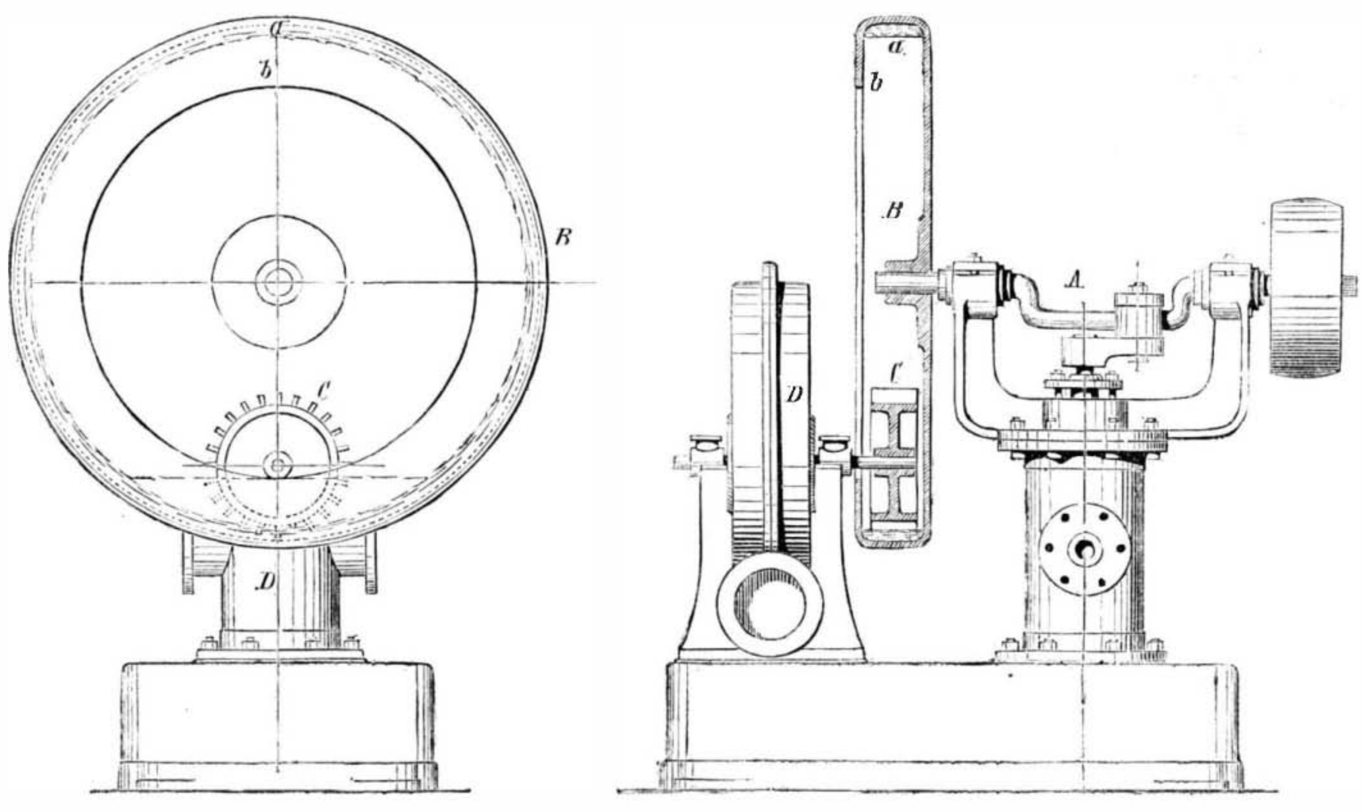
A WATER BELT FOR TRANSMITTING MOTION.

A curious mode of transmitting motion by means of a water belt is represented in the annexed engraving, which we extract from the *Revue Industrielle*. The device is that of an English inventor, Mr. J. Robertson, and is said to work with perfect freedom from noise and vibrations. The piston of the engine is connected with the driving shaft, A, on one extremity of which is attached a large hollow pulley, B. The outer face of the latter is cut away from the center so as to leave only a flange of the width shown at *b*. Through the opening passes the shaft of a fan blower, D, on which, and inside the hollow pulley, is a pallet wheel, C. The pallets on the latter do not touch the inside of the hollow pulley.

