# SCIENTIFIC MUSEUM.

### Traction.

Traction, in mechanics, is the act of drawing a body along a plane, usually by the power of men, animals, or steam; as when a vessel is towed upon the surface of the water, or a carriage moved upon the road. The power exerted in order to produce this effect is called the force of traction. Numerous experiments have been made for the purpose of ascertaining the value of a force so exerted: and when men are employed to draw laden boats on canals, it is found that if the work be continued for several days, successively, of eight hours each, the force of traction is equivalent to a weight of 31 1-9 lbs. moved at the rate of two feet per second, or 1 1-3 mile per hour, (it being understood that such weight is imagined to be raised vertically by means of a rope passing over a pulley, and drawn in a horizontal direction). The force of traction exerted when, without moving from his place, a man pulls horizontally against a weight so suspended, is estimated at 70 lbs. The action of a horse in drawing a vessel on a canal is said to be equivalent to a weight of 180 lbs. raised vertically, as above supposed, with a velocity of 3 1-3 feet per second, or 2¼ miles per hour; but this estimate has been considered too high; and from experiments which have been made on the power of horses in wagons, carts, and coaches, on level ground, it is found that the force of traction exerted by a stout horse is equivalent to 80 lbs. raised at the rate of 4 2-5 feet per second, or 3 miles per hour. Tredgold considers that a horse exerts a force of traction expressed by 125 lbs. raised at the rate of 3 2-3 feet per second, or 2½ miles per hour. A man or a horse can, however, double his power of traction for a few minutes without being injured by the exertion; and when the carriage is in motion, so that the friction on the ground is alone to be overcome, a horse can draw during a short time, on a level road, a weight exceeding 1,500 lbs.

The force of traction is found to vary nearly with the term $(w-v)^2$, where $w$ is the greatest walking velocity of a man or horse when unresisted, (6 feet per second, or 4 miles per hour, for a horse), and $v$ is the velocity with which the vessel or carriage is moved. From theoretical considerations it has been determined that the greatest effect is produced when the velocity of the object moved is one-third of that with which the man or animal can walk when unresisted.

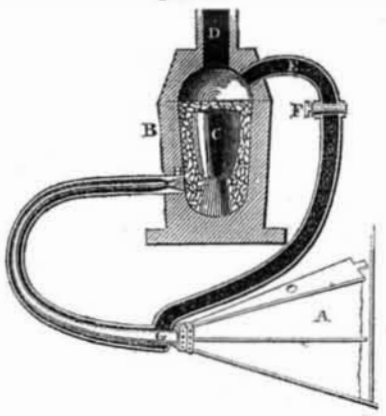
If a wheel-carriage were situated on a level plane, which opposed no resistance, it is evident that, whatever were the diameter of the wheels, the smallest conceivable power of traction applied to the axle would suffice to put the carriage in motion. But when a wheel in moving meets with an obstacle on the ground, that obstacle is pressed at the point of contact by a force acting in the direction of a line drawn to it from the centre of the wheel, and arising from that part of the weight which is supported by the wheel, together with the force of traction; therefore, by the 'resolution of forces,' the ratio between the resistance which is to be overcome by the moving power and the weight on the wheel will become less as the diameter of the wheel is increased; also the most advantageous direction in which the force of traction can be exerted is perpendicular to the line of pressure drawn from the centre of the wheel to the obstacle. But the height of the wheels cannot exceed certain limits, depending on the use to which the carriage is applied; and when the latter has four wheels, the height of those which are in front must be such as will allow it to be turned round within a given space; also, when a horse is employed to move a carriage, attention must be paid to the conditions under which the power may be advantageously exerted.

It was first observed by M. Deparcieux, and published in the 'Memoires de l'Academie des Sciences,' 1760, that horses draw heavy loads rather by their weight than by their muscular force. Sir David Brewster has also remarked that when the resistance is great, a horse lifts both his fore-feet from the ground; then, using his hinder-feet as a fulcrum, he allows his body to descend by its weight, and thus overcomes the obstacle; and, it may be added, that when this action takes place with a two-wheeled carriage, if the loading is disposed so that some portion may press on the horse's back, the effect of the animal's weight will thereby be increased. Now, if the traces, or the shafts of the carriage, were attached to the horse's collar, near his centre of gravity, a line imagined to be drawn from the latter point to his hinder-feet may represent his weight, and a line drawn perpendicularly from his feet upon a plane passing through the traces of shafts may represent the lever of resistance; but while the former line remains the same, this lever becomes less at the plane of traction (that of the traces or shafts) inclines more upwards from the wheel; and therefore, in order that the power of the horse may be advantageously applied, the diameter of the wheel should be as small as is consistent with other circumstances.

