

THE ABBE FORGING MACHINES.

Since the introduction and adaptation of machinery in forging metal into regular and irregular forms, the inventors and manufacturers in the United States have expended much thought and money to produce special machines for special work to meet the requirements of the users, their aim having been to bring together as few pieces as possible in such machines, and do the work in as small a space as could be used conveniently to get at the parts for adjusting and removing for repairs. That our readers may judge how well this has been done, we place before them an admirable illustration of a mammoth bolt forging and rod upsetting machine, designed and patented by John R. Abbe, and manufactured by the S. C. Forsaith Machine Company, of Manchester, N. H.

This company has manufactured two smaller sizes of these machines for many years, they being known to the trade as the No. 1 Abbe header, working iron $1\frac{1}{4}$ in. diameter or under, and the No. 2 Abbe header, working $\frac{3}{4}$ in. iron and smaller sizes, and so well have these machines been received, both in this and foreign countries, that many inquiries have been received for one of greater capacity, to cover a wider range, such as bridge rods and for similar service.

In operation this machine is identically the same as the smaller patterns, the machine being held on separate base casting, without legs, bolting to the main bed of the machine, this giving a more extended bearing on the foundation, while on the left hand side, at the back end, two arms project each side of driving wheel, and on the end of these are bolted a pedestal for the outer bearing for the crankshaft, relieving the shaft from the strain caused by the extra heavy weight of the pulley and the strain of the belt. The floor space over all occupied by the machine is in length from front to back 12 ft. 7 in., the width 7 ft., and the height $5\frac{1}{2}$ ft., the distance from bottom of base to center of shaft being 34 in., and the shaft is of forged iron, 6 ft. 3 in. long, $5\frac{1}{2}$ in. in diameter, with three bearings, two on the main frame 12 in. long, and outer bearing on the pedestal $12\frac{1}{2}$ in. long, the distance from center to center of wrist pin being $3\frac{1}{2}$ in., giving the crosshead which carries the upset a horizontal

movement of 7 in. The driving pulley is of heavy balance wheel pattern, weighing upward of two tons, 6 ft. in diameter, 17 in. in width of face, with bearing of hub on the shaft 16 in. in length, the hub being bushed with composition so as to be removed and replaced when wear may occur. All sliding parts are gibbed as in the smaller machines, so any perceptible wear can be taken up at will, with gib and key connections, and

instance, one of these machines is in use in the shops of the Philadelphia, Wilmington & Baltimore R. R. Co., doing special locomotive, car, and bridge forgings, one class of forging being the punching of a slot 5 in. in length, $\frac{3}{8}$ in. in width, through a bar of 2 in. square iron, 8 in. long, the slot or keyway being made with one revolution of the crankshaft of the machine. In fact, the machine forges a wide range of special work, such as crank pins, lever handles, connecting pins, and, in fact, anything for which dies can be produced.

The superiority of these forging machines was well attested at the great exhibition in Philadelphia in 1876, when they were selected by the United States commission to illustrate the high order of bolt heading machinery used in this country.

