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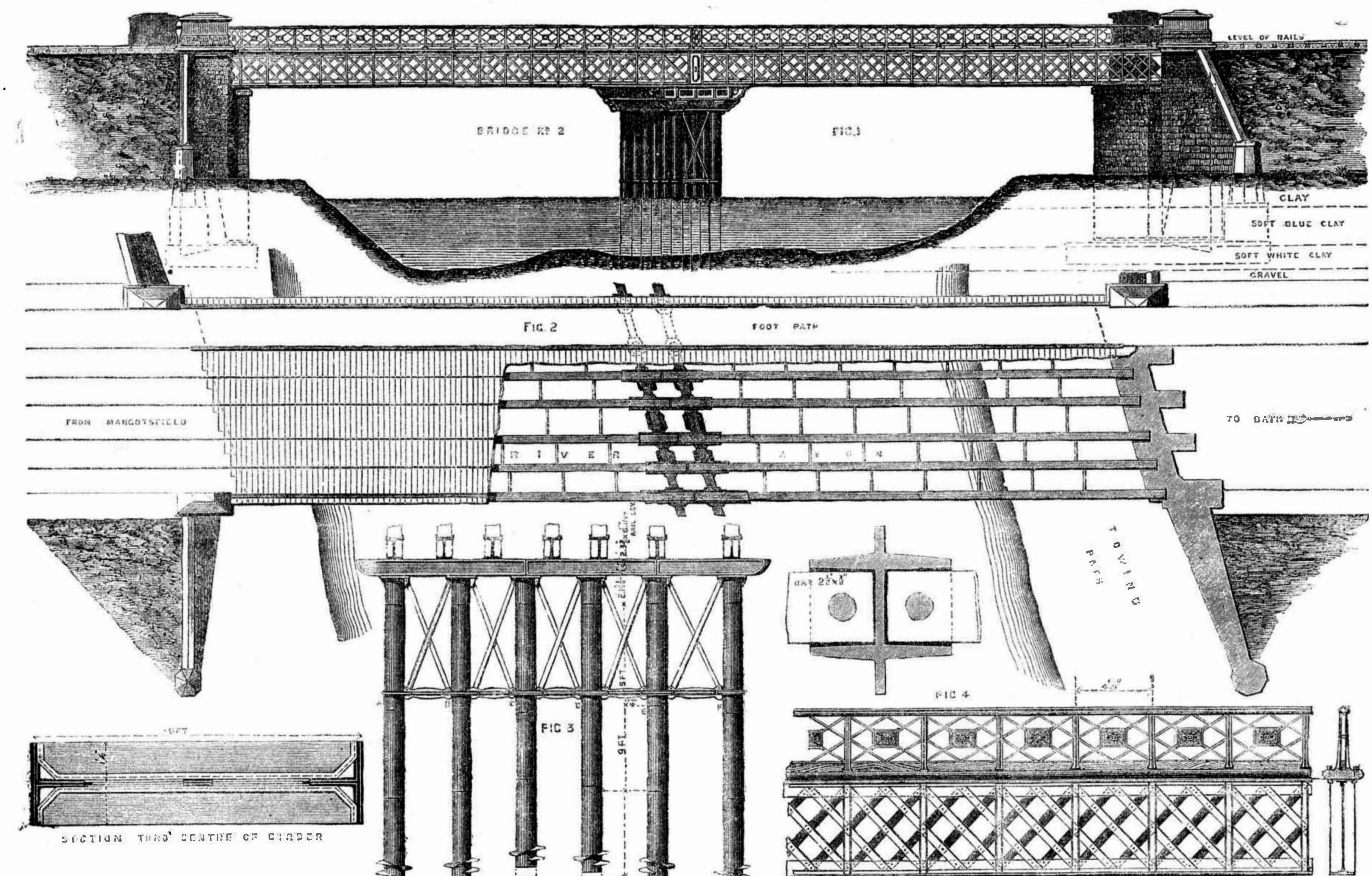
Iron Railway Bridge over the Avon.

We copy from the *Engineer* an engraving and description of one of six bridges over the Avon on the Mangotsfield and Bath branch of the Midland Railway. They are supported in the centre on cast iron screw piles. The engravings represent the bridge known as No. 2. It rests on abutment piers at each end; the middle pier is formed of a stack of twelve piles, which have screw blades prepared on a special system by Messrs. Handyside & Co., of Derby, who supplied and constructed all the six bridges. The superstructure consists of fourteen lattice girders, which, with their bracings, weigh 218 tuns. The piles weigh sixty-six tuns, and the girders by which they are united at the top, and the centrals carrying the superstructure, weigh forty-one tuns. The main girders are surmounted by a handsome open railing.

Referring to our engraving, we have at Fig. 1 an elevation of bridge No. 2; and at Fig. 2 a plan, with a portion of the platform removed, and showing also a footway beyond the lines of rails. Fig. 3 shows an elevation of the screw piles, which are two feet diameter, and are filled in with concrete. Fig. 4 shows the parapet railing in elevation and detail, from which will be seen its connection to the main girder.

It may be as well, before concluding, to say a few words upon the manner in which the screw piles of these bridges were fixed. In some instances they pass through beds of rock from ten inches to twelve inches thick, and in all cases they passed through blue lias and red clay. Each pile was held in place while being screwed down by a strong timber framing. Instead, however, of the usual capstan, rope, and winch arrangement for screwing, Messrs. Handyside use a special apparatus of their own design. Having experienced the difficulty of keeping the two ends of an elastic rope equally taut, and finding, moreover, that the winches were sometimes unable to exert sufficient power, they devised a machine by which both ropes and winches are dispensed with. It consists of an arrangement of worm wheels and gearing, and admirably overcomes all the difficulties of the ordinary system, and prevents those occasional jerks which are so undesirable in the operation of screwing. All the six bridges were designed by Mr. J. S. Crossley, the engineer to the Midland Railway Company; their supply and construction being intrusted by Messrs. Eckarsley and Baylis, the contractors for the line, to Messrs. Handyside & Co., to whom we are indebted for drawings and particulars. Although there are no strictly novel features about these bridges they deserve attention as examples of the best modern practice. We need scarcely add that the workmanship is excellent.



BRIDGE ON THE MIDLAND RAILWAY OVER THE AVON NEAR BRISTOL, ENGLAND.

Xylography, or Printing and Graining from the Natural Surface of the Wood.

A new method for graining has been recently patented in England, applicable to transferring impressions from wood to plain deal, or to painted surfaces, either flat or molded, in buildings of all descriptions, where an accurate transcript of the more costly woods is desired, and for house and bedroom furniture generally; for japanned goods, made in metal or *papier maché*; for enameled parqueterie tiles, and for articles in earthenware, such as garden seats, oyster and flower tubs, spirit casks, flower pots, tea-urn stands, etc.; for enameled slate, for paper hangings, and for oil cloths.

The inventor thus describes the process. Select a piece of wood of fine quality, about five feet long, twelve inches wide, and one-fourth inch thick; it is, to use the technical phrase, cleaned up by the cabinet maker on both sides, and is well sand-papered down. By having both sides of the board cleaned up, two patterns are obtained from the same board. A chemical preparation is then applied to it, which has the effect of opening the pores of the wood, and, at the same time, of hardening the surface, and, when the board is thoroughly dry, it is ready for use, and is, in fact, a wood plate, "not graven by art or man's device," but by the great Designer and Architect of the universe, whose works, the most stupendous as well as the most minute, are all perfect. The material used for taking the impression is prepared in oil, and is specially adapted for the purposes of transferring. The paper, too, manufactured for the purpose, is very thin but tough, so that it can be successfully applied to any irregular or molded surfaces, and it is sized to prevent the color from becoming incorporated with the body of the paper. A small wood roller is used for spreading the color on the board, and a large, broad, flexible palette knife is used for taking the superfluous color off. That being done, the sized paper is placed on the board, and both are passed through a small machine having turned iron cylinders, the upper one being covered with double-milled flannel; the paper is then taken off the board, its printed surface is applied to the article to be decorated, the back of the impression is lightly rubbed with a piece of soft flannel, the paper is removed, and an exact *fac simile* of the board, from which the impression is taken, is given. But that is not all, for a second and a third transfer are frequently obtained from the same piece of paper, and sometimes a fourth, a fifth, and a sixth. This is one of the remarkable features of the process, and, as you will not fail to perceive, must have a very marked influence on the rapidity of its application, and, consequently, on its cheapness. With the color properly prepared, and adapted for its purpose, the plate does not clog or become foul any more than does the plate of the copper and steel-plate printer; but such a result would occur in both cases if the material used was not suitable for its purpose. When a board has been used it is treated as all other plates are, a cheap material is used for dissolving the printing color, a handful of fine sawdust is then rubbed over it, which most effectually draws out of the pores of the wood the dissolved color, and leaves the board clean, and ready for further use when required. Under the same conditions, provided no accident happens to it, the board will be far more durable than either the copper or steel plate.

