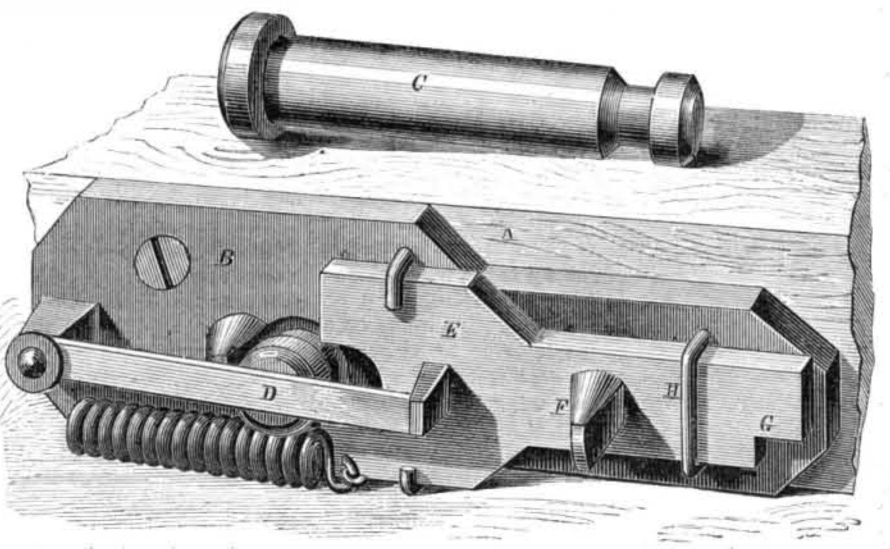
Improved Bolt for Securing Window Shutters.

The ordinary method of locking the shutters of buildings is to pass the bolt through from the outside and then secure it on the inside by means of a strap or split key passed through a hole in the bolt near the end. Beside the annoyance of being compelled to pass into the building to lock the bolt, it is an unsafe contrivance, as sometimes by turning the bolt from the outside the key will drop out, and in any case the key is too slender to resist any considerable strain upon it from the outside before breaking. The device, however, shown in the accompanying illustration has none of these objections, and is in all respects a most admirable contrivance for the purpose intended.

A represents the wall or casement of a building, on the inside of which the lock is secured. It consists of a plate, B, through which the bolt passes. The bolt is shown detached at C, and the end is seen directly under the flat spring at D. As will be seen the bolt has an annular score near the end, into which the end of the slide, E, fits when the shutter is locked. When the bolt is to be released the slide, E, is moved back from the bolt by the thumb piece or knob, F, when the flat spring, D, throws the bolt partially out of the plate, and its end engages with the snug on the slide, E, and retains it in the position seen in the engraving. When the shutters are closed and ready to be locked, the bolt is passed through from from the outside in the ordinary manner, its end pressing against the flat spring, releasing the slide, when the spiral spring instantly brings the slide to engage with the bolt, and securely locks the slide by springing the notch, G, on the end of the slide on the staple, H. This is effected by the position of the spiral spring, which, being on one side the slide, tends to draw that side more than the other. The fastening may be used in any position, either vertical, horizontal, or at any angle, working with equal certainty and effect. It may be applied to any shutter, and the ordinary bolts may be altered to suit, simply by welding on them an end containing the annular nick. Except the springs, the fastening is made of malleable cast iron, and the inventor desires to correspond with manufacturers of malleable iron castings with a view to the sale of the patent or the production of the device.



FARRAR'S PATENT SHUTTER FASTENER.

Patented through the Scientific American Patent Agency, December 8, 1868, by W. B. Farrar, who may be addressed at Greensborough, N. C.

Vienna White Bread.

Prof. Horsford gives the following recipe for making the celebrated Vienna white bread: In the first place, great care is taken in the preparation of the flour. Scrupulous neatness and cleanliness are observed in all the processes of preparing the yeast and dough. The dough is placed in an oven somewhat of the type of the aerotherme, that is surrounded by currents of heated air, maintaining a uniform temperature of about 380°. By an arrangement of steam pipes, jets of steam are introduced into the oven to maintain an atmosphere saturated with moisture, and so retard the evaporation of water from the loaf during all the early part of the baking. When the loaf has attained its fullest distension and is penetrated by myriads of minute pores, the steam is shut off, and a side door, communicating with a separate fire from that which heats the oven, is opened. From this the heat of an intense blaze is flashed into the oven to be reflected from the low, glazed, tile roof, and give that requisite delicate red tint to the surface, which at the same time charges a thin crust with an aroma which is the product of roasting—an essential oil—most grateful to the palate. This part of the operation is brief, and is watched through a glass door. When complete the loaves are taken from the tins and immediately varnished with warm milk or water, with which a little good melted butter has been incorporated. The water of the milk quickly evaporates, and leaves a fine glazed surface.

We can testify from considerable personal experience that the Vienna bread and beer are the best to be found anywhere.

The Growth and Prosperity of Michigan.