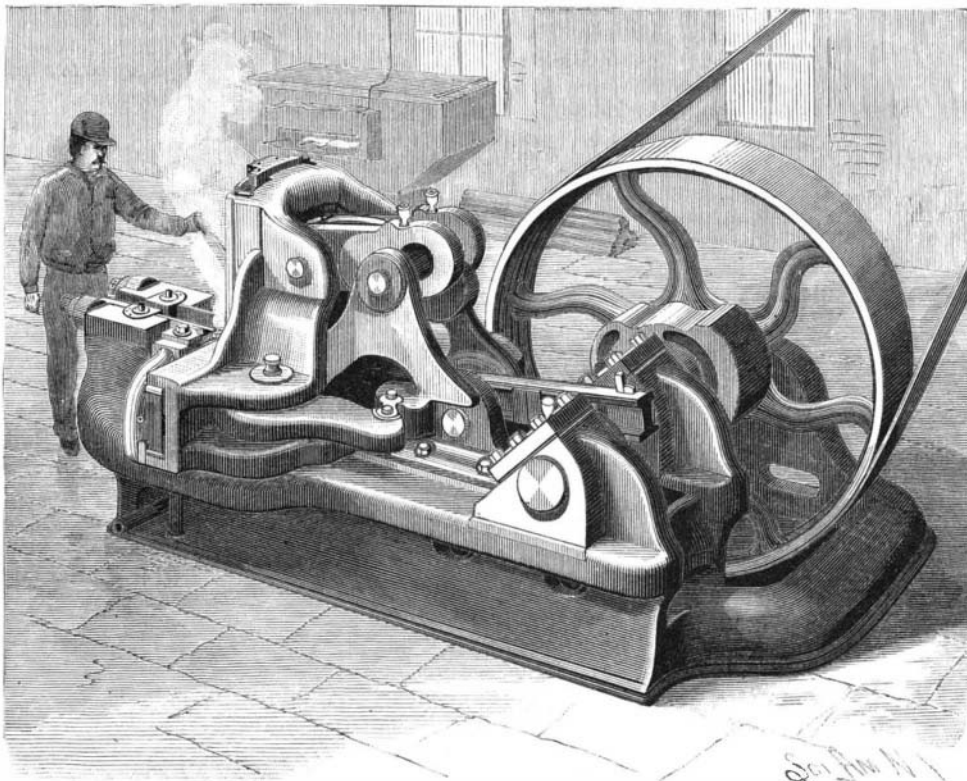
The machine from which the photograph was taken to make the cut has just been placed in the shops of the Roanoke Iron Works, Roanoke, Va., through the Niles Tool Works, of Philadelphia, Pa., and Hamilton, O.

ROAD LOCOMOTIVE FOR POSTAL SERVICE.

The engine we illustrate is one of several constructed by J. & H. McLaren for the *Fourgon poste* service in the south of France. This service is in the hands of different contractors, and altogether apart from the postal service of the state. It consists of the collection and delivery of parcels and light merchandise in districts remote from railways or indifferently served by them. Strange as it may appear,

many of the largest railway centers are also the chief centers of the *Fourgon poste* services, which collect their parcels in one town, and convey them by horse conveyance, and deliver them in another town many miles away, although there may be a direct line of railway between the two places. The excessive charges of the railways for goods carried *grand vitesse*, and the excessive time occupied in the conveyance and delivery of goods carried at *petite vitesse* rates, enables these contractors or carting agents to do a large business, many of them requiring several hundreds of horses for their work.

