ably wide floor for the lower tier of ice, which (the floor, not the ice) is covered with a layer of straw or hay, and this again with a thin layer of coarse sawdust or wood turnings. This allows the water from the melting ice to trickle down, and to be removed by the pumps. But as the space at the bow and stern of the ship is necessarily narrow, and would admit of the packing of but one cake of ice in the extreme parts of it, which would be attended with great loss and waste without any compensating advantages, it has been found necessary to erect partitions, or bulkheads, across such parts of the vessel as its particular model shall render advisable, so that from half to two-thirds of all the available space in the ship shall be occupied by the cargo, equidistant between bow and stern. This done, the ship is prepared to receive her cargo.

Moored at the wharf where the ice is to be delivered, the main hatch is thrown open, and a slide or chute is constructed from the landing to the hatch. Over the hatchway a windlass is erected, the drum extending entirely across it lengthwise. To this are suspended two iron frames intended to receive the cakes of ice from the chute, in such a manner as that, while the loaded one descends, the empty one rises. As the cakes of ice come rushing down the chute, they are dexterously directed by the ice hooks in the hands of the workmen to one side or the other, so as to enter the gigs, which descend with them into the hold. As the lower tier is completed, it is packed all round the sides of the vessel with sawdust. This gives additional space for the next tier, which is wider than the first, as the sides of the vessel recede from the keel; and the tiers, increasing in width until the whole breadth of beam of the ship is attained, are successively packed as described.

In the shipping of ice immense quantities of sawdust are used, so that what the owners of saw mills used to be bothered with to get rid of, now yields them a handsome revenue. It is estimated that the ice trade of Boston alone consumes sawdust, shavings, and rice chaff to the value of $30,000 a year, an item which used to be thrown away.

To deliver a cargo of ice to India involves a voyage of sixteen thousand miles, occupying four or five months, during which the equator is crossed twice; and if one half the cargo is delivered it is regarded as a success. The loss, is, however, sometimes much greater, even amounting to 75 per cent. On shorter voyages, such as the West Indies, and the southern part of the United States, the loss will not often exceed 33 per cent of the amount shipped.

It would seem that ice, costing nothing for the raw material, might be furnished at lower rates than is demanded for it; but when the amount of capital and labor employed, in houses, men, teams, horses, tools, and machinery are taken into the account, together with the greatly advanced cost of every item which enters into the business, it will be at once seen that only the utmost care and the most perfect appliances can render operations remunerative enough to induce capitalists to invest their funds, and allow them to continue thus appropriated.—*Journal of Pharmacy.*

A 6000-pounder Gun.

One of our most successful inventors and engineers has lately patented, and the specification has been published, of an enormous air-gun of 32-inch bore, to throw a 6000 lbs. shot. The bore of the gun is to be upwards of 30 feet long, and the inventor asserts that he can compress and retain air at a working pressure of 10,000 lbs. per square inch. The sectional area of a 32-inch bore is $804\frac{1}{4}$ square inches, and the total initial pressure would thus be 8,042,400 lbs., or nearly 3,600 tuns. It would, of course, be next to impossible to pump in air fast enough at this enormous pressure to keep up the velocity of the shot, so the high pressure air is to be contained in a huge casing or jacket formed around the bore of the gun, and having the same capacity of say 165 cubic feet. Thus, instead of the pressure being reduced almost to *nil* at the muzzle, the air would have been expanded but two-fold on the discharge of the shot; and if we disregard the influence of rarefaction, and consequent cooling by expansion, and its effect on the pressure, we should have 5,000 lbs. per square inch still left. If we take the average pressure at 7,500 lbs. throughout the length of the bore, we shall have 2,400 tuns exerted through 30 feet, or say 72,000-foot tuns, and this, were the air to follow fast enough, would send a 6,000-lb. shot at a rate of more than 1300 feet per second. As no ordinary valve could be opened quickly enough to admit air under such pressure, and in such quantities, the shot itself forms the valve. The high-pressure air in the air casing or jacket enters the chamber of the gun through ports, like those by which steam enters a steam cylinder. The shot—a short cylinder with hemispherical or pointed ends—is so packed as to close these ports while the jacket is being pumped full. To discharge the gun a little high pressure air is separately pumped in behind the shot, so as to start it on and past the ports, when the stored-up air does the rest of the work.