Many of our readers can remember when Michigan was in the far West, only to be reached by tedious journeyings through wide regions of unsettled country. But to-day Michigan has a population of more than a million; six incorporated colleges, one of them a University, with law, medical, literary, and scientific departments, and with more than twelve hundred students; an Asylum for the Blind and the Deaf; two Asylums for the Insane; a Normal School; high schools in every considerable town, and a system of public instruction as thorough, as wisely adjusted, and as efficient as in any State of the Union, so good indeed, that private schools are hardly known. Pupils come from all the States of the West, not only to the University, but to the Union Schools of Michigan. The finest and largest buildings, the most beautiful for situation, and most convenient in their appliances, are those which are set apart for public instruction. No interest is so jealously guarded as this. Every city and every county has its superintendent of schools. There is the same zeal for education in the newer as in the older settlements, in Saginaw and Muskegon, as in Monroe and Detroit. The market for school books in these forest cities is not less sure and regular than the market for boards and shingles.

Classic and foreign learning flourishes on what were but yesterday Indian hunting grounds; and the youths and maidens know more of Goethe and Virgil and Xenophon than of the legends of the red men. This strange mingling of ancient lore with the traditions of savage life is presented to us in the names of Michigan towns and cities. Pontiac borders upon Troy; just beyond Owasso is Ovid; Metamora joins Attica; Adrian is the next town to Tecumseh; Athens is but half an hour's ride from Wakeshma; and in Lenawee county we find Rome and Palmyra close to Madison and Franklin. Enough of the Indian appellations are retained to preserve a native flavor amid the classic and romantic names by which the famous sites of Europe and Asia, ancient and modern, from Caledonia to China, are represented in this favored Peninsula.

HOW TO CONSTRUCT A TOY STEAM-ENGINE.

A communication from T. D. Quincy, Jr., a high school pupil, of Dorchester, Mass., gives directions for the construction of a toy steam engine, most of the parts of which may be made by any boy of ordinary intelligence, possessing a slight knowledge of the use of tools, at a very slight cost. It is a single acting, oscillating engine of which A, Fig. 1, is the boiler, which consists of a fruit can about 4 inches in diameter by $4\frac{1}{2}$ inches in hight, with a new end soldered on where it was opened. B, C, D, represents the gage cock, which is made by turning a piece of brass to the form indicated at C, and drilling a hole through it in the globular part, which is then reamed out tapering. The plug, D, of the cock is turned to fit the hole in C, and seated by grinding it in with grindstone grit and oil at first, and afterward with oil alone. A piece of wire will do for the handle. Cut a thread on D, and fit a nut on it to hold the plug D in C; then put the two together and drill a hole longitudinally through C and across D. The cock is then complete. It may be cheaper to purchase the cocks already made at any gas fixture or hardware establishment, but these directions are intended for those who cannot readily avail themselves of this accommodation. E is the safety valve with its parts. F shows the form of the seat of the valve which has a hole drilled through it, as seen by the dotted lines, and beveled at the top to receive the piece marked G. Place these together and seat them by grinding, as in the case of the gage cock. Make a score in the small portion of G to receive the edge of the safety valve lever. This lever is merely a light bar with a hole in each end, one end to be attached to a stud, or fulcrum secured to the top of the boiler by soldering, and the other to a light spring on the side of the boiler with an adjusting nut at the top, or it supports a hook on which weights may be suspended. These described, two of the most important points relating to the boiler may be understood—the gage for ascertaining the hight of the water; and the safety valve, the means of regulating the steam pressure.

Fig. 1.

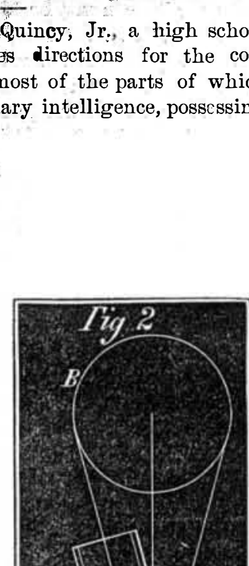


Fig. 2

The cylinder of the engine is a piece of brass tubing, $2\frac{1}{4}$ inches long and $\frac{1}{2}$-inch internal diameter, ground out true. The piston is a disk of brass, $\frac{1}{4}$ inch thick, with a wire soldered to its center as the piston rod. On opposite sides of the cylinder, near the top, are soldered two screwed pieces of wire designed to hold the cylinder end and stuffing box combined, in place.

Fig. 2 is a diagram of the cylinder, and its connections, A, is the cylinder, and B the path of the crank pin. Three holes are seen near the bottom of the cylinder, with an arc describing the oscillation of the cylinder, the upper hole being the center of the circle of which the arc is a segment. On the side of the bottom of the cylinder is soldered a piece of brass, about $\frac{1}{16}$ of an inch thick and $\frac{5}{8}$ by $\frac{9}{16}$ in area. The lower hole is drilled through a plate into a cylinder near its bottom; the upper hole $\frac{3}{8}$ of an inch above it and through the plate only, a small hole slightly indenting the cylinder being made exactly opposite without piercing the shell. Another piece of brass, $\frac{1}{8}$ inch thick, $\frac{5}{8}$ wide, and $\frac{3}{4}$ long, has a hole drilled through it $\frac{9}{16}$ of an inch from the bottom, and that receives a bit of wire soldered in and projecting $\frac{1}{16}$ of an inch. On a $\frac{3}{8}$-inch radius from this point, $\frac{3}{32}$ of an inch from the center line, drill two holes, that on the right hand entirely through the piece and that on the left about half way through, meeting one drilled from the bottom. The inner faces of this plate and that on the cylinder must be fitted smoothly together. These constitute the valve faces, or valve and seat of the engine.