In operation the water, *a*, of which a small quantity is placed in the pulley, B, is caused, by centrifugal force, to spread itself against the inner periphery, and to be carried around with the wheel. Into this water, as shown in the sectional view on the left, the pallets on wheel, C, dip, and are thereby acted upon by the force of the same, causing the wheel, C, to rotate. The hollow pulley is of sheet iron, and is revolved at the rate of 500 turns per minute. No water whatever, it is stated, is ejected from the apparatus, and it is only necessary to supply the small amount lost by evaporation to keep the device in working order.



WATER BELT FOR TRANSMITTING MOTION.

American Inventive Genius.

In Switzerland no patent law exists, much to the disgust of native inventors, who are obliged to seek protection for their improvements in this and other countries. Mr. Adolph Ott, a native of Switzerland, but long resident in New York, is now at home, laboring to procure the passage of patent laws by the Diet, and has lately published at Zurich a pamphlet on the subject, in which he makes the following tribute to the inventive genius of America:

"No nation can boast of having accomplished so much towards the general progress of industry as the American. If you make inquires about the origin of the most important improvements in any branch you please, you will find in five cases out of ten that it was made on the other side of the ocean. In our boasted watch industry the substitution of machines for manual labor took place only through the impulse given by Americans. The modern system of grain mills is of Yankee origin, and so is the whole india rubber industry. The present system of the construction of iron bridges is the result of American genius. Look at the boring machine that performs its work at the St. Gothard tunnel uninterruptedly; it came to us from the other side of the ocean, and so did the system of electric blasting. As to the printing telegraph, it is due to Professor Samuel F. B. Morse, an American who died recently. The system of railways like that on the Righi Kulm, which promises to be of so much importance to Switzerland, was invented by Mr Sylvester Marsh, a New England man. With regard to fire arms, the United States has presented us with the most important improvements. The best wood-working machinery is of American origin, this being also the case with numerous agricultural implements, not to speak of household machines. To a western man, Mr. Samuel Danks, we owe the mechanical puddler, an invention in the manufacture of iron which is only second in importance to that of Bessemer. In an article in the *Journal of the International Exposition*, the well known engineer Perels calls the American machines for making tools sent to the Vienna Exhibition "perfect instruments of precision," and according to him the hand saws are distinguished by a truly astonishing form and accuracy. In the making of scientific instruments, the United States are equally advanced. To Professor Jno. W. Draper we owe entirely new self-registering meteorological instruments, which, though more simple, are not less accurate than the best in use in Europe. The American watches compete already to a considerable extent with the Swiss and English. In view of this entirely unparalleled inventive activity, an American was not quite wrong in saying, in the International Patent Congress in Vienna: "It has been stated from the opposite side that a German had invented printing when there was no patent law. This is true, but it required three centuries thereafter to invent the printing machine. Surely in America, it would not have required over five years."

The Perils of Flying.

M. De Groof, the flying man, lost his life recently at London, England. He had ascended in a balloon, and his part of the performance was to fly down to the earth after the balloon attained a great altitude. The unfortunate inventor had constructed a pair of wings made of cane and silk, each 37 feet long by 4 feet wide, and also a tail 18 by 3 feet in dimensions. The wings were inserted into two hinged frames, which were attached to a wooden stand, upon which the aeronaut stood and manipulated them by means of levers. The theory was that, when started from any high altitude, the machine would reach the earth by a very gentle incline, passing over a great distance and eventually landing without concussion. At a first trial of the device, on being dropped from a balloon, the earth was reached in safety, but on the present repetition of the experiment, De Groof seemed to lose control of his wings, and the apparatus collapsed and fell, dashing the man to pieces on the street pavement below.

A NEW SECTIONAL BALLOON.

Mr. James Hartness, of Detroit, Mich., has recently patented a novel form of balloon, the main object of which is to prevent accidents due to bursting while in the air. In-

Fig. 1.

stead of making a single globe, he constructs the body of the balloon in sections, exactly similar to those of an orange, each one of which is inflated separately, and all joined together complete the sphere. A section is shown separately in Fig. 2, and several joined together in Fig. 1. An axial opening is left at the extremities, at the middle of which the sections, the inner edges of which are made of suitable shape for the purpose, are connected by straps, *b*. Through this opening a rope ladder extends, so that the aeronaut may have access to all the valves, one of which is arranged in each section. The poles shown passing up through the aperture are designed as a support for the balloon during the process of inflation.

Fig. 2.

It will be seen that, owing to the small amount of pressure which each section has to withstand, the fabric may be made much lighter than would be necessary in a balloon of corresponding size constructed in the usual way, while, as in compartment ships and sectional boilers, a rupture occurring at any point is confined to a single section, the others, remaining uninjured, retaining their buoyancy.