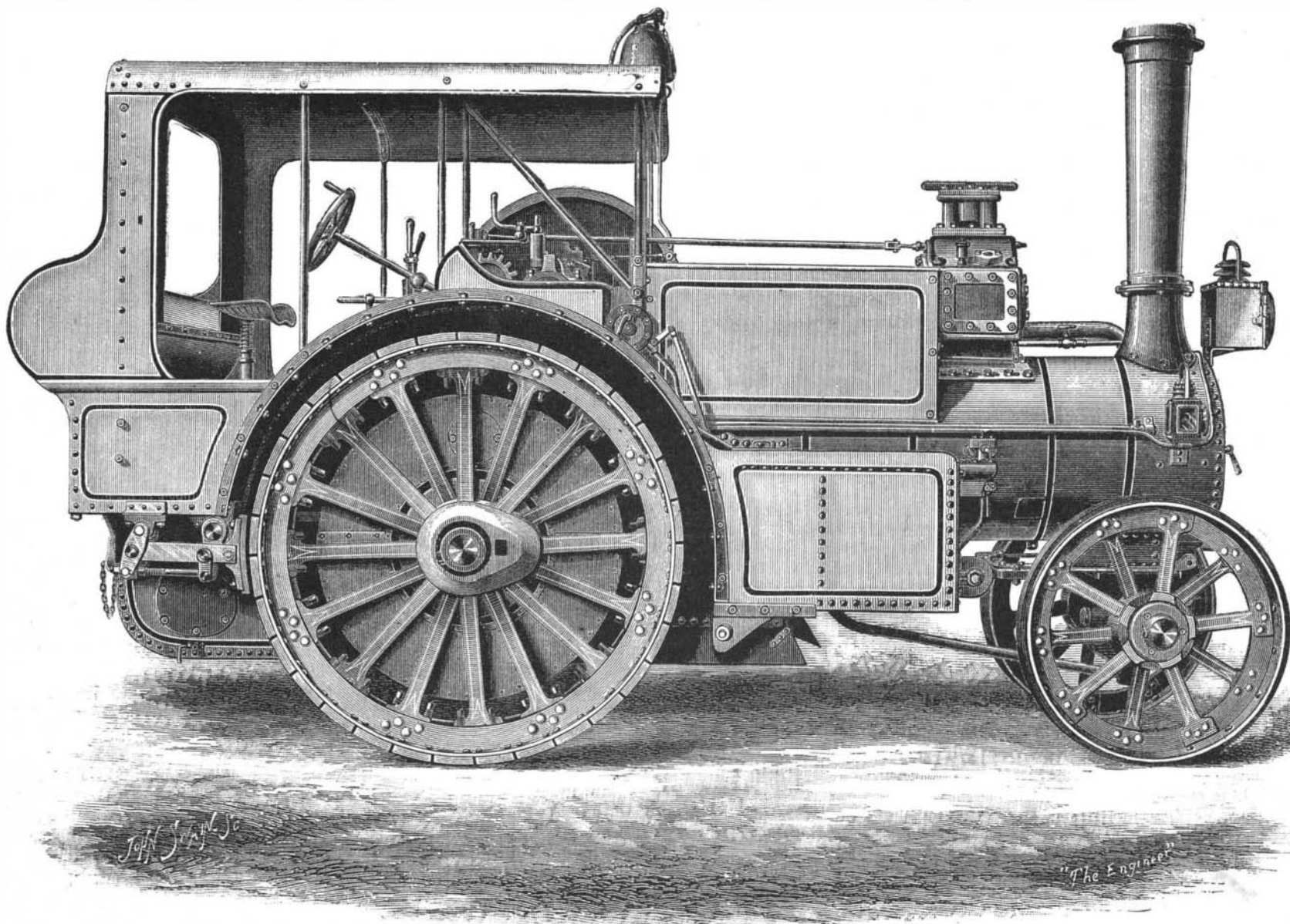
Some two years ago, Messrs. McLaren made one of their compound road locomotives, and tried it on one of



THE ABBE FORGING MACHINE.

the major portion of the small parts of the machine are of steel, the complete machine weighing 16 tons. The dies are wider than the bolt heads, leaving no fins upon the corners, while the holding dies leave the bolt exactly the size of the rod, while its working surfaces, all slides, and, in fact, every bearing upon the machine, are above the water, scale, and cinders that fall from the work—a notable feature possessed by no other machine, no gears, cams, or springs entering into the construction of the machine to cause repairs or noise when in use.

Its adaptability for other classes of work than bolts and rods is extensive, the great strength of the machine allowing a wide range in work performed thereon. For



IMPROVED HIGH SPEED ROAD LOCOMOTIVE, FOR POSTAL SERVICE.

the principal *Fourgon poste* lines, with so much success that in a short time a number more was ordered, similar to that engraved. The engines are on the compound system, 12 horse power, working with an average pressure of 175 lb. on the square inch. They are mounted on two laminated locomotive springs under each axle. They are running regularly between two large towns in the south of France, 70 miles apart. The goods are collected and packed in the wagon—which will carry about six tons—during the day and dispatched every evening. Consequently, the whole of the running is done in the night. Twelve hours are allowed for the journey of 70 miles, but out of this about three hours must be deducted for stoppages at various places *en route* to take up and put down merchandise. The average running speed is, therefore, about 8 miles per hour. The road for about 30 miles of its entire length is fairly straight and through a comparatively level country. For the remaining 40 miles it is very hilly, the gradients varying up to as much as 1 in 11, while some are as much as 3 to 4 miles long. For miles the road winds along a shelving side of the mountains, without any protection whatever on the low side, while at another part it descends a zigzag course down to the bottom of a very steep valley.