The pillars or supports of the wheel, shaft, and crank, are rods of brass or iron, $3\frac{7}{8}$ inches high, with holes near the top for the shaft. At the hight of $\frac{9}{16}$ of an inch from the bottom a hole is drilled and tapped, through which a pointed screw is passed, the point of which enters the hole in the side of the cylinder opposite that on which the plate is soldered. The thicker and separate plate is soldered to the top of the boiler, the side having both holes being placed inward or next the cylinder, and the left hand hole meeting that through the bottom being directly over one through the top of the boiler. Place the faced side of the cylinder against the fixed plate, the projecting pin of which enters the hole in the cylinder plate and the pointed screw through the pillar engaging with the opposite hole in the side of the cylinder. The pillar is soldered in this position to the top of the boiler, and the other is similarly secured at the distance of about one inch. The cylinder bottom is a thin plate of brass soldered on. When the crank and piston are at their lowest points, the latter should not quite reach the lower hole in the cylinder. The wheel may be of iron, about $4\frac{1}{2}$ inches diameter, to be obtained at any iron foundery, or be cast of lead, or lead and tin. The gage cock may be attached $3\frac{1}{4}$ inches from the bottom, and if filled to this hight the boiler will furnish steam for half an hour's safe running. The boiler may be filled by the safety valve. To start the engine set the boiler on a stove or range, or place it over a lamp. The first is the preferable mode as being more cleanly.

An engine of this fashion need not cost much, and its construction would afford useful employment to boys in town or country, and be a source of pleasant and profitable amusement during winter evenings.

Correspondence.

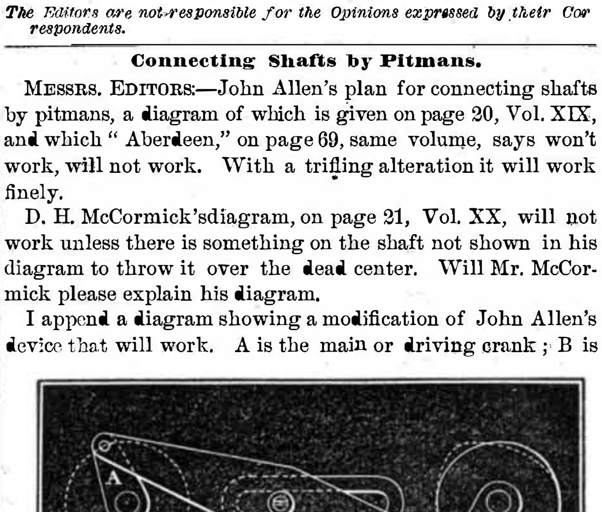
The Editors are not responsible for the Opinions expressed by their Correspondents.

Connecting Shafts by Pitmans.

MESSRS. EDITORS:—John Allen's plan for connecting shafts by pitmans, a diagram of which is given on page 20, Vol. XIX, and which "Aberdeen," on page 69, same volume, says won't work, will not work. With a trifling alteration it will work finely.

D. H. McCormick's diagram, on page 21, Vol. XX, will not work unless there is something on the shaft not shown in his diagram to throw it over the dead center. Will Mr. McCormick please explain his diagram.

I append a diagram showing a modification of John Allen's device that will work. A is the main or driving crank; B is the fulcrum which is made permanent in the center of the connecting bar and slides in its bearing, B, slotted for the purpose. The crank, D, is slotted at the end to allow the crank-pin to slide to and from the center. The crank pin will describe a curve shown by the dotted line E. In this way the movement will be perfectly free and smooth, though with slightly varying velocity in the revolution of the crank D.



C. H. PALMER.

Periodic Oscillations of the Earth.

MESSRS. EDITORS:—An article in your paper indicates a theory of earthquakes and volcanoes originating from gaseous explosions as opposed to the general belief in a molten sea beneath the earth's crust, and basing the improbability of such [illegible] universal ruin resulting from its eruption. This theory would be more probable did the explosive force crush through "thirty miles of the earth's crust," but why the necessity of such supposition, when conduits such as volcanoes and fissures penetrating through the crust of lesser thickness relieve the pressure?

The theory of an igneous sea is probable from the increase of heat proportioned to the earth's penetration, and also from the simultaneousness of earthquakes in regions far distant. There is also the periodicity remarked in geysers, volcanoes, and earthquakes, as regular in some instances as the ebb and flow of the tidal wave. This periodic law was noticed by Professor Palmieri, of Naples, who, from large investigation, attributes the eruptions of Mount Vesuvius to lunar influences. "The periods of its greatest force are every day half an hour later, coinciding with the movements of the moon, showing that the interior of the earth is like the ocean subject to tides."

There is reason to believe that internal oscillations of the earth are as periodic as external phenomena. In deep mining, from the hours of twelve at night until eight in the morning, water falls where none is seen during the day. The volume in the wheel is perceptibly increased; the atmosphere is charged with gases which prevent lights burning, and small particles of earth and rock, as in the Chicago tunnel, are observed to fall from the tops of the drives. Similar to this is the disturbance of the Atlantic Telegraph, whose electric pulse beats slowly or rapidly in certain recurring hours.

Humboldt remarks that "the great earthquakes which interrupt the long series of slight shocks appear to have no regular period at Cumana; while on the coasts of Peru, as at Lima, a certain regularity has marked the destruction of the city. The belief of the inhabitants in that uniformity has a happy influence on public tranquility and the encouragement of industry." GEO. A. LEAKIN.

Baltimore, Md.