Patented Car Improvements.

There were one or two points in the proceedings of the Car Builders' Association, at its late meeting, in which a peculiar sensitiveness was developed about discussing the merits of patented devices. The impression seemed to prevail with many of the members that such devices were not only inadmissible as legitimate topics for discussion, but that committees, in making their reports, must not indorse or recommend any such devices for adoption, no matter what might be their actual merits. This, in our judgment, is a mistake which cannot be too soon corrected: nor do we think that, in order to do so, any alteration of the constitution of the Association is necessary. That instrument, as it is now, merely forbids the admission of patentees or their agents to advocate their claims at any of the meetings of the society, but does not prevent the members from freely expressing their views in the regular course of discussion upon any invention or device, whether patented or not. To suppress all discussion with respect to patents would seriously hamper the Association in the exercise of its proper functions, and so far destroy its usefulness. It must necessarily be progressive, or disband. It is not the business of the Association to make or unmake the fortunes of inventors or patentees, or to discriminate between rival claims, except on the score of actual merit, and as the interests of railroads may be affected thereby. If the Miller platform or the Westinghouse brake is a good device now, let it be indorsed and approved; but as soon as either is surpassed by something better, let it be condemned. There is no evading this obvious duty. The Association has got to recognize patented inventions and pronounce upon their respective merits, so far at least as they apply to railway cars, or be exposed to comment and criticism, such as may be found in the SCIENTIFIC AMERICAN of July 18.—*National Car Builder.*

Soils and Fertilizers.

Turfy loam, being rich in decomposing vegetable fiber, forms a soil acceptable to almost all families of plants, forming, as it were, the staple or ground work to which other soils or ingredients may be added. Some cultivators, says a correspondent of *The Garden*, prefer using turfy loam as soon as it is taken from the field or pasture, to form the principal ingredient in the formation of vine borders, and for melon culture, etc., justly considering that many of its useful properties are wasted, by its retention, of perhaps years, in the soil yard, before it is supplied to growing plants. It is obvious, however, that it would be inconvenient for the cultivator to have to repair to the field or pasture supposing that he had permission to do so, whenever he might require even a small portion of this soil; and most plant grower will only be too glad to take an opportunity; when it offers itself, to lay in a stock of this soil to last them for several years.

When this is carted into the soil yard, it should be stacked up in the form of a ridge, and might, with advantage, be thatched with some littery material, so as to prevent it from becoming saturated with cold rains during winter, or from being desiccated during dry summer weather. If a portion of good farmyard manure can be secured simultaneously with this soil, a layer of the same might be made to alternate with a layer of the loam, and this would form a most useful compost for many purposes; as, when it had laid some six or more months, it would then be found to be in excellent condition, without further additions, to use for the potting of fruit trees of various sorts, strawberries, roses, and other kinds of plants requiring a rich and somewhat tenacious soil; while, to render it suitable for other varieties of plants, river or silver sand, leaf mold, peat, etc., could be added in the proportions required.

PEAT, LEAF MOLD, AND OTHER MATERIALS.

In establishments where collections of heaths and other hard-wooded plants are cultivated, "fibery peat" soil is indispensable; and, in many parts of the country, peat, of the desired quality, is exceedingly difficult to procure. The black bog soil, which is sometimes substituted for it, is absolutely worthless, and any attempt to cultivate hard-wooded plants in such material will be sure to end in failure. Where good peat cannot be found, it is always advisable to purchase it from nurserymen or others who may be in a position to supply it, and this can always be done for a trifling outlay. The best description of peat generally contains more or less silver sand; but, if found to be in any degree deficient in this respect, sand can then be added to any desirable extent; and as regards silver sand of the best quality, there are only a few places in which it is to be found. It can, however, always be purchased, and is not expensive; while, for many purposes, sharp river sand, where it can be obtained, forms a good substitute. Leaf mold, or soil composed entirely of decayed tree leaves, is also an essential material in every garden establishment; and, generally speaking, there is little excuse for a gardener not having an abundant stock of this always on hand. It is seldom, however, in good condition for potting purposes until it is two or three years old; and, even then, it should seldom or never be used alone, but mixed with loam or other soils. The leaves of the oak and the elm are generally preferred to those of the ash, horse chestnut, walnut, and others, whose leaves are of a softer tissue. Every soil yard ought, also, to contain a portion of clay, or the runnings of a clay pit; this improves with keeping, and is exceedingly useful where the natural soil is inclined to be of a light or sandy character; the latter will be considerably improved by an admixture of clay, which will be found to render it more suited to the culture of fruit trees and strawberries in pots, melons, etc. Advantage should also be taken of any opportunity which may occur to secure a quantity of lime rubbish, from any old buildings which may be about being removed or under repair, as this material is of service to soils deficient in calcareous matter, and in the formation of vine borders. Of well rooted stable or hot bed manure, I need scarcely say a considerable portion should always be kept on hand; also a portion of dry cow, sheep, or deer dung; decayed mushroom beds, composed chiefly of horse manure; also a quantity of broken bones, charcoal, soot, etc., all of which should be kept separate, and in readiness in the soil yard.