Charcoal Pipes.

The use of charcoal in the preparation of pipe heads, a long time practiced, has lately experienced many improvements, so that now pipes are produced remarkable for a deep black, lustrous appearance, and of very great durability. The material consists of a mixture of two parts of the best charcoal black and one part of the best black peaty earth, ground so finely that, when rubbed between the fingers, no trace of granules is perceptible. Two parts of this mixture are then united with one part of an equally well pulverized residuum of distilled cannel coal, containing still a portion of its bitumen, and the whole rubbed together thoroughly till all the three ingredients are uniformly combined. The mixture is then placed in iron boxes, in which are sunken molds corresponding to the pipe heads, and while the boxes are then heated to the boiling point of water, stamps with rough surfaces are pressed under hydraulic pressure into the openings of the heads, so that this process, united with the increased temperature, not only combines the carbonaceous mass into compact pipe heads, but also produces a smooth exterior, and at the same time a rough inner surface.

DYEING IN FRANCE AND CONTRIBUTIONS OF MODERN SCIENCE TO THE ART.

BY E. R. MUDGE U. S. COMMISSIONER TO THE PARIS UNIVERSAL EXPOSITION OF 1867.

(Concluded from page 194.)

The advantages resulting from the recent improvements, by which the coloring matter of madder is obtained in a purer and more concentrated form, will be rendered more obvious by a brief statement of the usual processes in printing. These may be divided into three different classes: First, where the colors are fixed without a mordant, as in dyeing blue with indigo, either of a uniform tint, or where the whites are reserved by an application which prevents the contact of the dye upon the parts to remain uncolored. Second, where mordants are first printed upon the tissues, which are afterward subjected to subsequent operations of tinctures, as by immersion in the dying liquid, etc. This process, until very recently, has been necessary for all madder dyes. Third, where the mordants and coloring matters are previously combined together to form the color to be impressed, which is called a "color of application." In this last class of processes the printed tissues are suspended in a vessel filled with steam from boiling water, which produces the same effect as dyeing by immersion in a liquid bath, the colors combining directly with the fibers of the tissues. By means of the steaming process, the operator can print and fix at once an indefinite number of colors, and terminate by the two or three operations of printing, fixing, and washing, a work which formerly required many weeks when accomplished by the process of dyeing after the printing with mordants; almost all the coloring materials known could be fixed by the third process upon tissues of wool, silk, or cotton. The coloring matter of madder alone has not been isolated in sufficiently advantageous conditions of assimilation, that the process of fixing by steam could be applied to it. The discovery of the different purifications of madder has placed it in the power of the printer of tissues to apply the expeditious process of steam printing to the most permanent and useful of all vegetable colors. The most important use of madder as a color of application has been achieved only within a few months. Very beautiful fabrics printed by this process at two establishments, one in France and the other in Bohemia, were displayed at the Exposition. M. De Kaeppilin, referring to these fabrics, says: "It is evident that the long and difficult operations required for fixing the vegetable coloring material on tissues are now quite simplified, and that the new manner of fixing the coloring material of madder, all prepared and combined with the different mordants, being allied with the beautiful and simple fabrication of colors from aniline, will achieve for the industry of printing tissues its most beautiful conquest. Instead of the ancient steam colors, which in respect to solidity left much to desire, the madder colors, married as it were with the brilliant colors derived from coal tar and the solid and resistant mineral colors, like ultramarine and chrome green of Guignet, will replace the fugitive colors of the dye woods. The fabrication will be more perfect, and will reunite solidity and brilliancy of colors with the delicacy of execution which can be obtained only by machines which print mechanically."

It has long been known that certain species of lichen exposed simultaneously to the action of ammonia, moisture, and a moderate temperature, gradually acquire a deep purple color, and the property of dyeing wool and silk with pure and brilliant tints. The pasty and woody mass containing the coloring matter is known as cudbear. The coloring matter extracted by means of an alkali, and separated from the woody portions is known as archil, or *orseille*. A new kind of archil was introduced in 1856 by MM. Guinon, Marnas, and Bonnet, under the name of French purple, in the form of lime lake. It furnishes very fine and pure mauve and dahlia tints upon silk and wool without mordants, and mixes easily with other coloring matters, such as ultramarine, indigo, carmine, cochineal, aniline red, etc., producing the most varied and delicate tints. The manufacture of French purple, although at one time extensively prosecuted, has been greatly diminished in importance by the competition of the coal-tar purple.

In 1854, MM. Hartmann and Cordillet succeeded in fixing upon fabrics the green coloring matter of leaves. In 1851 and 1852 the famous Chinese green, called *Lo-kao*, was introduced. Subsequently, M. Charven, of Lyons, obtained the coloring principle of the *Lo-kao* from a weed indigenous to Europe, the *Rhamnus catharticus*, for which he received a gold medal. The Chinese green was especially admired on account of the beautiful green shades which the fabrics dyed with it assumed in artificial light. MM. Guinon, Marnas, and Bonnet discovered the means of producing at less cost shades of green which preserve their character under artificial light by the use of Prussian blue with picric acid. It is a curious fact that, while the greens produced by indigo and picric acid appear blue in artificial light, the dyes produced by Prussian blue and picric acid appear green.

A remarkable and very beautiful amaranthine red was first commercially prepared from uric acid in 1856. This dye, called *murexide*, created a great sensation, but its use was of short duration, as a more vivid and more easily applied tint was about this time obtained from aniline, and the murexide was objectionable because the color, though unaffected by the sun, was destroyed by sulphurous fumes, as in the atmosphere of London, impregnated with sulphur from coal. This coloring material is peculiarly interesting from the circumstance that it is nearly identical in composition with the ancient purple derived from the murex. Professor Hoffman records, as he shared, the triumph which was felt in Liebig's laboratory when a few grains of this substance were first obtained in a state of purity, and the rapidity with which the scientific discovery was made practical in the arts. When the manufacture reached its culminating point, the weekly yield of murexide in one factory only amounted to no less than 12 cwt., a quantity in the production of which 12 tuns of guano were consumed.

The long-sought-for rediscovery of the Tyrian dye was hardly attained before it was replaced by a product of modern science. The year 1856 was remarkable in the history of dyeing as the epoch of the most complete revolution of the art. It was the period of the practical discovery of the first aniline colors. The property which aniline, a product from the hydrocarbons of the coal series, possesses of forming colored compounds, was indicated by Runge in 1856. This indication was followed by the discovery by a young English chemist, named Perkins, of the means of preparing commercially from aniline a coloring substance of great intensity of hue and permanency, which is known in the arts as the "Perkins violet." This was almost immediately followed by the commercial preparation in France, by Verguin, of the aniline red. The extraordinary qualities of these products, the wonderful facility with which they could be applied to wool and silk, and the freshness and vividness of their hues, stimulated the scientific and practical chemists in France and England to search for new compounds from the same source, and to cheapen the production of those known. The most important scientific results were obtained by the English chemist Hoffman, who discovered and prepared the colorless rosaniline, a base from which all the reds, beside many other colors, may be formed, by different reagents. The colors derived the hydrocarbons of the coal series are as various and as vivid as the hues of the flowers.