[The article referred to, published on page 377, Vol. XIX, SCIENTIFIC AMERICAN, propounds no unknown theory. Hutton, Mayer, and even Lyell suggest a similar theory, the latter, although giving attention and consideration to La Place's idea of the agglomeration and solidification of liquid nebulous matter, proving the growth and present formation of what are called the primitive rocks, thus striking a heavy blow at a theory which he evidently only partly accepted for want of a better. If an igneous sea existed and, as our correspondent states, "volcanoes and fissures penetrating through the crust of lesser thickness are conduits to relieve the pressure," how does he account for the total extinction of these outlets, many instances of which are patent. If the cause continues to exist why not its results be continually shown?

Our correspondent's second paragraph in regard to the simultaneousness of earthquakes could hardly be attributed to "lunar influences." Periodicity of eruptions, as geysers and volcanoes, boiling springs, etc., is no proof of the existence of a molten interior, but rather an evidence of the existence of a more superficial cause. He must have heard of, if not seen, the natural phenomenon of intermittent springs, which, are never attributed to an internal globe of liquid fire whether its perturbations are caused by lunar influence or the unequal pressure of gases evolved, but to natural syphons existing in the earth and connected with the surface at different points. That the whole earth, land as well as sea, is subject to lunar influence will not be disputed, but if this influence reaches a molten interior, there is no reason why Vesuvius and other volcanoes should not have their eruptions every thirty days, and the tremor of the earthquake follow continually the course of the moon.

The facts in the statements made in the last two paragraphs of Mr. Leakin's communication can be accounted for, as he will see, without the theory of a molten interior of the globe we live upon. What he means by the heading of his communication, "Periodic Oscillations of the Earth," we do not understand.—EDS.

Does Resistance Increase as the Square or Cube of Velocity?

MESSRS. EDITORS:—Whether the resistance of ships increases as the square or as the cube of their velocity, is a point much disputed; some maintaining the former, some the latter, and there is still another class who maintain that, while the resistance only increases as the square, the power required increases as the cube of the velocity.

The importance of a correct decision of this vexed question arises from the fact that this decision forms the only mathematical basis to any calculation required to determine the amount of power required to overcome the resistance of any vessel at any proposed increase of velocity.

The writer is of opinion, that resistance only increases as the square, and power to overcome increased resistance only increases in exact proportion to resistance, and in support of his views submits the following argument:

It is easy to prove that the resistance and the power required do not increase as the cube of the velocity by a single test. A 5,000 tun steamer uses at present 6,000 actual horse power of steam when making a speed of 15 miles per hour, hence, if resistance increases as the cube of velocity, to go one-tenth the speed would only require one-thousandth part of the power, which is equal to saying that 6-horse power would be sufficient to propel 5,000 tuns at 1½ miles per hour, which is simply impossible by any present known appliances, therefore neither resistance or power can increase as the cube of velocity; and I trust you will agree with me as to the fallacy of such an opinion. That resistance increases as the square of the velocity is the prevailing opinion of the most eminent engineers, and this view certainly seems most in accordance with the universality of Divine law; for by doubling the dimensions of any superficies or solid, we obtain four times, and not eight times the area or quantity.

The only question now left to consider is—Does the power required increase in exact ratio or a more rapid ratio than the resistance?

That it can only increase in the same ratio seems to me mathematically certain. The only means we have of measuring resistance at all is by the amount of power required to overcome it, hence it follows that the equivalent of the power is the exact measure of the resistance, and *vice versa;* therefore if it requires a power of 10 units to overcome any resistance at any given velocity, the measure of the resistance is 10 units; and by the same law if resistance is quadrupled by doubling the velocity, the measure would be 40 units, and the power required, being always the equivalent of resistance, would be also 40 units—the distance traveled being in both cases the same.

To deny this is, logically and mathematically speaking, to deny the possibility of measuring resistance at all, which is simply absurd; and I trust it will be conceded that I have demonstrated the fact, that whether the square of the velocity is or is not the exact measure of increased resistance, that the power can only increase in exact ratio to resistance, and therefore, that if resistance increases as the square of the velocity, so also does the power. Please throw some further light on this subject. MATHEMATICIAN.

New York city.

[Without assuming to decide on a point on which doctors (engineers) disagree, we will quote from a text-book that has withstood the test of criticism, and is generally acknowledged as authority on the subject of the laws governing matter. Silliman, in his "Principles of Physics," ¶ 143, pp. 105 and 106, says: "The resistance which a moving body meets in air and water, is an effect of the transfer of motion from the solid to the particles of fluid. For the moving body must constantly displace a part of the fluid equal to its own bulk, and the motion thus communicated is so much loss of the motive power. When other circumstances are the same, the denser the medium the greater will be the resistance which it offers. Newton demonstrated that if a spherical body moves in a medium at rest, and whose density is the same as its own, it will lose half of its motion before it has described a space equal to twice its diameter. The resistance encountered by a body moving in water is 800 times greater than if it were moving with the same velocity in air; for water, being 800 times more dense than air, the body must displace and communicate its own motion to 800 times as much matter in the same time." . . . . "The resistance increases as the square of the velocity; for, if the velocity is doubled, the loss of motion must be quadrupled, because there is twice as much fluid to be moved in the rame time, and it has also to be moved twice as fast. Again, let the velocity be trebled, then the body will meet three times as many particles of the fluid in the same time, and communicate three times the velocity; therefore the resistance is $3 \times 3 = 9 = 3^2$."