RAILWAYS IN NEW YORK CITY.

"The statistics of the horse car companies now in operation in this city, when compared with the figures furnished by the London underground railroads, show that there will be immense profits from a properly managed steam road in New York. The total length of our horse car lines is seventy-six miles. They employ 11,086 horses, moving cars at the busiest hours at the rate of one every forty-five seconds. The speed per hour is five miles; the cost of construction, three eighths of a million dollars per mile. Last year, the passenger travel amounted to 192,000,000 persons, being two and a half millions per mile. One some roads the ratio was still larger. The Sixth Avenue road carried four millions per mile, and the Third Avenue line, below Central Park, carried five millions. The average fare on the different lines and their connections is $5\frac{1}{8}$ cents, while the total expense per passenger is 4 15-100, leaving a net profit of 98-100 cent. The business of the horse roads has increased 255 per cent in ten years.

In London, there are 19 3-10 miles of underground roads. The motive power employed is 70 engines. Trains run every four minutes, during the busiest hours of the day, at an average speed of fifteen miles. The cost of construction per mile, after deducting sales of surplus real estate, is three and a half million dollars. Sixty-five million passengers were carried last year, at the rate of three and a half millions per mile. The average fare is five cents, and the total expense per passenger 2 31-100 cents, leaving a net profit of 2 69-100 cents for each passenger carried. In the underground roads, the increase of business in ten years has been 360 per cent.

A comparison of these statistics gives a most favorable showing to the steam railway. While the expense of construction and equipment is larger in the case of the latter the operating expenses are very much less. The expense of transportation per passenger by the steam engine is about one half of that reported by the horse roads, while the net profit is nearly trebled without any advance in the fares. At the same time the speed is fairly trebled. The steam road is popular, too. Rapidly as travel has increased on the surface lines in New York, the increase on the London underground railway has been half as large again. The people have had practical proof of the speed and safety of the latter, and patronize it accordingly.

This comparison shows the large profits which lie within the reach of any corporation that shall be the first to go to work and give New York the benefit of rapid transit. There are no estimates in the figures just presented. They exhibit work that has been done and profits that have been pocketed. According to these statistics, steam roads might acquire a net profit of over five million dollars, annually, by carrying the same number of passengers that now yield the horse roads a profit of less than two millions. A competent engineer, who has carefully studied the subject of rapid transit, estimates the gross revenue of a road to Forty-sixth street at $4,319,400 per annum, with $1,916,000 as the annual cost of operating, leaving a net income of 23 78-100 per cent on the calculated cost. There would also be added to this the extra fare for carrying first class passengers, baggage, express parcels, or the mails.

This exhibit appears as reasonable as it is gratifying. If it be also taken into consideration that the population in the city limits will be largely increased as soon as rapid transit becomes a fixed fact, the probability of large returns on investments in this direction becomes a certainty.

A golden harvest awaits the corporation that shall enter upon the work. Labor is ripe for it, and capital will not hesitate to lend a helping hand in due time. There is no such opportunity for enterprize and profit elsewhere in the land. It were a waste of time to enlarge upon the benefit of underground rapid transit to the community. The profit it promises is the argument of the hour."

The above is from the *Daily Graphic* of this city. It is gratifying to be able to add that the Legislature, at its recent session, granted some additions to the charter of the Broadway Underground Railway Company, which it is expected will, before long, enable that corporation to begin the work in earnest. The authorized first section of the road is from the Battery, at the extreme southern end of the city, under Broadway to Central Park, with a side branch to the Grand Central Depot at 42d street. Considering that it now takes the passenger a dreary hour, by horse car, to traverse this distance, $4\frac{1}{2}$ miles, and considering that by the underground railway it may be done in ten minutes, it requires no great stretch of the fancy to predict that the new road will enjoy an enormous patronage.