Although there may be certain practical difficulties in carrying out this scheme, it possesses great interest, and we shall look with much curiosity to its practical realization.—*Engineering.*

To Coat Iron with Copper or Brass.

The copper or other coating is to be melted in a suitable vessel, and a stratum of borosilicate of lead placed on its surface: the iron is then to be plunged into the molten metal, and retained there until a coating is deposited on it. Iron coated with the tin or lead may be treated in a similar manner. Another method of coating iron with copper is to place in a crucible a quantity of chloride of copper, upon which is laid the iron to be coated, and over that a quantity of charcoal. The crucible is then submitted to a red heat and the chloride of copper fused, and a coating of copper deposited on the iron; or the vapor of chloride of copper may be employed for the same purpose. The coating of copper thus obtained, may be converted to one of brass by exposing the sheet of metal to the vapor of zinc in a closed vessel.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

The Giffard Injector.

MESSRS. EDITORS:—In your paper of the 2d of May, you intimate that the principle of the Giffard Injector is not well understood, and present your readers with an explanation, given by Mr. John Robinson, of Manchester, Eng., as the best elucidation of the puzzle. I am of the opinion that Mr. Robinson himself does not show a very clear perception of the thing. At any rate, he fails to make it plain to any ordinary comprehension. With your permission, I will endeavor to do so myself.

The operation of the Giffard Injector is dependent on the laws both of pneumatics and hydrodynamics, and its secret lies in the fact that under any given pressure aeriform bodies are propelled with a very much greater velocity than liquids. Thus, if we would communicate to water a velocity far above any thing that could be accomplished by hydraulic machinery, let us first convert it into steam, then set it in motion and suddenly reconvert it into water by condensation; the water will retain the velocity of the steam.

To illustrate by example: We have a steam boiler in operation, under 90 lbs. pressure. If we run a pipe from the steam chamber into the boiler, under or above the water level, equilibrium will exist. But if we open the pipe into the air, steam will flow in a jet. I have no means at hand to ascertain the velocity of a jet of steam under 90 lbs. pressure—about 6 atmospheres—but a table before me gives the velocity under one atmosphere at 650 ft., increasing in a constantly diminishing ratio to 1,600 ft. under 20 atmospheres. Perhaps under 90 lbs. a velocity of 1,000 ft. would be a fair estimate. At any rate, I will assume it for the purpose of this illustration.

Suppose now that the steampipe is of just such length and caliber as to contain, under 90 lbs. pressure, the product, in steam, of one cubic inch of water. Remember it is moving 1,000 ft. per second. Suppose again, that it is suddenly and perfectly condensed, and we have a cubic inch of water flowing with a velocity of 1,000 ft. per second. Now if we open an orifice in the boiler below the water level, a jet of water will be projected from it with a velocity of about 114 ft., which is due to a pressure of 90 lbs. If, again, by means of outside machinery, we throw a jet of water of the same diameter with the orifice, and directed at it, with a velocity of 114 ft., there will evidently be equilibrium; because, as pressure and velocity are convertible into each other, the force of the jet will exactly counterpoise the jet seeking to flow from the orifice, and no water will pass into or out of the boiler. But if the jet, by additional pressure, attain a velocity of 115 ft., then the equilibrium is destroyed, and water will pass into the boiler through the orifice.