It would seem from the above that resistance increases as the square of the velocity, and that the power necessary to overcome that resistance increases in the same ratio. This is the opinion of mechanicians generally, we believe. The example given by "Mathematician" would seem to be conclusive; at least his argument is plausible, and if it has not been found true in practice, it must be one of those cases where exact mathematical calculations do not agree with our means of applying natural laws.—EDS.

Liebig on Unfermented Bread—A Correction.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of December 2, there is a recipe, copied from the *Chemical News,* for making unfermented bread. Liebig recommends the ingredients in that recipe because they make more economical and wholesome bread than that made by fermentation with yeast. Instead of using, as is generally done for lightening unfermented bread, a combination of carbonate of soda, with either tartaric acid or cream of tartar, which makes a purgative salt, Liebig recommends the using of muriatic (hydrochloric) acid with carbonate of soda, the combination of which makes common salt, a desirable ingredient in bread. But there must be some error in the proportion of the ingredients given in that recipe, which I am surprised that some of your readers have not corrected ere now. Reducing the French measures in that recipe to English measures, the proportions there given are: 1 pound flour, 70 grains carbonate of soda, 300 grains muriatic acid, 300 grains common salt, ¾ pint of water. The proportions of soda and acid in this recipe are, for the end in view, incorrect, being about 1 to 4; while the proportion to make common salt will be about equal parts of each; much excess of either beyond that which makes common salt being detrimental to the bread. Then, the amount stated of common salt is greatly in excess, because the amount, including that which the acid and soda make, will be nearly one ounce to one pound of flour.

It is remarkable what different opinions celebrated chemists give of this kind of bread. In 1846, a London physician gave the following recipe: 1 pound of flour, 40 grains carbonate of soda, 50 grains or drops of muriatic acid, 1 teaspoonful of powdered sugar, ½ pint of water, or as much as may be necessary. Bake in two loaves. He says that bread thus made is more digestible than biscuit from its lightness and porosity; that it saves time and trouble in the preparation compared with bread fermented with yeast; and that it is not liable to be vitiated by bad yeast or by fermentation. But a writer in the Supplement to "Ure's Dictionary of Arts and Science" (Dr. Normanby, I think), says that bread prepared in this way is with difficulty permeated with fluids; that it will not absorb water, hence its heavy and clammy feel; nor saliva, hence its indigestibility; nor milk, nor butter; and that it will not make soup, or toast, or poultice. This may be true if the ingredients used are proportioned as above; but if the proportion used be those given below, I claim for the bread all the good qualities that Liebig claims, and all the qualities that Normanby denies that it possesses. 1 pound flour, 100 grains of carbonate of soda, 60 grains of common salt, 1 teaspoonful of powdered sugar, 120 grains of muriatic acid, more or less, according to its strength; 1 wine pint of water, inferior flour will require less. Intimately mix the flour, soda, salt, and sugar in an earthenware vessel, then add the acid mixed with the water, and stir with a wooden spoon. Bake in one loaf for about one hour. The color of the loaf should be a light brown. The bread may be baked in an iron or tin pan, but, in mixing, the use of metallic vessels or spoons must be avoided. J. C.

New Harmony, Ind.

Expressional Dentistry.

MESSRS. EDITORS:—I was glad to see an article in your valuable paper on the above subject, in respect to which a want has been felt by the profession.

Why are we not proficients in artistic or expressional dentistry? It is because we have had imperfect materials with which to do our work as artists. We have been cramped and hampered by many rude instruments and articles, though so much has been accomplished toward the true and the beautiful.

The materials upon which artificial teeth are commonly mounted are gold and silver plate, and vulcanized rubber; with these bases the dentist is compelled to employ porcelain teeth, with gums attached; and when rubber is used, the teeth are made in blocks of two or three. These are made at the extensive teeth manufactories, and are infinitely better than the old bone walrus tooth, or ivory carved teeth, and they have assisted greatly our reputation abroad, for our tooth carvers and tooth molders, are acknowledged the best in the world; but from the very nature of their molded forms and arrangement, the artistic dentist is hampered and restricted in placing them just where he desires to suit the mouth and face and expression of the unfortunate patient requiring artificial teeth. Dentists have all felt this restraint in special cases, and many have spent months and years, and have burnt the midnight oil till health and strength succumbed, to improve this part of our art. Dr. John Allen's continuous gum work is beautiful, and perhaps accomplishes all that the most fastidious artist can desire in affording opportunity for expressional dentistry, but the labor and skill required, and the high price necessary for this work, deprive the masses, who have often as just an appreciation of artistic dentistry as the rich, from the benefits. Much credit is due Dr. Allen and others for their labors in this direction. The most popular material used by the profession for six or eight years past has been vulcanite. It has been popular on account of its cheapness, and the ease with which it can be manipulated; and yet the result of the use of rubber has been to retard rather than advance the artistic part of dentistry. Art has suffered sorely from this cheap and easily made work, and Nature smiles at our attempts to imitate her work with rubber and porcelain teeth in rows like soldiers in a ten cent lithograph. To be convinced of this, we have only to notice in crowds, on steamboats, on the railroad car, on the streets, everywhere, the many, many sets of glistening, regular artificial teeth worn; and when we can discern the artificial, the thing is proved, for expressional dentistry would so hide the art dame Nature herself would not suspect another's work.