The aniline colors whose use in the arts has been fully established by practice, are:

1. The aniline, or Perkins violet, called also rosaline, indesine, mauve, aneleine, hamaline, and violene.
2. The aniline reds with a rosaline base, called also fuschine, azaleine, and magenta.
3. The blues of rosanaline, Lyons blue, blue *de lumiere*.
4. The rosaniline violets, different in hue from the Perkins violet.
5. Hoffman's violet.
6. Imperial dahlia.
7. Aniline green.

To these may be added an orange color, chrysaniline, and colors produced from the oxidization of aniline, but not directly applied; a green called emeraldine, a blue called azurine, and the intense aniline black, developed only on vegetable fibers.

The use of these colors gives a marked character to the dyed tissues of the present age. The great change effected by them was remarkably illustrated at the Exposition by a display of parallel series of wools dyed by the ancient, and the new or aniline processes. The aniline hues were predominant in the richly colored fabrics of the Exposition, and, adopting the figure of Colbert, that "color is the soul of tissues, without which the body could scarcely exist," we might say that these colors fix the physiological character of the fabrics of the present day. Among the wonders of modern science what is stranger than this, that the gigantic plants buried in the coal measures of the ancient world are made to bloom with all the tints of the primeval flowers, upon the tissues of modern industry?

Artistic reasons are not the only ones which have led to the prevailing use of the new dyes; economical reasons have had equal weight, especially in the woolen industry. One of the most remarkable characters of the coloring materials derived from aniline is the powerful affinity which they possess for materials of animal origin, or nitrogenized substances, and especially for wool, silk, albumen, gluten, and caseine. The affinity for these substances is so great that there is no need of any mordant. In the application to vegetable tissues, such as cotton, it is only necessary to animalize the fiber with albumen. These colors may not only be applied with the greatest facility in dyeing by immersion, but add vastly to the economy of printing mousselines or calicoes, as they may be used as "colors of application" in steam printing. Beside, all these colors are now sold commercially in a state of great purity, and very often in crystals. The colorist has rarely anything more to do than to dissolve the product in a suitable vehicle, and to put it in presence of the fiber, in the conditions in which it can adhere, which for wool and silk are extremely simple.

The great problem in the art which science has now to resolve is to give more stability of color to these magnificent products of modern chemistry. The chemist who has furnished many of the facts above given, M. De Kaeppilin, is hopeful that this will be accomplished. He says: "Some of these results have already been obtained; above all, upon tissues of wool and silk. It is evident that colors derived from archills, such as the violets and reds, are more fugitive than the Perkins violet or new violets from rosaniline of Pourier and Chappal; that the roses of safflower or cochineal are not more stable than the roses of aniline, and that aniline black is not only superior to all other blacks, but that it is wholly unalterable and of complete stability upon tissues of cotton."

Before closing this imperfect review of the relation of chemical arts to the woolen industry, it is due to American science to observe that the name of the lamented Dr. Dana, of Lowell, is most honorably mentioned by French savans among those who have rendered important service to the art of dyeing and printing tissues. The credit is awarded to him of the introduction of lime in the operation of bleaching for the purpose of saponifying the fatty matter contained in the crude tissues. He thus completed the great discovery of Berthollet of the bleaching qualities of chlorine.

GENERATION OF OZONE IN THE ATMOSPHERE.

BY C. W. HEATON, PROFESSOR OF CHEMISTRY IN CHARING CROSS HOSPITAL COLLEGE, ENGLAND.

As to the mode in which ozone is generated in the air, we have only probabilities to guide us. There can hardly be a doubt that it is formed to some extent by the agency of lightning, and it is possible that this is the sole mode of its production. Some writers assert and some deny that it is present in the oxygen evolved by plants under the influence of light, but though such a formation is probable enough, the evidence both for and against it, is at present inconclusive, and lastly, it is possible, though still unproved, that it may be formed during some of the processes of slow oxidation which are so common on our globe.

However it is formed, it is at least certain that ozone exists in the air, and that, though small in quantity, it must, from its extraordinary activity, have important functions to fulfill in nature. But this very certainty has, unfortunately, been a fruitful source of wild assumptions and mere speculative guesses, doing infinite harm to the progress of true knowledge. Some have asserted, and have attempted to prove by perfectly inconclusive reasoning, that ozone arrests infection, and destroys the germs of epidemic disease. It is highly probable that such is the case, and it is certain that its presence is incompatible with that of many noxious gases. But then it is *not* certain that epidemics are due to noxious gases, and if, as is more likely, they are propagated by spores, we have yet to prove that the minute trace of ozone in the air is capable of destroying those spores. We can no more assume it than we could assume that it killed birds. Even more vague, and much more improbable, is the floating notion that an excess of ozone in the air "does us good." Men talk of running down to the seaside "to get a little more ozone," just as if it were not possible that the little more ozone might do them harm instead of good when they got it. In large quantity it is certainly an intensely powerful irritant poison, and that it is useful in large quantities is the merest assumption. As to the notion of its assisting the process of blood oxidation, the probability is all the other way, for its energy would be much more likely to cause it to oxidize, and destroy the lung itself, than to permit it to pass quietly into the blood, and effect the work performed by the more gentle oxygen. The simple fact is, that we know next to nothing about this branch of the subject; and if, instead of guessing at random, we were to set to work to try to elucidate some of the obscurities by which it is surrounded, or, at any rate, were to wait until others had done it for us, we should act a much more sensible and modest part.

For the future there is every hope. The main elements of the inquiry have already been acquired, and a strong body of experimenters are at work upon it. The British Association has appointed a committee to investigate some of the moot points, and from the high eminence of every member of it, we may justly anticipate some important contributions to our knowledge.

Tanning---A New Process.

A process has been invented in England for preparing hides to receive more readily the action of tannin. After the hair and particles of flesh have been removed, and the hides have been properly cleaned by the action of lime, the first step in this new process is to place the hides in water sufficient to cover them. The hides are to be placed in separately, with the fleshy side upwards, and are to be sprinkled with bran in the following proportions:

Light hides, for uppers, etc., each skin....	6 ounces
Calf skins....	3 "
Sheep skins....	4½ "
Heavy hides, for sole leather....	14 "

In this vat the skins must remain until fermentation has taken place, which will be, in warm weather, in about two days, but in cold weather somewhat longer. After this the skins must be removed and scraped from any adhering particles of lime or other substances. When this has been done the skins are subjected to the action of mustard seed, which forms the distinguishing characteristic in this process. It is carried out in the following manner: A vat of proportionate size is filled with a sufficiency of water to cover the skins, and to this water there must be added for every hundred pounds weight of the skins, when dry, five pounds of ground Italian mustard seed, and five pounds of barley meal. When these ingredients have been thoroughly mixed with the water, the skins must be dipped therein, so that they may be perfectly saturated with it, and they must be left in this dip for the following length of time:

Calf, sheep, or goat skins....	24 hours
Light hides and kips....	36 "
Heavy hides, for sole leather....	48 "

When this time has expired the skins must be taken out and hung up to dry, but only partially, as when subjected to the next process they should still be in a damp condition. The dip which has just been described has a very powerful action on the skins; the combined action of the mustard seed, barley meal, and heat thereby generated, is to open the pores of the skins, and thus to render the remaining processes in tanning them by means of bark much more speedy than under any other methods hitherto known.

A New Alloy.—A new alloy, forming, we are told, a beautiful white metal, very hard, and capable of taking a brilliant polish, is obtained by melting together about 70 parts of copper, 20 of nickel, 5½ of zinc, and 4½ of cadmium. It is therefore, a kind of German silver, in which part of the zinc is replaced by cadmium. This alloy has been recently made in Paris for the manufacture of spoons and forks which resemble articles of silver.

The British Government and Inventors.