To recur now to the cubic inch of water in the steampipe, with its velocity of 1,000 ft. per second. How much more easily and rapidly will it penetrate, where even a velocity of 115 ft. is sufficient to overcome the resistance. And suppose, now, that it comes in contact with another cubic inch of water in a state of rest. It will part with half its velocity to the latter, and both commingled, will move on at the rate of 500 ft. Let these two come in contact with other two at rest, and again, the weight being doubled and the velocity halved, they will move 250 ft. per second. Still again, let these four strike four others in a state of rest, and we shall have eight cubic inches moving with a velocity of 125 ft. per second, which, as we have seen, is sufficient to effect an easy and rapid penetration into the boiler. Of these eight, one is the cubic inch that was condensed out of the steam in the pipe, and here we behold it commingling with and carrying along seven others, by which, in fact, it was condensed, with a velocity much greater than that of a jet projected from below the water level of the boiler under the existing hydraulic pressure of 90 lbs.

I have taken for illustration a given amount of steam and water. In fact, however, there is a constant flow of steam, a constant condensation by an uninterrupted stream of water, and an unbroken jet into the boiler.

It may be asked, if the steam jet itself were directed at an orifice in the boiler, would it penetrate? It would not. It must be remembered that force is a product of weight and velocity, and here the weight of steam being so insignificant —it requiring 1,700 cubic inches under the pressure of one atmosphere to weigh as much as one cubic inch of water— the force would be insufficient to penetrate. But it is a very different thing when water moves with so great a velocity.

The principle of the Giffard Injector is applicable to other purposes than feeding boilers. It makes a good pump for shallow reservoirs. It would make a very powerful fire engine. It could be used to drive light machinery, by throwing its jet into a turbine wheel running at a high speed. I have used it to propel a toy boat—not very satisfactorily, however —having a small copper boiler heated by a spirit lamp, and throwing its jet back under the stern.

Nothing has been said, in this discussion, of the construction of the apparatus, nor was it necessary, as I presume that is familiar to all engineers. I have aimed only to develop the principle. It is a very beautiful invention.

Tuscaloosa, Ala. H. S. WHITFIELD.

Size and Capacity of Millstones.

MESSRS. EDITORS:—J. W. H., of Minn., on page 39, current volume, asks if it will take any more power to grind eight bushels of wheat in the same time on a four-feet run of stones than one of three feet. A very practical question, and one that all millers ought to be interested in, as it touches the absorption of power in all mills.

"H. M.," of Minn., page 263, attempts an answer, but gives no proofs. He says; "I think it will take less power to do the work on the four feet stone, as the velocity required to make the smaller stone equal in capacity the larger absorbs a large proportion of the power." If H. M. means that the larger stones absorb a large proportion of the power to do the work given, I agree with him; but if he claims that it is necessary to run a three-feet stone to equal in area of feet a four-feet stone to grind the given amount, then I beg to differ. Example: The usual motion given to a four-feet stone is 180 revolutions per minute, and some run them to 200 revolutions per minute, but I have stated the minimum. Now let us see what figures tell us about the frictional surface or area of face of a 4-feet stone running at 180 revolutions per minute. Area of stone, 1,809·56 inches multiplied by the velocity and divided by 144, equals the area in feet per minute—a trifle over 2,261·94 feet. A 4-feet stone at that motion, with proper power applied, is able to grind 16 to 18 bushels of wheat per hour and do its work well, and many even greatly exceed that amount if their burrs are heavy.

Some millers might ask: "What is the use of running the stones so fast if they will grind 16 to 18 bushels per hour when we only want to grind 8 bushels?" I answer, because experience says that is about the proper motion for a 4-feet stone to run at to discharge the flour and meal properly, the draft in furrow being one inch to the foot.

Now let us see the capacity and friction of a 3-feet stone running at 240 revolutions per minute. The peripheries of the 3 and 4-feet stones would travel at the same rate, but their areas differ greatly. The area of a 3-feet stone is 1,017·87 inches, multiplied by the velocity and divided by 144, equals 1,696·44 feet per minute, a difference in favor of small stones of 565·50 feet per minute. Experience proves that a 3-feet run of burrs, at the above motion and proper power applied, is capable of grinding 10 to 12 bushels of wheat per hour, and do its work well.