Within the past year another long step has been taken toward our ideal by the invention and introduction of consolidated collodion as a new base for artificial teeth. This has been noticed in your paper before, though not in this light; and is well known as the invention of Dr. J. A. McClelland of our city. With it (Rose Pearl is the name it bears) the advantages of the continuous work can be secured. Single teeth are used, and the dentist who may be an artist can arrange them as irregularly and as naturally—as artistically as he may desire, after a study of the features and expressions of the face. This work is easily made, and cheaply enough to satisfy the patient of moderate means. It is lighter in weight than any other material now used for dental plates, and its strength is so great that plates can be made much thinner than rubber or porcelain. The color, too, are those of the natural gums, or mucus membranes of the mouth—it is susceptible of a variety of shades, according to the taste of the operator. With Rose Pearl we can have artistic dentistry, and the profession will appreciate the severe labors of the inventor as much as the people will an artistic set of teeth for a moderate price. C. M. WRIGHT.

Louisville, Ky.

Steel for Axes.

MESSRS. EDITORS:—An article on page 22, current volume of the SCIENTIFIC AMERICAN, headed, "Low Steel—The Requirements of Ax Manufacturers," is calculated to create the impression that the requisite temper for this purpose has not been, and cannot be, manufactured in the country. The minds of the people who peruse your columns for information and instruction, should be at once disabused of any such an idea, and by your permission I will state a few facts, which your East Douglass correspondent, and others interested, will be glad to hear.

The steel manufacturers of both England and America can, and do make ax steel of both mild and high temper, according to the requirements or demands of their customers, who, it is presumed, know better what they want in this respect than the steel maker, who obeys orders strictly, as his great effort and desire is to please his customer, and thereby retain his trade. Collinsville, East Douglass (the home of your correspondent), and other Eastern ax makers, have, for years past, and up to within a short time, always demanded a high temper steel, claiming that it made a much keener edge than a mild or low temper, and was preferable on this account. At the same time the ax would not stand near the abuse in the chopper's hands, it being more easily broken than if made of a mild temper.

The Western ax manufacturers have for years past invariably used nothing but the mild temper, principally manufactured in this city, and of a quality unsurpassed by any made abroad. A high temper steel, while it is claimed it will give a finer edge in a cutting tool, has so many drawbacks attending its use, that the one redeeming feature—the superior cutting edge, is a very expensive and questionable luxury. It is much easier burnt in the process of welding, and easier broken in practical use, especially in frosty weather; and the writer has always been surprised that Eastern manufacturers of edge tools, and of axes especially, would discard a mild tempered steel that is not easily burnt in the process of welding, is tough and strong, and in every way preferable to the other. The difference in the cutting edge is so very fine that the practical chopper cannot appreciate it; for if he did, the Western ax makers, who produce nearly one half of the axes manufactured in the United States, would have had their attention called to this point before this. So that for the benefit of those engaged in manufacturing edge tools, you will be pleased to learn that both mild and high tempered steel for tools has been manufactured in the city of Pittsburgh for years past, of unexceptional quality, and especially the temper which your correspondent is so anxious to obtain, viz.: a low or mild steel, the requirements of ax makers.

Pittsburgh, Pa. AN AX MAKER.

Bean Sheller Wanted.

MESSRS. EDITORS:—Farmers badly want a machine to thresh beans of all kinds. It should be made like the corn shellers with a balance wheel with pulley attached so as to be used either by hand or power, and should be so contrived as to shell beans of different sizes. Such a machine, to cost not more than thirty to forty dollars, would meet large sales both North and South and be a boon to the farmers beside.

Prospect Hill Farm, Va. C. R. M.

A Valued Testimonial.

MESSRS. MUNN & CO.:—Enclosed please find the "wherewith" to renew my subscription to the SCIENTIFIC AMERICAN. My old friends, I would willingly send you subscribers could I do so; but the illness of almost four years, confining me to my house, renders me unable to do so; yet I can send out your circular. Your books will show I have been a subscriber ever since the SCIENTIFIC had a being. My age and illness admonishes me that my name must disappear from your books ere long forever—but I trust for a world without affliction, pain, or sorrow, and where there is no parting.

But, be life longer or shorter, I must have the paper to the end, and shall leave for it my best wishes; and I say most sincerely that I consider it the most valuable paper printed, of any kind. I have only one child, a son, who, if he survives, will be a subscriber in my place.

Please tell your subscribers if you think proper, to follow my example: "Always be subscribers to the SCIENTIFIC AMERICAN; and when a paper comes, stitch it with a fine thread, cut it open, leaving it in book form, convenient for reading, which do carefully and thoroughly; keep it clean; and at the close of the volume, if not ready to get the numbers bound, put them together in proper form for binding, put a board or 'straight edge' on each side, near the back, and then press strongly in a vice; punch holes through them and tie up tightly with a strong cord, and thus have a book."

Schenevus, N. Y. A. HOTCHKIN.

WATER POWER OF THE CONNECTICUT---THE HOLYOKE DAM.

About ten years ago, Mr. Alfred Smith, a citizen of Hartford, Conn., purchased about eleven hundred acres of land on the site of the present flourishing manufacturing town of Holyoke, Mass., now containing over 1,100 permanent residents. It has now in operation fourteen paper mills, two large thread mills, four cotton mills, and other manufacturing concerns, One of the paper mills, that of the Holyoke Paper Company, makes six tuns of paper per day.