In consequence of the dangerous nature of the road, it is of the greatest consequence that the engines should be fitted with ample brake power and an efficient system of lighting. They are therefore fitted with a steam brake—worked by McLaren's patent steam reducing valve—as well as the ordinary hand brake. The former can be applied instantly with such force as to pull the engine up with full steam on, and at the same time, by means of a chain, the brake is also applied to the wheels of the wagon. In the experimental engine it was found impossible to make lamps which could be relied upon, so the new engines have all been fitted with an arrangement for burning ordinary gas. This is compressed into a receiver up to 175 pounds pressure, and reduced down to burning pressure by means of a patent regulator or diminishing valve, which Messrs. McLaren specially designed for this purpose. One charging of gas is sufficient to give a brilliant headlight and supply the signal lights for the round trip of 140 miles. The water tank capacity is sufficient for twenty-five miles, so that, with a fill-up before starting, it is only necessary to take up water twice *en route*.

When the roads are in fair condition, 10 cwt. of fuel suffices for the round journey; a little more is required in bad weather. The weight of the engine empty is 13½ tons; loaded up with coal and water, 15 tons. The wagon weighs 2½ tons, and the load from 5 tons to 7 tons, so that the average total weight of the train is about 23 tons. The service is a daily one from each end, so that one engine leaves each terminus each evening with its load and goes straight through with it. A reserve of engine power is always available, so that ample opportunities exist for washing out, cleaning, and repairs. The average mileage of each engine is about 15,000 miles per annum. The engines in question have been running for over six months without a hitch or breakdown, and the system is admitted by all to be a complete success.—*The Engineer*.

THE MASTODON GIGANTEUS (Cuvier).

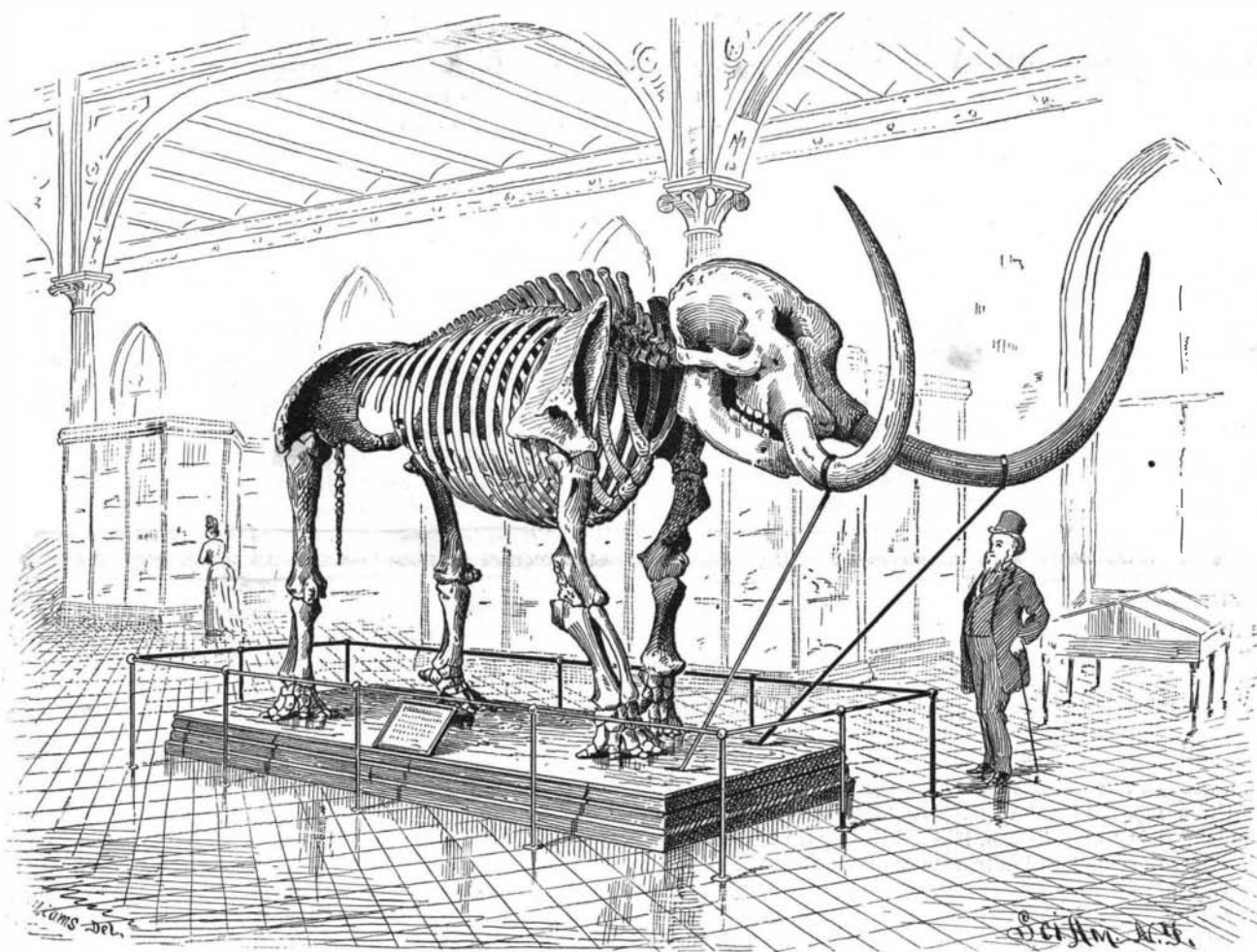
BY DR. J. B. HOLDER, AMERICAN MUSEUM, CENTRAL PARK.