Again, if you would grind 16 to 18 bushels per hour on a 3-feet run of stones, it would be necessary to run them to 320 revolutions per minute. Then they would be equal to a 4-feet run, if they are heavy enough; but as a general rule it is impossible to run at that motion, on account of the grain choking in the eye of the stone. Therefore to grind 16 to 18 bushels per hour with one run, the 4-feet run at 180 revolutions is preferable on that account.

A 3-feet burr running at 220 revolutions, with proper power applied, is capable of grinding 8 to 10 bushels of wheat per hour and do its work well; if that is the case, then let us see where we have saved power. The area of a 4-feet stone running at 180 revolutions is 2,261·94 feet per minute; the area of a 3-feet stone at 220 is 1,555·07; difference in favor of small stones of 706 87 feet per minute. What are these extra feet unless rubbing surfaces?—friction. These extra feet cost more in the first place, have to be kept in order, take longer to dress, absorb power, and generate heat, a great detriment to good grinding.

If I have proved that the 3-feet burrs will grind the stated amount (8 bushels), then throw the 4 feet out and save power; if your power is light it will pay. I have one run of 3-feet burs running in my mills at 220 revolutions; it grinds 8 to 10 bushels of wheat per hour, and does its work as well as a larger stone, and saves power. At one time I thought a 4-feet burr just the thing for any power or amount, but experience has taught me differently. Now I use the size of stones and number of runs best adapted to the work and power.

In erecting new and overhauling old mills, the first thing in order is to ascertain the amount of power you have at command; then you can determine the size and number of runs you can use. The next thing in order will be the cleaning and bolting apparatus, ever remembering to have enough. GEO. RULE.

Wheatland, Iowa.

The Moon As an Inhabited Planet.

MESSRS. EDITORS:—On page 280, current volume of the SCIENTIFIC AMERICAN, you have an article under the heading "Lunar Vegetation," which is good as far as it goes, for it verifies to a certain extent the writings of a philosopher who lived nearly one hundred years ago, namely, Swedenborg. He claims that the moon and all the planets are inhabited, and meets the objection "that the atmosphere surrounding the moon is too light to support man," by the answer, "that things are created for their conditions," and that the men of the moon have lungs constructed for their especial needs.

By referring to Swedenborg's work on the "Planetary System," you will gather my meaning as I may not have been explicit enough. A. W. W.

New York.

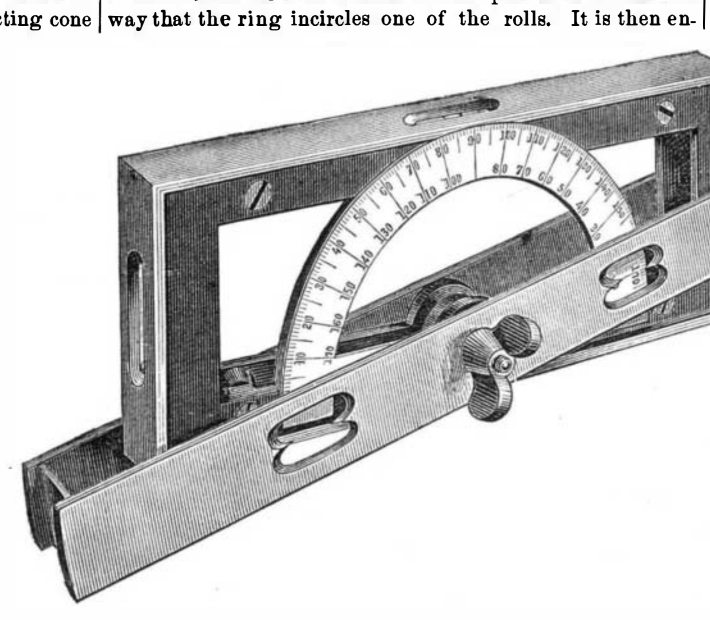
GENERATING STEAM BY GAS.—Illuminating gas has been employed in England, in heating steam boilers and generating steam for working the hoisting apparatus of warehouses, or other purposes where steam power is only required at intervals of time. With a vertical tubular boiler of three horse power, steam at 60 pounds pressure is generated by twenty-three burners, consuming 100 feet per horse power per hour in full work. The compactness, economy, and efficiency of the gas heated boilers is highly recommended by those who have used them. The first cost and expense of maintenance is small, and the insurance companies have decided to require no heavy risk premiums on buildings furnished with boilers heated by this plan.