The relations subsisting between inventors and various branches of the government, needing and using the intelligence of inventors, have long constituted a topic of painful comment and incrimination. British law regards every inventor as an outlaw; as a man having no legal rights in any matter relative to the use of his invention by the government. It would be an insult to the reader's intelligence were we to debate the moral right and wrong of this decree. We only state what is the law, expressing, at the same time, our conviction that public opinion would never second or sanction the strict upholding of this, in any case of undisputed use and adoption by a governmental department of an invention originating with a member of the public. Not wishing to overrate the grievances inventors have complained of in the course of their dealings with the government, we are free to admit, that although the legal ruling is precisely as we have stated, yet the cases of inventors whose inventions have been adopted by the government, remaining totally unrewarded, are comparatively few. Usually some bonus has been conceded, but the manner of this assessment and award has been hitherto most unsatisfactory. Government, in these matters, has acted as though prompted by the desire to give an inventor the very maximum of trouble; to tire him out by all sorts of unnecessary delay, whereby in time his hopes and aspirations might be lowered to a convenient despair for inducing him to accept a trifle. Indications, we are gratified to state, are not wanting that Mr. Gladstone's administration is not insensible to the past injustice to which we have referred, and is resolved that inventors coming before governmental departments, and having their inventions ultimately adopted, shall be equitably treated in future. The first indication is seen in the terms of a recent announcement issued from the War Office, for the consideration of inventors, whereby various checks are imposed to the suppression of a valuable invention; first, establishing a more fairly constituted tribunal than heretofore for the assessment of value; secondly, defining the mode of payment, and indicating the precise time. In former days, if a man possessed an invention bearing upon warlike art, and wished to treat on behalf of the same with the government, his usual course of proceeding was the following: He made application either to the War Office, the Ordnance Select Committee, or the Admiralty. His letter of communication met a prompt response, accompanied with a printed statement of the terms on which alone the government would condescend to treat with him. He must defray all expenses; he must disclose all particulars; finally, he must trust wholly and absolutely to government for reward in the event of ultimate adoption. Now, the common opinion is (and it is one that, conscientiously, having arrived at belief through evidence within our own knowledge, we cannot gainsay) that, on many occasions, inventive particulars thus communicated to the War and Admiralty departments, have been turned to unfair account; that, by some means or other, those particulars have become known to members of the public service, "improved," ostensibly, at least, into discoveries of their own, to their sole advantage. If this did not happen, it readily might have happened. So powerful an incentive to profitably unfair dealing, without much chance of discovery, should never have been permitted. By the terms and wording of the recently issued memorandum, we are glad to see a check imposed on this contingency of unfair dealing. Inventors now are given to understand that their communications are not to be addressed to either of the war departments, but to one of the Under-secretaries of State, who takes upon himself the responsibility of laying them before the War Department, where due consideration is pledged. The government do not hold themselves responsible for any expenses an inventor may have occurred in the inceptive stages of an invention, but express readiness, under certain circumstances, to contribute towards expenses necessary to the development of an invention. The next point of importance in the recent memorandum is relative to the tribunal of assessment, which is to be a committee held in the War Office, a great improvement on the old mode of leaving this matter to the discretion of the legal heads of departments. Whether or not any civilian element is contemplated in these War Office committees of adjudication, the memorandum does not state; but if not, the machinery will be needlessly defective. Lastly, as regards time and mode of payment in behalf of inventions deemed worthy of acceptance and adopted, these matters—so important to inventors—are, by the memorandum, clearly defined. As soon as the value of an accepted invention has been assessed, the sum—under sanction of the Secretary of State—is to be inserted in the estimates, when, on being passed by the House (but not till then), the inventor will receive his award. The new *regime* may be said to have found its first application in the award to Captain Moncrieff; for, although government had come to a conclusion in respect to this matter, before the memorandum to which we have been referring was issued, yet the spirit of it is clearly seen in the terms and manner of Captain Moncrieff's award. Altogether, the aggregate sum receivable from the government by this gentleman, may be set down as some twenty thousand pounds. After paying him for the expenses of drawings, models, etc.,—a concession rather in advance, by the way, of the terms of the new convention—he is to have ten thousand pounds on the passing of estimates, and five thousand more at the date when his assistance may be no longer required by government in further developing his system. He is to be paid a thousand a year for such time as he has been already assisting the government, and for all future time until his services are no longer required. Then he is to receive five thousand pounds Altogether this is an arrangement more liberal—as we have already said—than the new memorandum, strictly interpreted, would warrant inventors to expect. All the better, is what we say; and if this liberality of treatment is to be repeated, all the better still. The English public, we are right sure, will never uphold unfairness by the government to inventors who have advanced the interests or increased the power of any public department.—*The Engineer.*

Agricultural Implements.

Probably no department of invention has on the whole more munificently rewarded the genius expended upon it, or still offers greater inducements to inventors than that of agricultural implements. It is true that powerful and effective reapers, and threshers, and a host of minor inventions have been brought nearly to perfection, so far as anything human can be said to be perfect; but there remain very many agricultural operations to the aid of which machinery has not been yet successfully applied.

The annual address before the New York State Agricultural Society, delivered February 10th, by Thomas H. Faile, the retiring president, contained among much other interesting matter some statements of special interest to inventors.

He spoke in the highest terms of the beneficial effect upon both visitors and exhibitors of implements at the annual fairs of the society, bringing together as they do the manufacturers and those for whose benefit improved machinery is designed. He says "I think it a mistake to suppose that manufactures of agricultural implements attach any importance to the *cash value* of premiums. It is the opportunity to exhibit and make them known which they want, and this they get at every well conducted fair, whether State or county: in proof of which, I was told by an exhibitor of a small implement at the last fair, that he had spent over $30,000 in exhibiting and introducing it, and had been well compensated for his outlay by sales which he never could have made but for the fairs. The exhibition of machinery and agricultural implements was the crowning excellence of the best fair. The increased number of new machines, and the improvement of those long known for their usefulness, showed in a stronger light than ever before, the marvelous inventive genius of our people. The time has passed when mere hand work can make the cultivation of the soil remunerative, and it is only by the use of improved implements that success can be attained. Even in the remote parts of our country the scythe, the sickle, and the cradle, have been superseded by the mowing machine and the reaper, and by means of these and other agricultural implements, the fertile lands of the West have been brought into use, making Chicago the most important port in the world for the shipments of cereals.

"The different trials of implements—mainly agricultural—have resulted in such vast benefit, not only to farmers, but to the whole community, that another should not be long deferred. In ditching and digging machines especially, there is open a wide and very important field for improvement and invention; and when the vast quantities of wet lands, which could be reclaimed and made valuable by ditching, and the unavoidably slow work of the present method is considered, it seems to me that the society might do great good by offering an oportunity for a competitive trial of these important machines; more especially as it is now claimed that there is a rotary digging machine in Illinois which has been successfully operated

"It has been suggested that a separate trial should be made of portable steam engines, sewing machines, etc., but it would seem that all such inventions can be more effectually tested by those whose interest it is to procure the kind best adapted to their purposes. I allude to manufacturers, especially those using sewing machines, who in preparing the various articles in their line, aim to have the best, and to whom $5,000, $10,000 or $20,000, is a small expenditure for ascertaining that fact. Hence I think that no premiums or certificates of merit should be given to such articles at our fairs. Nor do I think there should be any awards for pianos or musical instruments of any kind. In the great national exhibitions held in London and Paris, where the highest musical talent in the world was congregated, it was no doubt proper; but farmers are not supposed to be Mozarts and Rubinis, and a certificate of merit or superiority of one instrument over another is simply absurd, and leads to unnecessary trouble and dissatisfaction. As before mentioned, the opportunity to exhibit to such large assemblages as frequent our State fairs, is what the makers want, they knowing full well the advantages to be derived from it."