The dam, which here controls the whole power of the Connecticut, is one of the most remarkable instances of engineering skill in the country. The Hartford *Times* says: "The only question of the assured and certain success of the company, and the growth of Holyoke to a great manufacturing center, being merely one of the durability of the great dam, Mr. Bartholomew and the company have wisely gone to work to make the dam absolutely indestructible. The work of improvement here is one of far greater magnitude than we had supposed; and its impressiveness as a triumph of engineering skill and a proof of what men's labor can effect over the rude forces of nature can be properly appreciated only by being seen.

"In the flood of last spring the front timbers of the dam were slightly loosened by the concussion of a huge and heavy bridge, which came crashing down on the flood from some point a hundred miles above. An examination of the front foundations, while it disclosed no very serious injury to the great dam, revealed another fact of some interest. The river bed at this place is for a considerable distance composed of rock—but a rock full of seams; and the steady, continuous fall of the great sheet had by hydrostatic pressure lifted out the rock in masses, and scattered boulders of a tun to twenty tuns weight for a considerable distance down stream—making, at last, a great hole in front of the dam, from twenty-six to thirty feet deep! or as deep as the deepest places in New London harbor.

"It was found necessary to check this destructive work; and accordingly the dam, which has for so many years presented a sheer fall from its edge, will now be made with a sloping front as well as rear; so that it would, if the river were dry, present an outline similar to that of the peaked roof of a house. This front extension is fifty feet in diameter at the base, presenting a uniform slope to the top, that will so graduate the fall, for its entire width of over a thousand feet, as to make it look more like a great rapid than the old familiar Holyoke dam.

"This work is done by sections; the first, which was begun in September and is now nearly finished, being 269 feet wide in the middle of the dam.

"It is made of solid timbers, fastened in layers crosswise, in the way known to builders as "crib-work," and filled in with an enormous ballasting of stone. These solid masses of timber, bolted and riveted together for such an extent and hight, present, to one unaccustomed to it, a very impressive sight. Unlike the old dam, the new front will be solid; no openwork timbers. The timber "cribs" are sunk, and the rock ballast filled solidly in beneath them in the higher part, with a good deal of engineering skill. The engineer is Mr. S. S. Chase, whose uncle, we believe, built the original dam. He floats down a good deal of his timber from Vermont. It consists largely of hemlock, a timber which resists decay and the action of water beyond most others. Chopping into the wood of the old dam, shows that twenty years have failed to damage it a particle; it is as sound as ever.

"They have put down in this section about one million feet of timber. That fact tells the story of the literal solidity of the new dam.

"It is found that the weight or force of the stream, exerted against the dam at all times, is nearly four thousand tuns. The weight of this new structure above the water is 13,000 tuns.

"Looking at it from the shore, this section of 269 feet seems but a little part of the whole breadth of the fall; but to a person standing on it, at its lower or its upper edge, it seems in itself a "big thing."

"The construction of the fish-way, for salmon and shad, had to be delayed on account of this improvement on the dam. It will be made, at the east end of the dam, as soon as the latter is finished.

"One of the rocks lifted out from its natural bed by the hydrostatic pressure in front of the old dam, weighed, before Mr. Chase blasted it, twelve tuns; and yet it had been taken out and moved a hundred feet down stream by water power."

There are between twenty and thirty mills and factories in active and profitable operation at Holyoke; all the power required being taken from the great dam. It is distributed at present by three canals at different levels, and affords an immense power. The water power of the Connecticut at Holyoke is estimated by competent engineers as equal to that of Lowell, Mass., and Manchester, N. H., combined. It subjects to the service of man the whole volume of the Connecticut river, which here pours over a steady flood, reliable at all seasons, of 1,017 feet in breadth, at a fall of between 25 and 30 feet, but less than one-fifth of the power is yet utilized.

Successful Trial of the Shelbourne Submarine Drill.

Considering that it is an entirely new invention, and has never yet been thoroughly tested, Mr. Shelbourne's experience with his machine for drilling sunken rocks during the last three days in the swift currents of Hell Gate must be considered as eminently encouraging. As was intimated in our previous article, the pipe used to convey the exhaust steam from the engine inclosed and sunk with the "mushroom" was found too flexible and too small. A larger and firmer one had to be procured from Boston, causing a delay which prevented any trials of the drill from being made on Tuesday. Yesterday the new pipe was severely tested in a very swift current, and found to work satisfactorily. Assuming the machinery of the drill to be in working order, the first problem is to keep the floating derrick stationary while the holes are being bored. The *Wallace*, the boat which has been chartered by Mr. Shelbourne, is about sixty feet long, and quite shallow, yet on Monday it was found impossible to hold her with several large granite boulders, weighing four tuns each. These were intended for use only as temporary moorings, while four holes six feet deep, should be made by the drill for the insertion of ring bolts. To these, which are marked out like the bases on a base-ball ground, with reference to the pitcher, cables will be extended from the *Wallace*, which will then be firmly fixed as though tied to a wharf. Yesterday the first hole was drilled and the first ring-bolt inserted. While the tide was still running strongly, and contrary to the advice of her experienced commodore, the *Wallace* steamed out over the Frying Pan and dropped one of her boulders overboard. At first the current slowly carried the vessel along, the huge stone dragging on the bottom, but at length the anchor caught in the rocks be low, and the *Wallace* was brought to. So far so good; but work must be done before the turning of the tide. The ponderous "mushroom" is swung out over the boiling waters, while the diver incases himself in his horrid habiliments. Both speedily find their way to the bottom. The diver sees that the drill is in proper position, and everything being reported right, at last Mr. Shelbourne gives the word to turn on the steam. It works to perfection. Standing by the anaconda-like steam pipe, you can hear distinctly the machinery in operation below. An hour passes, and the tinkling of a little bell gives the longed-for information that a hole six feet deep has been sunk in the Frying Pan Rock. The ringing of this little bell is one of the most beautiful ideas embodied in the invention. It is done by electricity, and is, in fact, the Atlantic Cable on a small scale. Mr. Shelbourne pulls a cord, which reverses the motion of the machinery, and presently another tinkle of the bell informs him that the drill is withdrawn from the rock, and that the "mushroom" is ready too root itself in another spot. And now the diver, with a ring-bolt six feet long, a sledge-hammer, and other implements, descends again, and in an amazing short space of time is drawn up to announce that "he has stuck a pin." There not being time to shift the position of the *Wallace*, anchor again, drill another hole, and get off this tide, the "mushroom" is hoisted on board, and we start back for Jersey City. To-day another and perhaps two ring-bolts will be put in. When all are down, and the *Wallace* permanently moored, Mr. Shelbourne will be ready to work night and day, and soon Hell Gate will be shaken by the discharge of nitro-glycerin, and the diabolical Frying Pan and Pot be shattered.—*New York Tribune of Jan. 14th.*