Improved Combination Tool for Machinists and Other Mechanics.

The object of the inventor of this instrument is to supersede a number of separate tools usually required in the shop. It may be used as a spirit level, plumb, try-square, bevel protractor, clinometer, etc., and is adapted to the wants of the machinist, woodworker, draftsman, and surveyor.

The implement is a metallic rectangular frame, having seated in its top and one of its ends spirit glasses for leveling and plumbing work. To the bottom bar of the frame is pivoted a steel frame, held in any position desired by means of a thumb nut. The bolt with which the nut engages is not the pivot upon which the swinging steel frame turns; its object being merely to hold the frame fixed in place. The center of the swing frame has on either side an inward projecting cone fitting into a corresponding recess in the stock of the implement. This gives the frame a large bearing and one always perfectly tight without danger of wearing. A graded semicircle guides the position of the frame, through holes in which the operator can readily see the degree at which he desires to fix the frame. The whole being built strongly of metal, there is very little danger of breaking or wearing out.

It is the subject of one patent obtained through the Scientific American Patent Agency, Jan'y 1st, 1867, and application for another on improvements by A. F. Ward is now pending. All inquiries should be addressed to W. S. Batchelder & Co., Pittsburgh, Pa.



WARD'S IMPROVED COMBINATION LEVEL.

Whitewashing.

A correspondent of the *Germantown* (Pa.) *Telegraph* furnishes the following:

As the house cleaning time will soon be here, it may not be amiss to say a few words in regard to whitewashing. There are many recipes published, but we think the following to be the best that can be used: White chalk is the best substitute for lime as a wash. A very fine and brilliant whitewash preparation of chalk is called "Paris White." This we buy at the paint stores for three cents a pound, retail. For each sixteen pounds of Paris white we procure half a pound of the white transparent glue, costing twenty-five cents (fifty cents a pound). The sixteen pounds of Paris White is about as much as a person will use in a day. It is prepared as follows: The glue is covered with cold water at night and in the morning is carefully heated, without scorching, until dissolved. The Paris White is stirred in with hot water enough to give it the proper milky consistency for applying to the walls, and the dissolved glue is then added and thoroughly mixed. It is then applied with a brush like the common lime white wash. Except on very dark and smoky walls and ceilings, a single coat is sufficient. It is nearly equal in brilliancy to zinc white a far more expensive article.

A Locomotive struck by Lightning.

On Friday last, during the hail storm that visited this section, the eastward-bound train on the Toledo, Peoria and Warsaw Railway, George Boies, conductor, and C. A. Martin, engineer, had just left El Paso when the storm struck it. When about a mile and a half east of that city, the lightning struck a telegraph pole. Instead of shattering it and going to the ground, it burst the insulator, making a blaze of light, passed on the wire to the next insulator, and burst that, with another blaze of light, as intense, a looker-on informs us, as a thousand gas jets, and so on for five poles. It then ran down one pole and leaped to the track, and ran back without doing any damage until it struck the engine. It ran up one of the drivers, and burst a section of two feet out of the solid tire, and passing along the boiler, without doing any damage, it reached the lever and went upward with a blaze of light similar to that on the telegraph wire, and with a detonation like a small cannon. So intense was the light, and so violent was the shock, that the engineer was nearly blinded, and almost stunned. Our informant says that the appearance of the light on the track was brilliant beyond conception. It looked as if there was an immense lake of fire ahead, into which the train was about to plunge, and the contrast between the light and the ordinary daylight that followed seemed as great as that between the brightest day and the darkest night.—*Peoria (Ill.) Paper.*

Venom of Toads.