The mastodon, that great fossil mammal, allied somewhat nearly to the elephant, has become, perhaps, more familiar to the public than any other of the numerous great creatures which once lived in our extended country. This familiarity came about through the frequent discovery of well preserved skeletons of the mastodon.

In nearly every State west of New England portions of this creature have been disinterred. And every year there are several found, more or less in a

state of complete preservation. The circumstance of several examples having about them evidences of man's work is extremely interesting. On one account it brings the date, though greatly indefinite, to man's existence. We are, therefore, able to say, man and mastodon are contemporaneous. But the date is obscure. We have not determined what sort of man made those stone arrowheads which struck the life out from the great carcasses and lie among their remains. We have not a knowledge of what sort of man made the charcoal which was found lying among the partly burnt bones of a mastodon near the Mississippi River. But we do know that some man made the arrowheads. And we know also that no other than man is capable of making charcoal, or even to make fire by which it is formed. We are then able to say that the mastodon, like the fossil elephant of America, lived in the period allotted to man, while the marvelous great skeletons of extinct mammals, which have also been found in the Western "Bad Lands," are of more ancient date, being of the Miocene and other ancient deposits.

The most perfect, and also the most remarkable, as to size and interesting developments, is the skeleton of a mastodon now mounted in the Geological Hall of the American Museum of Natural History, in Central Park. This example, of which our engraving is a correct picture, was found embedded in a peaty material in the town of Salisbury Mills, near Newburg, N. Y.



MASTODON GIGANTEUS—FOUND NEAR NEWBURG, N. Y.

At the time of the discovery of these bones, in 1877, the locality was cultivated as a potato field. It was, fifty years since, a pond hole of considerable size. In digging a ditch about 20 inches deep, in order to drain the pond, at the depth of 14 inches the workman came upon a hard substance, which proved to be one of the long bones of the mastodon.