It will be seen here that the privilege of exhibition is regarded as a sufficient inducement to manufacturers of other than agricultural goods, at the annual fairs of the society, as a premium even when obtained would be of little service to makers of pianos and other articles not strictly pertaining to agriculture. While acknowledging the force of this view as regards piano manufacturers, we think the exclusion of sewing machines unwise. A premium on a sewing machine at a state agricultural fair is well worth competing for, especially as sewing machines are almost as common now in farmers' houses, as churns.

There can be no doubt that the annual fairs of this society have been a great stimulus to the demand for improved agricultural machines and implements, and have aided inventors in bringing their improvements before the public. If continued in the same spirit of liberality that has hitherto characterized their management, they will be still sustained by all classes of manufacturers and inventors; but a narrower policy may prove disastrous, unless careful discrimination is used in the exclusion of articles from the prize list.

Furnaces for Smelting Glass.

An improvement in the method of creating drafts in glass furnaces has been made by James Davison, of England. At present long caves are placed under glass furnaces, and large cones of brickwork above them, in order to get the sufficient amount of heat requisite for the perfect fusion of the materials used in glass making. Mr. Davison's invention does away with these expensive and inconvenient draft creators. He employs steam, which is generated in any suitable boiler, and which is injected into small flues, chimneys, or funnels, by steam pipes or jets; these he places in any convenient part of the furnace, and one or any number may be applied according to the size of the furnace, and the number of glass pots it may contain. In each flue or chimney the steam pipes or jets may be either fixed or portable; they are provided with stop cocks so as to regulate the supply of steam, and in this manner a draft is created and the heat of the furnace increased and regulated at pleasure. The principal features of this invention are, the application of steam injected into furnaces for the manufacture of glass, and the materials employed in that manufacture for the purpose of obtaining the necessary draft; but the flues may also be so arranged as to consume the smoke from the fuel.

TRANSPORTATION OF FRESH MEATS TO MARKET.

On page 323, Vol. XV., of the SCIENTIFIC AMERICAN, in a leading editorial, we discussed the above subject, offering some suggestions as to modes by which meats could be preserved fresh during transportation over long distances. We closed the article referred to with the following paragraph:

In the more immediate Western States, it is possible to construct cars so that animals may be slaughtered there, and the fresh beef delivered in a wholesome condition in this city. In the Southwest this plan seems at present impossible, and the only mode by which this object can be attained will be by boats constructed for the express purpose of carrying the slaughtered animals from the ports of New Orleans or Galveston direct to the Atlantic seaboard. This project seems to be a very difficult one, we admit, but science, well directed by capital, may yet accomplish the result.

Our suggestions were made with reference to the construction of refrigerating cars and boats for the purpose specified, and we now have the satisfaction to record that they have borne good fruit.

The New York *Herald*, of March 19th, says:

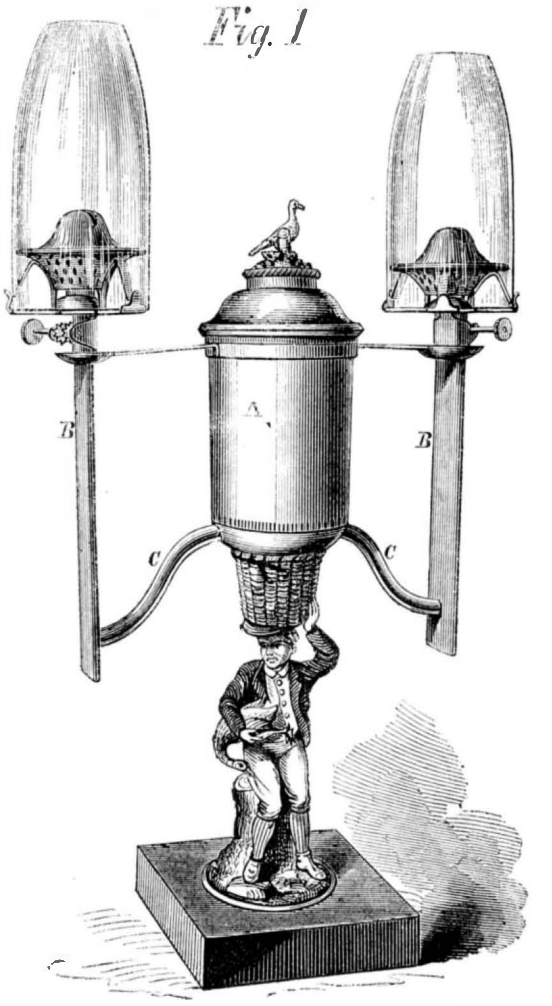
Yesterday a new invention, in the shape of machinery for making ice and performing the refrigerating process, was tested on board the ship *William Taber*, lying at the foot of Nineteenth street, East River, in the presence of a number of scientific and mechanical gentlemen, to whom invitations had been extended. The ship already named has been thoroughly fitted with this new apparatus for the preservation, during transportation, of fresh beef and other perishable food for a long period, and she will sail for Texas some day next week, to return with a large cargo. The properties and designs of this novel invention may be briefly stated as follows: The inventor has contrived a series of pumps, by means of which he obtains a pressure on the carbonic acid gas generated in the process of working, which was before obtained by the action of oil of vitriol on carbonate of lime. When these two properties are brought together they must, under this process, decompose. He has reduced the carbonic acid precisely in this way, and allows it to escape into bags. By the application of the pumps, which are surrounded with water, he reduces it to a liquid state. The first pump, under this pressure, carries 75 pounds to the square inch, the second 300, and the third is capable of 1,200 pounds to the inch, which pressure is amply sufficient to liquefy carbonic acid gas. Having reduced it to a liquid form, it necessarily becomes deprived of all its caloric, and the moment it becomes liberated it again assumes its gaseous form and takes caloric from all surrounding points. The inventor's first idea was to utilize carbonic acid gas for the production of ice. One of the principal features in the apparatus is an iron case lined with copper, and through which are copper tubes set in the top and running clear through. This case is surrounded with wood and well packed by other material to prevent it from receiving caloric from the outside. The tubes are filled with water, which soon becomes converted into ice. Another novel feature in this invention is that after the gas has performed its office of converting the water into ice once it is allowed to escape into gas again. It is now ready to be reliquefied and to go over and convert another quantity of water into ice. The expense is limited to the interest upon the apparatus used, the cost of a given quantity of carbonic acid gas, and the cost of running a steam engine and apparatus to liquefy it and turn it into a gaseous form again. Fifty dollars' worth of carbonic acid gas, it is claimed, would make numbers of tuns of ice. The two great principles, then, in the mechanism of the affair, seem to be, first, the application of pumps to the liquefaction of carbonic acid gas; and second, the remaking of it into gas over and over again *ad infinitum*. On experimenting the inventor also found that the passage of a current of air through the tubes produced an intense degree of cold, and the idea at once occurred to him that he could, by means of a "blower," make a current of air available to cool a room of any given size, and in this he succeeded, as exemplified yesterday. The same current of air goes through the "blower" repeatedly. In a temperature of forty-five degrees, in a room sixty-six feet long, thirty-three wide, and thirteen high, in eight minutes the thermometer went below zero twenty-six degrees. With the aid of this machinery the ship *William Taber* is prepared now to carry from Texas to the New York market, it is claimed, 400 tuns of fresh beef. Through the agency of this process, it is also stated that all kinds of fresh meats, fresh fish, fruit and vegetables can be preserved for an indefinite time in a cold, dry atmosphere. The value of 400 tuns of beef in the New York market is about $96,000; the expenses of the trip to Texas is estimated at $10,000, which would leave the handsome profit to the inventors, whoever they may be, of $86,000. After the apparatus had been thoroughly tested, as above described, the gentlemen present partook of a handsome *dejeuner* on board the ship, during the progress of which the inventor performed some very interesting scientific feats, such as boiling an egg hard, making champagne cream, solidifying quicksilver and other things pertaining to the laboratory of the chemist, through the agency of carbonic acid gas and his refrigerating process.

THE third pumping engine for the Brooklyn Water Works, now being built, will be the largest and most powerful pumping engine in the world, with the exception of one in Cincinnati.