Experiments have shown that when the angle of traction, as it is called, that is, the angle which the plane of the traces makes with the road on which the carriage is moving, is 15 or 16 degrees, a horse pulls with good effect, and the height of the points at which the traces are attached to a horse's collar being about 4 feet 6 inches from the ground, it follows that, in order to obtain this inclination, the lower extremities of the traces or shafts should be 2 feet 3 inches from the ground. In general, however, in two-wheeled carriages the height of these extremities is about 3 feet. As an example of the force of traction exerted by steam, it may be stated that on a level line of railway, an engine with an 11-inch cylinder, and having an effective pressure of 50 lbs. per square inch in the boiler, drew 50 tons at the rate of 30 miles per hour, working 10 hours daily; and that the same engine, with an equal pressure in the boiler, drew 160 tons at the rate of 15½ miles per hour.

### On Boilers.---No. 10.

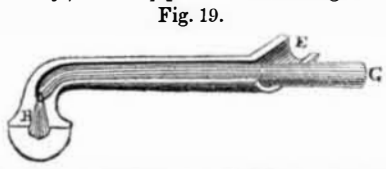
Fig. 18.




Cook's Smoke-Consuming Tuyere.—A number of American inventions have been patented. Mr. Dimpfel is the patentee of a Smoke Blower, which is well known, and Mr. Ransom Cook, of Saratoga, N. Y., is the patentee of the Smoke Tuyere, illustrated by the accompanying engravings, figures 18 and 19.

We present this Tuyere because we believe it is applicable to blacksmiths' forges, and any furnace where a bellows and blower is used. We have exhibited the tuyere as employed in connection with a cupelling furnace, but it is equally applicable to any other. A is a common bellows; B is the furnace; C is a crucible placed in the furnace, and seated on a block; it is surrounded with fuel. D is the chimney; E is a pipe or tube leading from

Fig. 19.




the chimney, and connected with the air-pipe, G, which enters the bottom of the furnace to supply the fuel with air. F is a cock to close the passage between the chimney and the supply pipe, to supply a greater or less opening according to circumstances. It will be observed that the pipe, G, which leads from the bellows to the furnace, is an interior tube; it is placed inside of an outer tube, as shown in fig. 19. There is a small space left between the two tubes, so that smoke from the chimney will pass round and between the two tubes. The air that is forced in by the bellows or blower, is therefore condensed; and when it escapes out at the end H, where the space is enlarged, it expands, and thus a partial vacuum is created at the entrance to the furnace or fire. This partial vacuum draws—to use a familiar term—some smoke out of the chimney, according to the well known laws of gravitation. This smoke is returned to the furnace, mixed with fresh air, to render it combustible, and it is ignited by passing through the red-hot coals. Working machinery (and a blower in the chimney is one of these) has been employed to force the smoke back through the fire, but this invention takes advantage of a law of nature, and does away with the necessity of working machinery to return the smoke. It also provides, in a most simple manner, for that which is necessary to render the smoke combustible, viz., the mixing of it with a quantity of fresh air. When a fire is first mended, a great quantity of black smoke generally escapes; this smoke is fine carbon or coal in mechanical suspension. At that period, above all others, a smoke-returning apparatus is most necessary, for after the coal is well ignited, no black smoke escapes—the carbon is fully ignited, and there is but little necessity then for the action of a smoke-consuming device or machine. A machine working when there is no necessity for its action, is a dead loss, and is expensive. No clear description of the principle and application of this Smoke-Consuming Tuyere has ever before appeared in public prints. We have seen notices of it, but they were neither clear nor intelligible to general readers. The accompanying engravings and description will enable any person to understand the invention.