Prof. Whitfield, of the geological department of the American Museum, in company with Major Brooks, of Newburg, visited the place of discovery. He found the situation to be "a swamp, bordered on the side nearest the position of the skeleton by a low hill of 'boulder clay,' a hard, blue clay, mixed with gravel, which slopes down and passes under the peat or muck of the swamp, and forms the original bottom of the pond. Every evidence, as has usually been noticed in other examples, was in proof of the animal's extinction by miring."

This skeleton is regarded as the most perfect of mounted ones known. This is a gratifying circumstance, as the greater number which have been removed from their burial places have proved to be greatly decayed. Often the upper side of the great creature is much decayed, owing to the nearness of the bones to the surface.

The only skeleton now in museums which compares to the present one in perfection is that famous one—the Dr. Warren example—which was found in 1845, near Newburg, N. Y.

In the present specimen the tusks were so injured that two others were substituted. The latter belong to the skeleton the only other portion of which is a lower jaw. This jaw is on exhibition with the skele-

ton, and exhibits the two remarkable under tusks which are known to exist at early age. These lower jaw tusks are obsolescent, being only about six inches in length. In most mandibles of the mastodon which are extant there is more or less of remaining alveolar development, which shows that at some period the creature had the mandible tusks fully grown.

The great tusks which are used in the skeleton to replace the decayed ones which were found with it are from an example found in Hoopstown, Illinois.

The dimensions of this skeleton are as follows:

Extreme length.....	18 feet.
Exclusive of tusks.....	14 "
Width of pelvis.....	5 "

It is the purpose of the American Museum trustees to mount alongside this mastodon the skeleton of the great elephant which Mr. Barnum lost by the late fire. This will afford an opportunity to compare the bones of the largest of Asiatic elephants with a large mastodon. It is well known that the African elephant has some near affinities to the latter, and in the near future a good example of that species will be added to the group.

The elephant as contrasted with the mastodon shows at once a greater height and shorter body. This is very considerable. Perhaps the next important comparison is in the aspect of the fore limbs. In the elephant the fore limbs are columnar, as are the hind limbs. In the mastodon there is a decided aspect

more or less of prehensile capacity (as it were), that is, the latter have the fore feet approaching the plantigrade in aspect, and the limbs correspondingly adapted for pronation and the opposite. Of course this is slight, but shows the difference in probable habits. The fore limbs of the mastodon, with such development, we should expect, would be able to be thrown over low foliage or brushwood, and a crushing effected by the somewhat expanded manus. No such movement could be effected by *Elephas*. As much as we naturally compare the two great creatures, and especially as both have similar nasal developments, a near view of both together shows many differences in form.

The teeth are usually spoken of as constituting strong characters. The molars of the mammoth,

with projecting, strong tubercular ridges, resemble the teats of a cow. The Greek *mastos*, a breast, being the root, hence mastodon, *mastos* and *odontos*, breast-toothed, or nipple-toothed.

The latter named kind of teeth are manifestly for crushing the coarse vegetable matter; and this corresponds to the probable uses of the fore limbs in crushing down shrubbery. The elephant, we see, grinds his food as the horse does. Both creatures, however, have the proboscis, and probably use that member similarly.

The first notice of the finding of the remains of a mastodon is found in the Transactions of the Royal Society of London, in the year 1714. Here is a short article in which is stated that a letter from Cotton Mather, of Boston, New England, to Dr. John Woodward, gives a description of some large bones which were found in 1705 at Claverack, in New York State, near Albany. Nothing further appeared until 1740, when De Longueuil, a French traveler, discovered some bones at the Salt Lick, in Ohio.

To Cuvier we are indebted for the first intelligent accounts. Until 1801, little was known of the perfect skeleton. At that time Mr. Peale, of Philadelphia, obtained and set up in his museum an example which was found in Orange County, N. Y. In 1840, Mr. Koch found one on the banks of the Missouri River. It is now in the British Museum. Some specimens, single bones, have been taken up in Connecticut, along the Farmington River. The great river which separates New England from New York seems to have been a partial barrier to the passage east of the great beasts.

It is gratifying that, though New York City has not had the privilege of exhibiting a good skeleton of the