Clock making in Bristol, Conn.---Ingenious Inventions.

Bristol, Conn., is noted for the manufacture of clocks. The business is divided and subdivided into several distinct branches, so that there are only five firms in the town that manufacture complete clocks, while twenty firms are engaged in making the different parts of the same. The New Britain *Record* gives the names of these firms as follows:

"The Bristol Brass and Clock Company, where the brass is rolled into plates; the brass founderies of Lester Goodenough, where ratchets and sockets are cast; the works of the Bristol Foundery Company, where the weights and alarm bells are cast; the works of L. F. and W. W. Carter, where movements and cases are put together and the finished clock with Lewis' patent calendar attachment is produced. Clock springs and springs for toy movements are made by E. B. Dunbar and Wallace Barnes. S. E. Root makes sash and paper dials patented by himself. W. H. Nettleton makes lock works and pillars, and straightens and cuts wire. A. Warner and Mr. Taylor make verges, pendulum rods, and wire bells. N. Pomeroy, L. Hubbell, and S. E. Root manufacture movements. E. N. Welch Manufacturing Company, Atkins Clock Company, E. Ingraham & Co., and Mr. Partridge are large manufacturers of both movements and cases. Geo. W. Brown & Co. have also a large factory for the manufacture of clockwork toys.

"The clocks are produced in great variety, and range in price from one to eighty dollars each. Some are so constructed that by one winding they will run respectively, thirty hours, eight days, thirty days, and one year. A self-winding attachment is also made at Bristol, which is placed in the draft of the chimney, and the clock no sooner runs down than the draft, operating a fan, winds it up again. This little invention is a source of great income to its author. A perpetual calendar attachment, which will correctly indicate the day of the week and month, is also made, the patentee of which receives as royalty for the right to manufacture an income of $3,000 per year. An important improvement on the original invention has recently been made and secured by letters patent.

"Most of the workmen employed in clockmaking are 'specialists' who have labored many years at some particular part, and though they have become experts at their business, their wages are lower than those of most other mechanics, ranging from $1·75 to $2·25 per day. Much of the work is 'put out' to be done by women and girls.

"At present the clockmakers are busy making movements for a walking doll, a New York firm employing five hundred girls in making the dolls to which they are to be attached. Many other mechanical movements for various purposes are also made, among which are movements for lamplighters and fans, cradle rockers and baby swings (in which the baby is the pendulum ball), coffee roasters, works to ignite torpedoes, and works for a variety of animated toys. The first clockwork toy ever made was a toy engine, invented at Bristol, but the inventor never took out a patent, and probably escaped the miseries of a large fortune."

An Opportunity for Enterprise.

Not seldom we are addressed by inventors soliciting aid in the disposition of the improvements they have perfected, their object, generally, being to dispose of the whole or a portion of their patent right in return for present pecuniary assistance. As we invariably decline doing a commission business of this character, we can take no action upon such appeals, unless occasionally to draw attention to the matter by a notice in our columns.

A case now before us, however, we cordially commend to the attention of those who are seeking a desirable investment for a moderate sum. It is an improved weighing scale, the subject of a patent just obtained by S. S. Hamilton, who may be addressed at Taylor's Falls, Chisago Co., Minn. Very favorable terms for the patent may be obtained by addressing the inventor as above, as he is in ill health, which precludes him from personal attention to the necessary business of manufacture and introduction. We think the opportunity is a good one to obtain an interest in a valuable invention, and at the same time assist a very worthy invalid to go to a warmer climate, which his health demands.

FUSEL oil, tannin, acetate of lead, oil of vitriol, strychnine, creasote, Prussian blue, mountain dew. The *World* has done the community good service in exposing the villainous compounds which are daily sold to our citizens under the name of rum, gin, brandy, and whisky. What will the *World* say to the enactment by the Legislature of a law prohibiting the sale of such poisonous compositions, unless prescribed by a competent physician? The inquiry strikes us as a pertinent one, in view of the exposure which has just been made. We hope that our able cotemporary will give the public the benefit of its views upon this question.