### Singular Effects of Disease of the Brain.

A citizen of Livingston County died a few days since, of inflammation of the brain. During his last sickness his aberration of mind assumed the very singular phase of forgetfulness of substantive ideas. In his conversation he could employ all the parts of speech but "nouns," and though he was inclined to say much, he could not express himself fluently except in the use of words of the class named. These ideas he was obliged to omit, or express only by implication. An examination of his brain was made after death, when the following facts were elicited:—From the *dura mater*, or outer lining of the brain, an adventitious bone had grown, which penetrated the brain and caused suppuration of the anterior and lower part of one of the lobes of the brain on the right side This was the only indication of disease or loss. The foreign bone had no union with the skull. The fact is very singular, and the case is novel. Aberration of the mind is attended with the loss or forgetfulness of some class of ideas, but this case is anomalous from the fact that it was attended only by a forgetfulness of one class of words, for the person under consideration seemed to possess the idea denoted by the word, while the word itself was beyond his reach.—[Roch. Amer.

[The above is certainly a singular case. We can have no idea of any person having an idea that is not substantive. The idea of an act without an actor is certainly a singular thing.

### The Coal Trade of Pennsylvania.

The amount of bituminous coal mined in Pennsylvania during the year 1851 was nearly 1,400,000 tons, and of anthracite nearly 4,900,000, making an aggregate of 6,300,000 tons. The value is about $22,000,000. The coal-fields of Pennsylvania cover one-third of the State, or about 15,000 square miles, lying above or within the water-level. Those of England, Scotland, Wales, and Ireland combined, contain only 11,000 square miles of coal, in an area of 120,000 square miles of territory.—This coal in many cases lies from 900 to 1,800 feet below the surface of the ground, and is raised by machinery. In regard to the quantity of iron-ore, nearly the same relative proportion exists between Great Britain and Pennsylvania.—[Philadelphia Ledger.

### Vegetable Parasites in Sugar.

M. Tayen has observed in sugar, at Paris, a parasistic vegetation which runs in cavities in lines, and changes the sugar to a reddish tint. The sporules of this cryptogamic vegetation were not over one or two thousandth of a millimeter in length. During the past year he detected in a sugar refinery at Paris, a variety of this vegetation without a reddish tint, occupying irregularly scattered cavities; its sporules are a little larger than in the reddish kind. The sides of the cavities are covered by a thin membrane, from which the filaments proceed. He has nrmed this vegetation Glycyphila, from two Greek words signifying sweet and lover.

### Singular Cause of Death.

Mr. Francis Choate, of Lynn, aged 48 years, died at the Massachusetts Hospital a few days since of mortification of the bones of the jaw. The business of the deceased was the manufacture of friction matches, and it is supposed that the poisonous exhalation thus imbibed was the cause of the disease which resulted in his death.

[We have seen the above in a number of our exchanges. It is not a singular case; the disease is well known, and peculiar to all those engaged in making phosphorated matches. The phosphorus used is the cause of it. A remedy for the evil has been discovered, as those who are subscribers to the Scientific American have been informed some time since. The discovery is the making of phosphorous amorphous.

### LITERARY NOTICES.

The Magazines for February have been sent us by Messrs. Dewitt & Davenport, Tribune Buildings.—They are all beautiful numbers, and deserve the patronage of the American public in preference to Harpers' and others, made up of the borrowed literature of Europe, without encouragement to American authors. In point of real merit, they are much superior. Graham's has several splendid steel and wood engravings, besides 112 pages of clearly printed text.

Sartain gives his readers a fine picture of Columbus and his companions attending religious service in the new world, a beautiful picture of the Capitol enlarged, besides several done on wood. It is edited with marked interest.

Peterson's Ladies' National, edited by Ann S. Stephens, is an old favorite, and deserves well. The illustrations are numerous, and the contributions are from the highest intellectual sources. The two former are $3 per annum, the latter $2.

Practical Model Calculator.—No. 6 of this work, edited by Oliver Byrne, and published by Henry Carey Baird, of Philadelphia, contains rules for calculating the dimensions of the various parts of steam engines, and their power; also, rules for calculating the strength of materials. This is a very useful work. We hope Mr. Byrne will in some number present a clear account of the coefficients employed. This will be very satisfactory to the great body of our mechanics. For sale by Dewitt & Davenport, of this city.

Dexter & Brother, 43 Ann street, this city, have just received from London a large edition of Kossuth in England, beautifully illustrated, containing a memoir, and all his speeches. It is worth possessing, and is sold for 25 cents at the office as above.