Railway men, who have examined the matter, say that the Broadway Underground Railway route is the best railway line in the world. It passes through the heart of the city, in the center of all travel and traffic, the resident population along its line being greater than that of any corresponding distance in London, or any other city in the world.

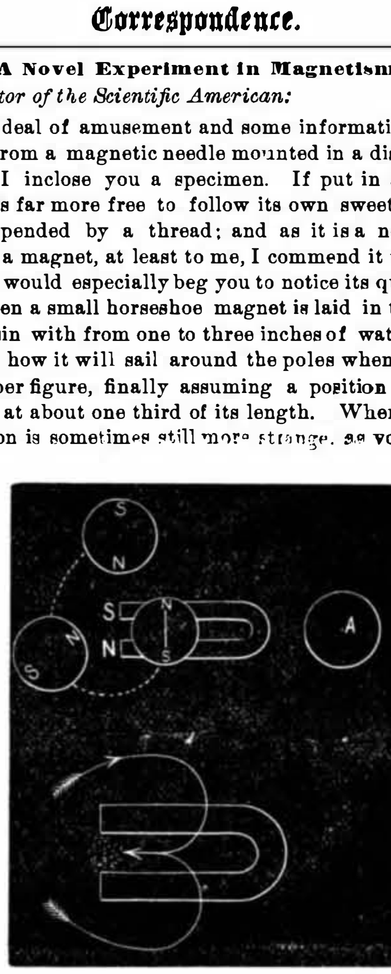
Surveys for the Broadway Underground Railway, made to accommodate the enlarged works authorized by the late Legislature, have lately been executed, and we hope before long to place before our readers some of the plans and estimates of the work.

Correspondence.

A Novel Experiment in Magnetism.

To the Editor of the Scientific American:

A good deal of amusement and some information can be obtained from a magnetic needle mounted in a disk of cork, of which I inclose you a specimen. If put in a basin of water, it is far more free to follow its own sweet will than when suspended by a thread; and as it is a new way of mounting a magnet, at least to me, I commend it to your attention. I would especially beg you to notice its queer movements when a small horseshoe magnet is laid in the bottom of the basin with from one to three inches of water over it, and to see how it will sail around the poles when placed as in the upper figure, finally assuming a position across the horseshoe at about one third of its length. When placed at A, its action is sometimes still more strange, as you will perhaps see.



With a bar magnet, its motions are different, but amusing and instructive; but in any mode of experimenting with it, its perfect freedom to assume its proper position serves to show the lines and centers of force with far more clearness than any form of magnetic toy I have ever seen.

Another very pretty experiment (see the lower figure) is to put one of the magnets in the basin with about one eighth of an inch of water over it; take a small file and a bit of iron, and let the filings drop on the water over the magnet. This is a much better way than to put the filings on paper and the magnet underneath. The way the filings sail into position is very interesting; they like to enter into position from the outside and near the center, and float down the middle, as in the direction of the arrows; and as they accumulate, the first ones are forced out beyond the poles, in the well known curves. Filing them is better than sprinkling filings over the water, as they fall each one separately. In sprinkling filings on the water, they fall in aggregations in which they are not as free as when each atom of iron is separate. H. P. HENRY.

Pittsburgh, Pa.

REMARKS BY THE EDITOR: We have tried all these experiments, and, although the movements we observed are not precisely those described, they are still very amusing and interesting.

The Largest Locomotive in the World.

To the Editor of the Scientific American:

I see in a recent issue of your paper that a correspondent makes the statement that the largest locomotive is one on the Philadelphia and Reading railroad, which has two cylinders, 20 x 26, and twelve driving wheels; and that the whole weight is sixty tons. He probably has never heard of the "Janus," constructed by William Mason, of Taunton, Mass. It was built for the Union Pacific railroad, but could not be used there; and where it is now, I do not know.

Sandwich, Ill. GEO. H. FRIZZELL.

REMARKS BY THE EDITOR.—We are much obliged to our correspondent for reminding us of the Janus, which, as he states, was built at the celebrated Mason Machine Works, Taunton, Mass. Mr. Mason informs us that the Janus has four cylinders, 15 x 22, and twelve drivers $3\frac{1}{2}$ feet diameter, and no other wheels. Its weight, when the tanks and coal bunkers are full, is 84 tons. It is now working on a coal road in Pennsylvania. If anybody can produce a larger locomotive, we hope they will trot it out.

Hardening and Tempering Tools.

