

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 appraisement 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.

Barbados.

The island of Barbados is the most densely populated part of the earth. This island, with an area of 106,600 acres, contains a population of over 175,000 souls, that is to say, an average of no less than 1,054 people to each of its 166 square miles of territory. The Chinese province of Keang-su, which was at one time ignorantly imagined to be the most uncomfortably crowded district under the sun, contains but 850 moon-eyed Celestials to the square mile, while East Flanders, in Belgium, the most thickly populated neighborhood in Europe, can boast of only 705 inhabitants to the square mile. Coming nearer home, Westchester Co., New York, with a territory three times as large, has only four-sevenths as many people as are packed upon this thronged, man-ridden Caribbee island. If the Empire State were as thickly settled as Barbados, it would boast a population of 60,000,000. Of the 175,000 souls in this island, 9 per cent are whites and 91 per cent are blacks or of mixed blood.

Mistakes of Life.

Somebody has condensed the mistakes of life, and arrived at the conclusion that there are fourteen of them. Most people would say, if they told the truth, that there was no limit to the mistakes of life; that they were like the drops in the ocean or the sands of the shore in number, but it is well to be accurate. Here, then, are fourteen great mistakes: "It is a great mistake to set up our own standard of right and wrong, and judge people accordingly; to measure the enjoyment of others by our own; to expect uniformity of opinion in this world; to look for judgment and experience in youth; to endeavor to mould all dispositions alike; to yield to immaterial trifles; to look for perfection in our own actions; to worry ourselves and others with what cannot be remedied; not to alleviate all that needs alleviation as far as lies in our power; not to make allowances for the infirmities of others; to consider everything impossible that we cannot perform; to believe only what our finite minds can grasp; to expect to be able to understand everything."

IMPROVED CONCRETE MAKING MACHINE.

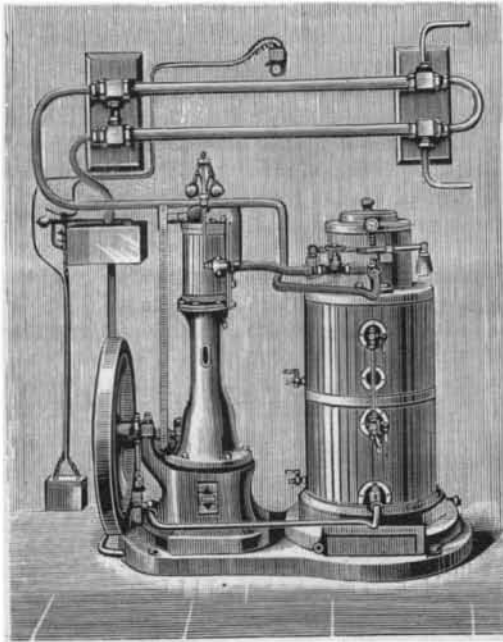
The Carey-Latham machine consists essentially of an arrangement of elevator or dredger buckets, a cement hopper, and a mixing cylinder. The sand and ballast are gathered by the buckets and delivered to the mixing cylinder—the proportion of sand to ballast being regulated by the number or capacity of the buckets employed. The cement or lime is fed from the hopper by an archimedean screw, the pitch or speed of which can be adjusted to suit the quantity required to be delivered in proportion to the sand and ballast.

The cement is delivered, says *Engineering*, in a continuous stream, and together with the load and ballast, which are fed in by the dredger buckets, is passed to the revolving cylinders, where the whole becomes intimately mixed in the dry state. By the time the materials have arrived at about the middle of the mixing cylinder they have become thoroughly amalgamated, and water is then admitted in the requisite quantity by means of a perforated hollow shaft, around which the cylinder revolves. The operation of wet mixing is then performed, and the complete concrete is delivered continuously from the open end of the cylinder. An important feature of the machine is the arrangement of mixing blades, which revolve in the same direction as the cylinder, but at a slightly different speed; this has the effect of increasing the stirring or mixing action, and overcomes a difficulty which was found to exist by the setting of the cement when fixed blades were employed. The blades in moving at a quicker speed constantly change their position with respect to the inside of the cylinder, so that no cement can accumulate and set upon them. The cylinder is horizontal, but as the blades are of a curved or screw-like form, the materials are lifted and tumbled over and over, and at the same time forced toward the open end of the cylinder.