The toad, formerly considered as a creature to be feared, does in reality possess a venom capable of killing certain animals and injuring man. The *British Medical Journal* says that this poison is not, as in generally thought, secreted by the mouth; it is a sort of epidermic cutaneous secretion, which acts powerfully if the skin be abraded at the time of contact. Dogs which bite toads soon give voice to howls of pain. On examination it is found that the palate and tongue are swollen, and a viscous mucus is exuded. Smaller animals coming under the influence of the venom undergo true narcotic poisoning, soon followed by convulsions and death. Experiments made by MM. Gratoilet, Cloez and Vulpian, show that the matter exuding from the parotid region of the toad become poisonous when introduced into the tissues. A tortoise of the species "Testudo Mauritanicao," lamed in the hind foot, was completely paralyzed at the end of fifteen days; and the paralysis lasted during several months. Some savages in South America use the acid fluid of the cutaneous glands of the toad instead of the curara. The venom exists in somewhat large quantity on the toad's back. Treated with ether it dissolves, leaving a residuum; the evaporated solution exhibits oleaginous granules. The residuum contains a toxic power sufficiently strong, even after complete desiccation, to kill a small bird.

Weldless Steel Tires.

Weldless steel tires are now manufactured in England by rolling. The mill which is used for this purpose consists of two sets of rolls supported by the same framework, but each set working independently of the other. Hydraulic power is employed to press the rolls together. The first set of rolls consists of a single pair. The operation of making a tire consists in placing a hammered ring containing enough metal to form the tire between the first pair of rolls in such a way that the ring incircles one of the rolls. It is then enlarged by rolling, and its section formed in the same manner as a straight bar would be drawn and shaped in ordinary rolling mills.

The second set of rolls is similar to the first with the addition of two side rolls mounted upon a pair of jaws which can be opened and closed by toothed segments operated by a worm having a right and left-hand thread. These rolls finish the tire. Seventy to eighty horse-power are required to drive this mill and the entire operation is completed at a single heat. The same process has been in use for years in this country in the manufacture of weldless iron tires.

GLADDING'S CLOTHES LINE HOLDER.

The engraving shows a neat device for securing clothes lines to any support without the necessity of tying or knotting. It allows the line to be attached or detached instantly, and is adapted to hold not only the ends but to support the line at any intermediate point. It is a simple frame, A, of

cast or malleable iron, with two bows, B, spreading from the bottom up, and having their inner surfaces beveled from the outside inward. Between these is a tongue, C, pivoted at the bottom end and shutting in between the jaws, B. This tongue is also beveled, its lower edge being the thickest.

In use the line is passed over the tongue or looped in between the jaws, and the tongue pressed upward and backward, the bevel of the jaws and tongue firmly holding the line, which can be removed only by depressing the tongue by the hand, thus disengaging the line.

A patent for this device was obtained through the Scientific American Patent Agency April 28, 1868, by James W. Gladding, who may be addressed for state rights, etc., at Normal, Ill.

Deficiency of Mechanics in California.

There seems from all we can gather to be a great dearth of mechanics in California. Wages are ranging at from three to four dollars per day in gold for carpenters, and it is said that at least one thousand more might at once obtain employment there. There is a scarcity of hatters, shoemakers, machinists and workers in all branches of mechanical art. Ten thousand mechanics, it is stated, would readily find employment. Much of the machinery used there is made in England and eastern cities of the United States. Leather is sent to Philadelphia and elsewhere to be made up and returned. It would seem from these statements which are gathered from California papers, as though many young men might better themselves by going there. We understand rates of passage are extremely low this season from New York to San Francisco, on account of the strong opposition existing between the lines of steamers which run between the two ports, via Nicaragua and Panama.