LUMBERING operations in Canada are nearly stopped by the extraordinary fall of snow during the past winter.

SANFORD'S KEROSENE SAFETY LAMP, AND SAFETY ATTACHMENT FOR COMMON LAMPS.

Accidents from the use of illuminating kerosene oil ought not always to be attributed to the impurity of the oil, or to the presence of the volatile explosive fluids that form a part of the composition of crude petroleum. There can be no doubt these frequently exist in oil that is sold as perfectly safe, and accounts of explosions of lamps are not infrequent. The law in relation to the purity of kerosene would, if rigidly enforced, prevent these disasters, but it is doubtful if an enforcement of

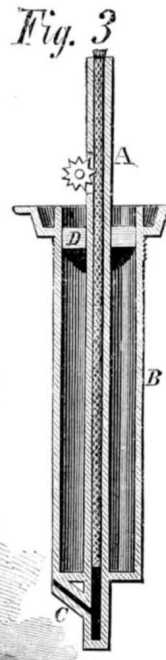


the law is possible in all cases. But many kerosene accidents do not result from explosion, but from overturning or breaking the vessel, or lamp, and the ignition of the fluid, which is in all cases highly inflammable. A portion of this danger could, however, be removed by the employment of a perfectly safe lamp.

Dr. Sanford, of Keokuk, Iowa, is satisfied that he has produced such a lamp, a representation of which is seen in Fig. 1, accompanying this article. His principle is to remove the flame to a safe distance from the oil reservoir, to make the latter of metal, and to feed the oil to the wick only in small quantities, as required. The lamp is simple—does not require an engineer to run it—easily kept in order, and gives a good light.

Fig. 2

Fig. 3



The reservoir, A, is of polished metal, so as not to absorb the heat rapidly, and is closed by a screw cap. The wick tubes, B, are about three inches from the lamp, supported by braces, as seen; on the lower ones of which rest the pipes, C, which convey the oil to the wicks. The burners are of the usual form. The distance between the flame and the reservoir effectually prevents any heating of the oil by conduction, and if the lamp should fall and break the pipes, the amount of escaping oil would be too little to produce any disastrous consequences.

Fig. 2 is Dr. Sanford's plan for rendering the ordinary lamp safer. It is a hoop considerably larger than the lamp, to which is attached a series of buffers on its inside, made of rubber or other elastic substance, to protect the lamp from concussion. This guard is held in place by the cap of the lamp being screwed down upon it. The guard may be made as ornamental as desired.

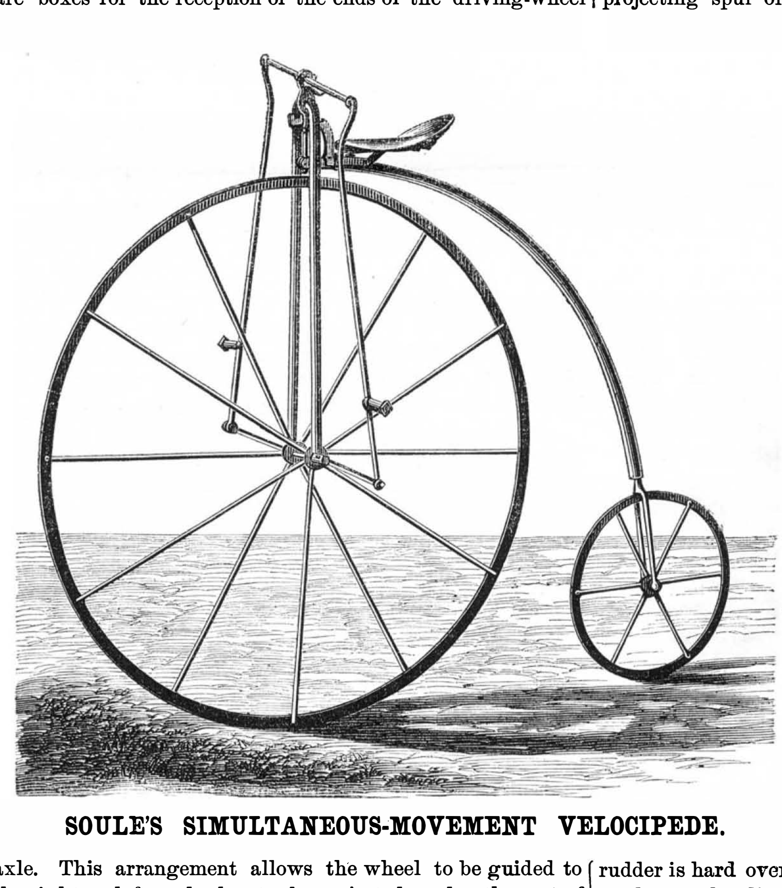
Fig. 3 is a vertical section of the wick tube and its accompaniments. The tube proper, A, is flat, as are the tubes, B, in Fig. 1. It is inclosed in a cylindrical tube, B, and projects through it at each end. Both are closed at the bottom except the small passage, C, leading from the wick tube to the oil in the lamp. The top of the round tube, B, is the screw cap of the lamp. Between the wick tube and its outer cylindrical sheath, is interposed, near the top, a gland, D, of some material not a conductor of heat, and the rest of the space between the tubes contains a fluid, which, if the lamp is overturned, flows out and extinguishes the flame if the oil should ignite.

These inventions are both covered by letters patent. For further information address J. F. Sanford, at Keokuk, Iowa.

Improved Adjustable-Reach Velocipede.

Undoubtedly the fewer the mechanical appliances interposed between the power and the proposed result—the force exerted and the force delivered—the more satisfactory will be product of the two elements. This theory is specially applicable to the velocipede. Four-wheeled vehicles propelled by the physical power of the rider are old; the three-wheeled carriage is more modern; the two-wheeled vehicle, now so popular, may perhaps be compelled to make way for the one-wheeled contrivance; and surely this latter is bringing the theory of wheel-riding to its ultimate—perhaps carrying it beyond its proper limit.

The machine shown in the accompanying engraving is, in effect, a unicycle, the small following wheel being only one point of suspension for the reach, and acting only as a truck or friction wheel. The driving wheel, which is also the steering wheel, may be of very great diameter, as it is worked, not by direct connection of the feet with the treadles, but by the hands and feet both, through the medium of connecting rods between the cranks and a walking beam. The reach supporting the seat is hinged to the lower end of an upright pivot secured in a yoke at the top of the forked brace, the lower end of which are boxes for the reception of the ends of the driving-wheel



SOULE'S SIMULTANEOUS-MOVEMENT VELOCIPEDE.

axle. This arrangement allows the wheel to be guided to the right or left, and also to be projected under the seat of the rider, or further in front. By this arrangement, when great speed is desired and the state of the road will permit, the rider may bring the wheel directly under him, and in descending grades he can project it in front to guard against the danger of being thrown over. In order to secure the wheel in either of these, or any intermediate position, a sector, notched on its upper side, and forming a portion of the reach, passes through a slot in the yoke, and a spring catch fits into the notches to hold the wheel and reach in the relation desired.

The inventor claims as advantages over the ordinary two-wheeled vehicle, that it is easier balanced, when in motion, can be propelled at a higher rate rate of speed with the same amount of exertion, and can be driven over any ordinary road passable for other vehicles.