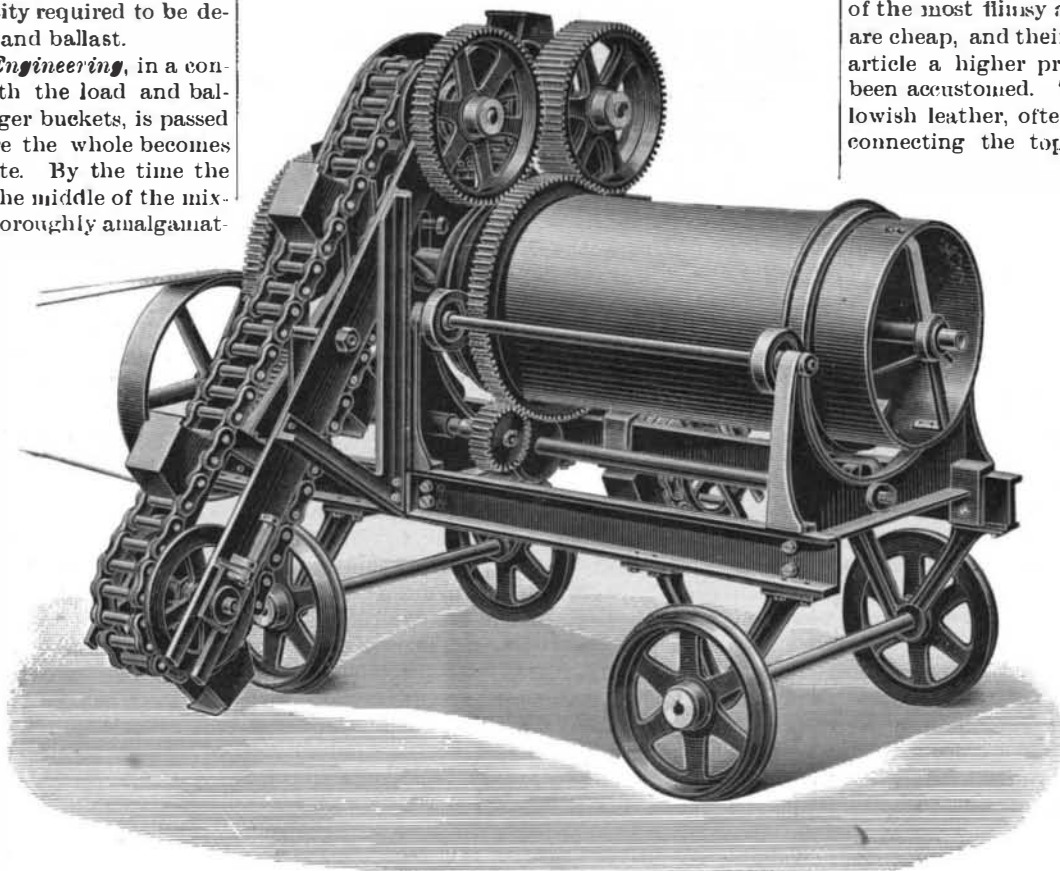
At the Newhaven Harbor Works, two of Carey & Latham's machines have been employed in making over one million tons of concrete; but numerous improvements have since been effected in them, and the machine we illustrate differs in several material points from the former pattern. It is now constructed in various sizes suitable for making five to seventy cubic yards per hour, and we understand Messrs. Ingrey, Poore & Latham, London, have supplied several of 20 yards and 70 yards capacity to some of our large contractors.

A SMALL CONDENSING ENGINE AND BOILER.

The engine and boiler, illustrated herewith are designed for use in small workshops, rural residences, etc. Mr. Pifre, the maker, has designed the boiler so that it only requires an occasional supply of fuel, and the steam is condensed to return the water to the boiler. The principle adopted for firing the boiler is that of a cupola or a slow combustion stove, having a column of fuel which burns away at the bottom and allows the remainder gradually to descend. The boiler is placed

**A SMALL CONDENSING ENGINE AND BOILER.**

on the same baseplate as the engine, and is composed of an outer shell with an internal cylindrical firebox, standing upon an ashpit cast with the foundation plate, which is provided with slides for regulating the air supply. The lower part of the firebox contains a number of vertical water tubes ranged round the circumference and jointed with bends to the firebox shell. For the small sizes, from $\frac{1}{4}$ to 1 horse power, the firebox has the same diameter from top to bottom of the outer shell, leaving an annular steam and water space in which the circulation of the water is promoted by the water tubes. Into the upper part of the firebox a cylindrical filling chute is inserted, which reaches to about the middle of the firebox. Above the firebox and round the upper part of the filling cylinder

