan, causing a great commotion there and lifting a column of water some 300 feet high.

Several notable tornadoes have ravaged the Northwest during the last ten years, among which may be mentioned those at Hazel Green, Wis., in June, 1877; at Mankato, Minn., in June, 1880; at Faribault, Minn., in June, 1881; at New Ulm, Minn., at Grinnell, Iowa, at Racine, Wis., in 1883; at Rochester, Minn., in the same year; and at several other localities. But it should be remembered that there have likewise been many storms and tornadoes in other parts of the United States, as appears from the researches made by Lieut. Finley, whose unique book, bearing the title of "Six Hundred Tornadoes," will give the needed information, together with the supplementary observations made by the same authority.

The universal opinion, however, seems to be that none of the long list exceeds in its destructive energy or terrible manifestations the tornado of St. Cloud and Sauk Rapids, Minn., that took place on April 14,

1886, and of which the writer had the opportunity to make special observations, at least so far as the effects were concerned. Being on the outskirts of the storm, I only saw the massing of black clouds, followed by a spiteful hail, many of the stones measuring more than an inch in diameter; but on a subsequent day I visited the locality, making inquiries of eye-witnesses, and following the tornado's track myself for several miles, and noting its varied effects.

During the day a remarkably high temperature had prevailed for the season, the mercury rising as high as 80 deg., and the air was sultry and oppressive. At 3 P. M. observers saw dark banks of struggling clouds overhanging the ridge that in ancient times used to be the river limit, and there were apprehensions of impending danger. Suddenly the clouds began to revolve, while sharp points shot downward, until a whirling funnel-shaped mass was formed above a basin amid the hills, that seems to have furnished the cradle for the ensuing tornado. Its first condition was undoubtedly that of a simple whirlwind, having a diameter of about 1,000 feet, which uprooted or twisted off nearly every tree in its circle, overturned the monuments in the adjoining Masonic cemetery, and tore up the bowlders from the ground. Thence it moved slowly and majestically along, at the rate of about 12 or 15 miles an hour, but with an inconceivably rapid rotary motion upon its vertical axis, confining itself for some distance to a path hardly more than 150 feet wide. The pyrotechnic display of flaming colors against a background of sooty blackness was very impressive and wonderful. Hundreds of people took timely warning and got out of the road of the moving column of cloud, whose general trend was toward the northeast. Having wrecked the Catholic church on Calvary Hill, and also several farmhouses, it entered a portion of the city of St. Cloud mainly occupied by foreigners, whose frame cottages were strewn over the plain indiscriminately, leaving nothing but the cellars to mark the site of the houses.

I noticed but one exception to this general work of complete demolition, and that was of a house that had been whirled about end for end and left on its foundation as a wreck. Reaching the freight depot of the Manitoba R.R., the wind tore that to pieces, overturned the long lines of freight cars, carried the trucks away, and even in places wrenched the iron rails from the ties. In one instance the trucks were blown from underneath a car, dropping the latter on the track where it was left. By a merciful exemption, the hospital of St. Benedict was spared, although the houses in its vicinity were taken. The tornado left the city limits near the residence of Lieut.-Gov. Gilman, tearing away his fences and killing his horses. The total loss of life in St. Cloud was 22 individuals, mostly women and children, besides 40 or 50 more or less injured; and the total loss of property was \$87,395, of which amount \$50,000 fell to the share of the Manitoba R.R., while the remainder was divided among 64 sufferers and their families, thus rendered homeless. From these figures it will be seen that the dwellings were not of an expensive sort, and will readily be rebuilt by the generosity of contributors.

The tornado struck the Mississippi River at a point opposite the village of Sauk Rapids, and fishermen who were in full view of the crossing aver that for a few moments the bed of the river was swept dry; and in corroboration of this remarkable statement they showed me a wide marshy spot where no water had been before this event took place! Two spans were torn away from the substantial wagon bridge below the rapids, one span being hurled up stream and the other down it by the rotary motion of the blast; and great blocks of granite being also torn bodily out from the piers. The large flour mill near the bridge was leveled. The depot of the Northern Pacific R.R. was demolished, and the central portion of the village itself was then attacked with the greatest violence. Being the county seat, the court-house was located here, a substantial structure, of which only the vault, six iron safes, and the calaboose were left—the latter turned upside down. A fine new schoolhouse, costing \$15,000, was completely swept away. The Episcopal church was so utterly removed that the sole relic thus far found is a battered communion plate. The floor of the large skating-rink is all that remains of that structure. Stores, hotels, a brewery, and four-fifths of the residences in the village were scattered as rubbish along the hillsides, or borne away for miles through the air. The caprice of the storm was shown here and there. The lower story of one house was removed to parts unknown, while the upper story was left on the foundation below. A large barn containing twenty mules was demolished, but the mules escaped without a scratch. A woman was lifted from her chair, carried over the walls of her roofless dwelling, and deposited in a thicket of scrub oaks several rods distant. A man told me that, after getting his family into the cellar, he thought he would watch the storm for a moment; but being caught by it, he seized hold of the roots of a tree, and was flopped up and down, as a carpet that is being shaken, but escaped without serious injury. An iron safe was carried by the wind completely across the street, and left there as a monument of aerial energy!