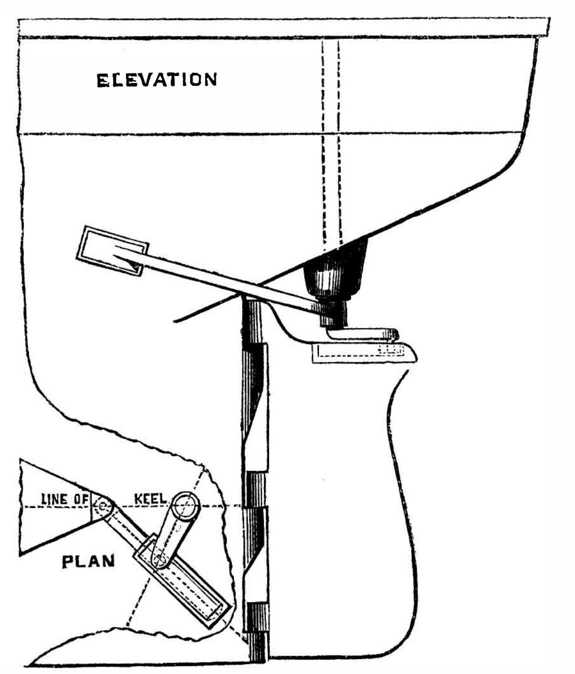
Patent now pending through the Scientific American Patent Agency. Further information may be obtained by addressing the inventor, L. H. Soule, Mt. Morris, N. Y.

Prof. Alonzo Jackman, of the Norwich University, Vermont, claims that he originated the idea of an ocean telegraph. In proof of this he republishes an article from his pen, published in the Vermont *Mercury* in 1846.

New Method of Working Ships' Rudders.

A correspondent of the London *Engineer* furnishes that journal with the following, which we transfer to our columns:

"I beg herewith to bring to your notice a new kind of rudder for seagoing vessels, or rather a new method for working the rudder. With the common rudder the greater the angle of divergence from the line of the keel the more power is required to bring the rudder into that position. With large vessels this power is something enormous, and we have lately seen in the letters from Mr. Reed that the rudder of the



Minotaur requires the united exertions of seventy-eight men to put it hard over when at full speed. To avoid this the balanced rudder has been used, and with evident advantage as regards the reduction of power required to work it. But the balanced rudder and its post have to stand considerably more strain and stress than the common rudder, inasmuch as the full force of the waves is exerted against a nearly unyielding surface held in position by the upper bearing and the lower footstep. This latter is generally carried either by a projecting spur or on a framing securely fitted to the stern, and naturally throws great strain on the latter, is liable to being damaged, and awkward to get at. In fact the lower footstep has always been the stumbling-block against the application of the balanced rudder, which otherwise would, no doubt, long since have been more generally adopted. My improved rudder, as shown in the accompanying tracing, is designed to combine the advantages of both the common and the balanced rudder without their attending drawbacks.

"The rudder is suspended from the stern-post in any of the ways usual with the common rudder, but it has no rudder-post or spindle. A little behind the hinge, at a distance varying with the size of the rudder, an upright shaft or spindle is fixed, reaching to within a little of the rudder-blade, and carrying at its lower end a strong crank arm or lever with a pin provided at its outer extremity. The upright spindle is supported by a strong bearing near the crank, the upper end being connected to suitable steering gear. At the upper edge of the rudder a groove is provided, in which the crank pin can be made to slide. As the spindle is turned to the right or left, the rudder follows the movement of the crank to a less degree, diminishing in amount as the angle of divergence increases, until, when the rudder is hard over, the crank in plan stands nearly at right angles to the direction of the rudder.

By this arrangement the leverage of the strain transmitted through the crank arm from the rudder to the steering gear is reduced as the angle of the rudder with the line of keel increases, and the dimensions may be chosen in such a manner as to cause very little variation in the strain on the gearing during manipulation. In my sketch the rudder is shown making an angle of 45 deg. with the keel, and in practice the crank will be placed so as to allow the rudder to swing back into its original position when released. This way of working the rudder has also the eminent advantage of being easily fitted to existing vessels, in which case the rudder-post may be retained as a provision against accident. I need hardly add that the arrangement shown in my sketch represents only one out of a great many varieties in detail which may be adopted to suit circumstances. If you consider the foregoing sufficiently novel to merit your attention, I shall be obliged by insertion in your next issue, for which please accept my thanks in advance."

London. Joseph Bernays.

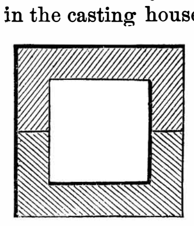
M. Friedel has just discovered that siliciureted hydrogen gas is entirely decomposed by the electric spark, giving rise in the eudiometer to a shower of a brown amphorous silicium.

CAST-WELDING OF STEEL AND IRON---A NEW COMBINATION RAIL.

Not a few important improvements in the art of construction have been effected by using old principles in a new way; and it does not appear that those who thus divert the ideas of others into novel channels, deserve less credit than more original inventors. Success is, after all, the popular test of inventive skill; and as an invention fails or succeeds, so will the voice of public opinion award praise and wealth on the one hand, or oblivion on the other, to the producer. A short time since an apparently novel, and certainly ingenious application of an old principle to a new purpose was brought under our notice in Sheffield. Whether the idea involved is or is not absolutely new, we shall not pretend to decide. Certain it is, that if as successful as it promises to be, the invention will effect a considerable advance in the manufacture of rails, and therefore we have no hesitation in bringing it prominently before our readers.

For very many years attempts have been made, from time to time, to produce a rail which shall have a hard table and a comparatively soft and ductile web and foot; such a condition would obviously best be complied with by a rail, the table of which would be of hard steel, while the web and foot would be of iron. Nearly all these attempts have resulted in failure. Dodd's rails, the upper tables of which were converted by a species of cementing or case-hardening process, have not become popular; either because the process of converting was uncertain in its results, or the cost was greater than the result was worth. Steel-topped rails, made by welding the steel top to an iron bottom failed, because, under heavy work, the steel invariably peeled away from the iron, unless the weld were carried into the web; and even then only puddled steel, little harder than some varieties of iron, could be used. No one, so far as we are aware, has attempted to weld cast steel to an iron web by hammering or rolling. The cost, including wasters, would be enormous, and the difficulty of securing a perfectly sound weld over miles of bars insuperable. It follows that rails, as now made and generally used, are all iron or all steel, or of the compound type used by Mr. Ashcroft on the Charing Cross line, in which a steel top and web are secured between wrought iron angle flitches by cross bolts. We have recently examined rails with cast steel tops made at Sheffield by, as we have said, a new application of an old process, which bid fair to solve a difficult problem. Too few of these rails have been made to enable us to pronounce the process a complete success; but bearing in mind the very imperfect nature of the experimental appliances by which they were produced, the results have been very satisfactory; and as new furnaces and plant are being put down to test the principle thoroughly, we shall soon be in a position to pronounce a positive verdict on the subject, one way or the other.

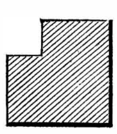
The process of manufacture is excessively simple and may be explained in a very few words. An immense number of cutting blades, for shearing iron, slicing tobacco, carpenters' planes and chisels, wood-turning tools, etc., are made every year in Sheffield, in which a very moderate quantity of cast steel, of the best quality, is secured to anything rather than a moderate quantity of, it may be indifferent, iron. Popularly, it is thought that the steel is united to the iron by welding under the hammer; but this is contrary to fact. The cost would be too great, and the weld might or might not be good. A far more elegant system is adopted. Let us suppose that a heavy steeling for a pair of shears is required. In producing this, an ordinary steel ingot mold is taken, and set up on end in the casting house. The mold is made of iron, rectangular



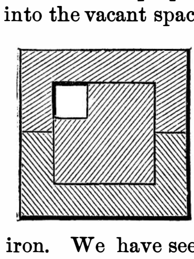
in section, and in halves, secured together by bands and keys. For convenience, we give here a plan of the mold, looking down it from the top.

A pile of scrap iron is heated and forged under the hammer. Its weight may be anything, from 30 lb. or 40 lb. to 2 cwt. or 3 cwt., and in section its shape is shown in the cut next below.