SCARCITY OF FIRST CLASS WORKMEN.

The abolishment of the system of apprenticeship in this country, and the introduction of planers, engine lathes, and other labor saving machines into the machine shops has produced a scarcity of good workmen. The effect of the former has been to encourage a class of half trained mechanics, who, having gained sufficient knowledge to enable them to perform certain kinds of work, and at that to obtain living wages, are content to remain without further effort at improvement. The introduction of machinery to perform what was formerly done by hand has obviated the necessity for that skill in manipulation and nice training of the eye, which in former times were essential for all kinds of work. It is a common thing to find men who can attend a lathe, or run a planer, who are utterly incapable of doing work with a file, and who, if they were set to constructing any machinery requiring nice fitting throughout, would utterly fail. The exceptions to this are rare, and we are afraid they are becoming more so. Mechanical engineers are frequently troubled to find workmen who can properly execute their designs. Especially is this so where new forms are introduced into machinery, when a general lack of resources and expedients will most probably manifest itself. We know of one engineer who could only find at the third trial a shop where he could get work done to his full satisfaction.

We feel satisfied that the training of the eye, in which most deficiency is probably found, owing to the substitution of engine lathe work for hand turning, and planing for the old time chipping and filing, might easily be obtained by practice in drafting, which demands both skill of hand and eye, and to most mechanics would be found a pleasant recreation as well as a valuable accomplishment. At a future time we may say more on this subject.

A New Era in Steam Navigation.

A company has just been formed in New York city, and the necessary capital paid in, for the immediate construction of a new steamboat, 216 feet long, specially designed to run *forty miles an hour*. The boat is to be operated on the plan patented by Stephen I. Gold, a man of science, the inventor of many valuable improvements, among which are Gold's steam-heating devices, now very extensively used. His present invention consists in a new mode of applying steam power to the paddle wheels, by which he is enabled to make use of machinery having great effective force, with but little weight. This results in a reduction of the immersed cross section of the vessel, and a consequent increase of speed over ordinary boats. The new vessel is to be provided with 25-horse power for each square foot of immersed cross section. If this enormous force can be successfully applied to the paddle wheels, the vessel must move at the intended velocity, or something will break.

It has been ascertained that about 1-horse power per square foot of cross section will move a boat at the rate of 10 miles an hour; 4-horse, 20 miles; 16-horse, 40 miles; 64-horse, 80 miles, and so on. But up to the present time no engineering skill has been able to devise a method of augmenting the driving power without also increasing, proportionately, the area of the immersed cross section. Although we have many large and powerful boats, they do not travel much faster than the smaller craft. The fastest of our river boats, such as the *Mary Powell*, *Bristol*, and *St. John*, have between 3 and 4-horse power per square foot of immersed cross section, and they run from 16 to 21 miles an hour when not affected by wind or tide.

We heartily wish success to the projector of the new boat, and to the enterprising gentlemen who have united to furnish the necessary pecuniary assistance. Whatever the final result, the project is most laudable, and cannot fail to be fruitful in engineering experience.—*The Wheel.*

A Sub-Aqueous Entertainment.—Boston, capital of the land of notions, proposes to introduce into its 4th of July celebration this year a new feature—a submarine race, or walking match under water. The distance is a mile, from Long wharf to the Cunard wharf in East Boston, and it is proposed that three practical submarine divers shall enter the race. A wag says this is a plan of the cold water men, who wish to show what can be done in their favorite element.

Black Varnish for Iron Works.—Dr. Lunge distils gas tar until nearly all the volatile products are got rid of, the residual pitch being then dissolved either in the heavier oils, or, if a quick drying varnish is required, in the light oils or naphtha. The advantages of varnish so prepared over the original tar, is that by the above process we get rid of the ammonia, water, carbolic acid, and other constituents that give to tar its disagreeable odor, and make it so long in drying.