**IMPROVED CONCRETE MAKING MACHINE.**

there is a smokebox with a lateral pipe to the chimney. Coke or charcoal is used as fuel, and the entire lower part of the firebox and the chute are filled with the same. The coke burns in the fire box and the combustion gases pass through the annular space between the firebox and the filling chute. In proportion as the fuel on the grate is consumed, the column of coke sinks down, and at sufficiently long intervals the chute is filled again to the top. This does not interfere with the combustion, which can be regulated by the slides on the ashpit and a damper in the chimney pipe, and the evaporation when once adjusted proceeds very regularly. For powers above one horse, the firebox reaches only to about the middle of the height of the

boiler, and the filling chute is riveted to its top, a number of tubes being inserted between the annular firebox top and the top of the boiler.

The engine is of the steam-hammer type, and possesses no peculiar features, except that the cylinder, piston, and slide valve are made of bronze, so as to require no lubricant besides the steam. It is fitted with a governor and a feed pump driven by an eccentric. The steam, on escaping from the cylinder, is passed through a condenser, which is placed out of the way against a wall, and consists of two concentric pipes. The steam passes through the inner pipe, while in the annular space water circulates in the opposite direction to the flow of steam, a reservoir in which the water can cool itself again being, of course, required for this purpose where there is no available cheap supply which can be allowed to run to waste. The condensed water flows into a cistern, from which the feed pump draws. The safety valve on the boiler also discharges into the condensing pipe.

These small motors are very cleanly, according to the *Mechanical World*, of London, there being no continual firing with a shovel, and they are intended to be especially useful for those who desire small powers intermittently.

French Shoes.

The following is from special reports which have just been made to the Government at Washington by the consuls and commercial agents of the United States:

The French have peculiar tastes, and believe that their shoes are inimitable in material, workmanship, and, above all, in style. Take, for instance, their ladies' dress slipper, the distinguishing features of which are the pointed toe and a high heel, sloping from the place where the heel belongs to the center of the foot. This peculiar structure is extended to their walking shoes, and it is a sad fact that they have been sent in countless numbers to America and other countries, and have been readily sold, when to the casual observer they would simply appear to be refined instruments of torture. Wooden shoes and wooden soles, cardboard and straw soles, with prunella and cloth uppers, are cheaply manufactured, and find favor among the working classes. The French have possessed themselves of the secret of cheap manufacturing, so that, while maintaining a fair exterior, they can deteriorate the quality to such an extent that it is more than an offset to any foreign competition.

The duties are not excessive, but the great obstacles to the importation of boots and shoes in this district (Marseilles) are of another character. These are the willingness of the people to purchase and wear shoes of the most flimsy and inferior quality, provided they are cheap, and their unwillingness to pay for a better article a higher price than that to which they have been accustomed. The soles are of soft, spongy, yellowish leather, often underlaid with paper; the seam connecting the top with the vamp soon gives way, and in wet weather the "counter" breaks down, and permits the heel to bulge beyond the soles. These goods are the product of hand labor in hundreds of small shops and factories throughout this district, and they form the staple footwear of the people, who, conservative and severely frugal in all things, cannot see why they should pay from 26f. to 30f. for one pair of good shoes when the same sum will purchase three pairs of new ones. In this, as in other articles of dress and luxury among the French working people, it is the new thing which counts.

Boots and shoes for men's wear have been imported here (Lyons) to some extent from Vienna, in Austria, and are meeting with some success. They are quite perfect in elegance and shape, but objection is made to the quality of the soles, which are said to be inferior. Germany is also supplying the French markets with felt slippers to a considerable extent, the sole either of

felt or leather, as the case may be. England is exporting so very small a quantity to this country that it is scarcely worth mentioning. Boots and shoes manufactured in the United States are quite unknown in this consulate district. Large quantities of caoutchouc come from there, but the fabrication into boots and shoes is perfected here in France.

A CALCULATION made by Mr. Corthell of the figures of the mile-long railroad train drawn by a single locomotive establishes that there were 3,253 tons weight on this train, which was drawn by a single 55 ton engine. This would be more than the weight of many steamships with their cargoes.