To the Editor of the Scientific American:

You have been talking to us in your "Practical Mechanism," by Joshua Rose, in a way that we can understand, and upon subjects in which we are directly interested, and, as I think, to our benefit. But please keep out the oxides. We do not want them in the shop; we know of straw and blue colors as different tempers because we always find them so in practice. If a straw may be a blue, and a blue a straw, temper, because of films of oxide and the time they were coming, our present system of tempering is gone, with no new one to take its place. I never yet found a blue as hard as a straw, nor a straw as soft as a blue, whatever time it took to draw them.

New York city. TOOLS.

Compound vs. Oscillating Engines.

At the Risdon Iron Works, San Francisco, Cal., under the direction of G. W. Dickie, M. E., the oscillating engines of the steamer Los Angeles have lately been removed, and a compound engine substituted, by which an important saving in fuel is gained. The engine, of 337 horse power, is known as an annular compound; the high pressure cylinder being $19\frac{3}{4}$ inches diameter by 28 inches stroke, and the low pressure cylinder $43\frac{3}{8}$ inches diameter by same stroke; expansion of steam, eight to one, the smaller cylinder being contained within the larger one, jacketed with high pressure steam, and both cylinders operated by one balanced slide valve, cutting off at three quarters of the stroke.

The consumption of fuel for the new machinery is claimed to be 1·6 lbs. of coal per hour per horse power. This, we think, must be a mistake, as it is considerably less than the average of the best compound engines. With the old oscillating engines, the steamer made nine knots an hour on a daily consumption of 22 tuns of Sydney coal. With the new engines, she makes the same speed on 5 tuns of coal.

Whitworth Steel.

Some idea of the solidity of compressed castings of Whitworth metal may be gleaned from the fact that, five minutes after the application of pressure,—about twenty tuns to the square inch,—a column of fluid steel becomes shorter by 12·5 per cent, or $1\frac{1}{2}$ inches to the foot. Sir Joseph Whitworth, as a writer in *Iron* states, holds the proportion that for certain purposes a metal must be used having a certain tensile strength and a certain percentage of ductility. Hence the metal cast at the Whitworth works is classified according to its possession of these qualities, and arranged for convenience in four groups, distinguished by colors, red, blue, brown, and yellow, and by numbers, No. 1 of each group representing the most ductile metal, and No. 3 the least so. Of Low Moor wrought iron, the tensile strength per square inch is 27 tuns, and ductility or percentage of elongation, 38. In good cast iron the same qualities are represented by 10 and 0·75. Various samples of Whitworth steel similarly tested gave from 36 to 72 tuns tensile strength, and from 33·3 to 14 per cent elongation. There is shown a singular relation between the tensile strength and ductility of the metal, the one generally increasing as the other decreases, a circumstance which, it is suggested, may possibly deserve investigation.

The Polyspheric Ship.

This is the name of a novel vessel, recently invented in England by Mr. Charles M. Barnes. The bottom is flat and fitted with three inclined planes with square ends, the effect being as though three teeth of a gigantic saw were moved through the water with the sloping portion of the teeth first.

The inventor has tested the device by means of small models impelled by rockets. A 7 pound model was driven, by a 3 pound 3 ounce rocket, a distance of 105 yards in 3 seconds, or at the rate of 63 knots per hour. The motion is said to resemble sliding over ice. There is scarcely any water disturbance, and the decks were apparently motionless. When drawn slowly over the water, the vessels offered more resistance than models of the ordinary shape; but when the equilibrium, between the horizontal pressure of the inclines forward and the pressure of the water in the contrary direction, is destroyed, the model at once rises in the water and passes over the mass of hitherto obstructing fluid.

Valve for Gases and Corrosive Liquids.

This valve is adapted to cases where liquids have to be forced into vessels under pressure. A piece of glass tube, about 3" long and $\frac{3}{16}$" internal diameter, has a bulb blown in the middle, and the ends are cut off square. A piece of india rubber tube 3" long, and of such a thickness that it will just pass into the bulb tube, has one end tied with string or platinum wire. Just below the ligature a transverse slit is made, so that the end is nearly cut off. The uncut part serves as a hinge. A small pellet of cork or india rubber is put into the end beyond the slit. The tube is then stretched on a piece of glass tube, and the whole forced into the bulb tube, till the valve occupies the interior of the bulb. Any pressure in the tube raises the valve on its hinge, while any back pressure closes it tightly. For pressures up to 30 lbs. on the square inch it is perfectly airtight. Beyond this the author has not tried it.—*Roland H. Ridout, in the Chemical News.*

A MOUTH without grinders is like a mill without a stone. A diamond is not so precious as a tooth.—*Don Quixote*