The number of the killed at Sauk Rapids was 39, and about 100 were injured more or less. The fatal blows seemed to be of two kinds, either contusion about the head or stabbing by the lance-like splinters of boards whirled through the air. Many had their limbs broken by falling timbers and other heavy objects. Of sufferers still living, several are in a critical condition and may not survive. It is an instructive fact that, of those who had the presence of mind to take refuge in cellars, on hearing the roar of the approaching tornado, only one, so far as I could learn, fell a victim to its fury—a boy who was crushed by falling masonry in a part of the cellar farthest from the storm. I examined nearly every cellar in the village over which the storm had passed, and found that the portion nearest its direction of approach was free from rubbish, and would no doubt have proved to be a safe refuge.

An appraisal committee say that the total number of houses destroyed at Sauk Rapids, not including sheds and barns, was 109, and the total value of property destroyed was more than \$290,000.

One of the saddest of the many tragedies marking this wide disaster took place at a farmhouse in the country, about sixteen miles north of Sauk Rapids, where a wedding party of thirty were assembled. The ceremony was just concluded, and the officiating clergyman was offering prayer, when the building was struck by the tornado. The bridegroom was killed outright, as were also fifteen others; seven more victims have since died, and only one of the company escaped severe injury of some kind.

Following the tornado's track through the forest, I was interested in observing that the scrub oaks had in so many instances resisted successfully the onslaught that had leveled larger and nobler trees. Their branches were grotesquely laden with torn garments, scraps of roofing, fragments of boards, articles of furniture, and other objects. This display was observable for miles. The depot sign "Sauk Rapids" was carried to a locality nine miles distant. A plank 14 inches wide and 12 feet long was transported 18 miles. A hunter 28 miles north of the village told me that he saw a black cloud approaching, from which he took refuge. But it did no further harm than to shower down bits of boards, lathing, torn books, etc. He picked up a ledger which was identified as belonging to the clerk of the county court.

I had excellent opportunity of noting, in a large open field, the proofs that the tornado traveled in a serpentine path, and with rapid rotation on its axis. Along the right hand of the general track, the boards and other fragments of houses, and the overturned trees, were all disposed so as to point forward and inward toward the line of march. Those along the left-hand side were invariably pointed backward and away from that line. Many large splinters were driven into the ground so firmly that, using all my strength, I could not pull them out again. A farmhouse standing near the left-hand margin of the track had its right side intact, while on the left or outward side the windows were all broken in, and the walls and roof were pierced by numerous plinters. Estimates have been made as to the rate of the rotary motion that could drive timbers deep into the soil and that could send a splintered joist, like a huge javelin, completely through the roof of a dwelling, but I know of no satisfactory mode of calculation.

Putting together the testimony of various observers stationed at different points, the width of the tornado's track must have varied from 100 to 1,000 feet; its entire duration must have been rather less than one hour, lingering but a few moments in any one locality; and the entire distance traversed by it, from the starting point southeast of St. Cloud to the point where it burst in a heavy rainfall, considerably northeast of Rice's Station, was about thirty-five or forty miles. The total loss of life thus far reported from all points was about ninety individuals, and about twice that number injured. The sum total of property destroyed could not have been less than \$400,000.

Trees in the Valley of Mexico.

A contract was lately concluded by the Mexican Government with Mr. Oscar Droege, to plant 2,000,000 trees in the Valley of Mexico, within four years. The trees specified are chiefly ash, poplar, acacia, and mountain cedar, with a sufficient margin for miscellaneous kinds, according to special conditions of site and climate; and the arrangements contemplate the formation of national nurseries in which the study of scientific forestry may be pursued on a footing in some degree commensurate with its importance. The valley was densely wooded in the time of Montezuma, when Cortez and the Spaniards entered the country. But the Spaniards burnt off and destroyed the timber.

An article on the usefulness of patents, taken from the *Boston Advertiser*, will be found on another page. It is well worth reading by every one, and we especially commend it to the attention of our legislators when considering the various bills pertaining to patents now before Congress.