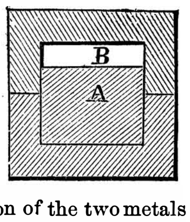
This pile or bloom is about the same length as the mold. A short time before the steel pots are ready to be drawn, the pile is heated, in a proper furnace, to a bright red heat. It is then brought quickly to the casting house and placed in the mold. The whole, then, is in cross section, as in the third cut. Melted cast steel, in proper quantity, is then poured



into the vacant space, and the result is that the steel unites so soundly to the iron, the surface of which



it partially fuses, that it is difficult to tell, on making a cross section, where the iron begins and the steel leaves off, to the one sixteenth of an inch. The ingot may then be reheated and worked into any required form by rolling or hammering, the steel always reducing in a given ratio with the iron. We have seen combination ingots, consisting of some 4 cwt. of iron and 1 cwt. of steel, thus made with perfect success. This is the principle which has been applied by Mr. E. Gray, of the Moscow Works, Sheffield, to the manufacture of steel-topped rails. He places within an ingot mold, of the required size, a heated pile of iron, A, and he fills up the vacant space, B, with fluid cast steel. From personal inspection of numerous



samples, we have ascertained that the union of the two metals is perfect. No subsequent rolling or hammering will separate them.

In converting this ingot into a rail, it is passed through rolls in the usual way, but care must be taken to drive the mill as though it were working altogether on steel. If the pile is highly heated, and the rolls are run quickly, the steel will behave precisely as cast steel always behaves under such conditions; it cracks and splits, and breaks up along the edge of the table. If the pile is moderately heated, and the rolls run slowly, and with an easy draft, the steel works perfectly, and a rail results, which, judging from inspection, leaves nothing to be desired. We need hardly add that, should the process be as successful as the inventor—in our opinion reasonably—believes, a rail will shortly be introduced to the public which will be superior to any other now in the market, possessing, as it will, that combination of hardness and toughness most desirable and most difficult of attainment. The process, it will be seen, was applied to other purposes than the manufacture of rails nearly thirty years back. It is, of course, possible that difficulties may arise, which even the practical steel worker—and Mr. Gray has been working steel all his life—cannot foresee, which will defeat the success of his process. But it is not easy to understand in what they will consist, and we are, upon the whole, justified, we think, in regarding Mr. Gray's invention as one full of promise, and likely to lead to very important results.—*The Engineer.*

PROGRESS OF THE VELOCIPEDE.

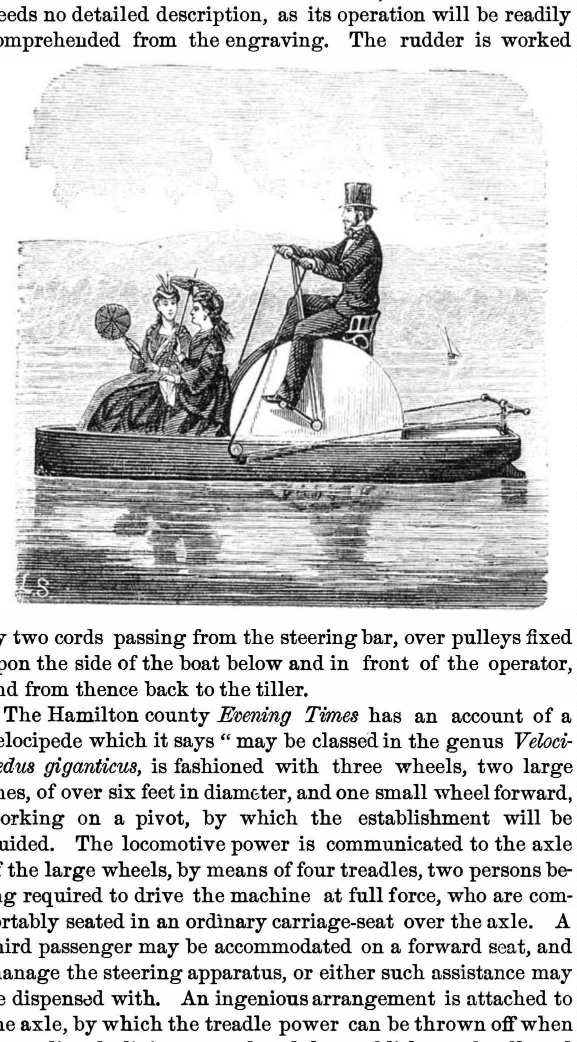
We are in receipt of several communications relative to the construction of roadways for velocipedes. Among the most feasible of these is one from an Albany correspondent, who recommends a way consisting of a single plank in width, laid so as to be nearly or quite level with the ground, one on either side of the street, so as to permit of travel both ways. The plank need not be more than an inch and one-half in thickness, cleated in the back to prevent warping and springing.

Another suggests rails, the wheels of velocipedes to be flanged, a plan, which, with some modifications, has been proposed in England. Indeed, an application for a patent on a velocipede railway, has been made to the Lord Chancellor of England, of which the following is a description: One single line of rail is arranged in the middle of the roadway. The rolling stock is constructed with four bearing wheels, with double flanges, all in one line in the middle under each carriage, instead of having bearing wheels placed on each side. Traversing screws and gear are employed for shifting the wheels laterally, relatively to the body of the carriage, until the load is perfectly balanced on the wheels. The perpendicular position is still further preserved by the addition of one or more wheels on each side of the carriage, so arranged by working in slots, as to run freely upon the road without bearing any part of the weight of the carriage, except when the carriage inclines to one side or the other.

Another correspondent suggests the Croton aqueduct, from the Westchester side of Harlem river to Central park, in New York city, as a grand "boulevard" or highway for velocipedes; the top of the aqueduct to be covered with Nicolson pavement, having a strong and ornamental rail on each side, with a low central rail to divide the up and down travel.

We regret that, delightful as would be such a velocipedal Utopia, the expense connected with the scheme compels us to pronounce it impracticable.

We give herewith an engraving of a water velocipede, devised by a Boston inventor, which is a very neat device. It needs no detailed description, as its operation will be readily comprehended from the engraving. The rudder is worked



by two cords passing from the steering bar, over pulleys fixed upon the side of the boat below and in front of the operator, and from thence back to the tiller.

The Hamilton county *Evening Times* has an account of a velocipede which it says "may be classed in the genus *Velocipedus giganticus*, is fashioned with three wheels, two large ones, of over six feet in diameter, and one small wheel forward, working on a pivot, by which the establishment will be guided. The locomotive power is communicated to the axle of the large wheels, by means of four treadles, two persons being required to drive the machine at full force, who are comfortably seated in an ordinary carriage-seat over the axle. A third passenger may be accommodated on a forward seat, and manage the steering apparatus, or either such assistance may be dispensed with. An ingenious arrangement is attached to the axle, by which the treadle power can be thrown off when descending declining ground, and the establishment be allowed to run by its own momentum.

It thinks that gigantic velocipedes may be immediately constructed on this principle, with wheels from twenty-five to thirty feet in diameter, to supersede those old-fashioned abominations, the ordinary stage coaches, and to be propelled by the passengers themselves.

The number of velocipede halls in New York and Brooklyn is now about thirty, and "still they come." Most of them are schools of instruction, where, for a moderate fee, the most awkward individual in existence, can be taught the management of the erratic, but not untamable, iron steed.

An important fact was elicited at a recent display of velocipede riding on Clinton street, Brooklyn, and that is, that the large wheeled velocipedes ride easier and go faster than the small wheeled machines, even when the latter are ridden by the best riders. Another important fact, developed by the experiment, is, that an effective brake on the hind wheel is positively necessary. We have not yet seen a brake which had enough iron to cover the tire of the wheel with. All those now in use scarcely have an inch of iron surface to bear on the wheel, when four times the amount would not be too much. The leather thongs, too, connecting the brakes with the guiding arms, should be replaced by the wire cord, as it is absolutely necessary that the brake cord should be made of material that will not give way.

A slight grade affects the progress of the small-wheeled velocipedes considerably, an effort being required to propel a machine from Atlantic street to Montague, while, on the other hand, a man can start from Montague street to Atlantic, and go all the way without using the treadles or putting his feet to the ground. The rule is, that the larger the wheel the easier a grade is ascended. It was decided by a unanimous vote that good spring seats were requisite on the Nicolson pavement.

A noteworthy feature of the display was the fact that not a solitary horse shied at the velocipedes, much to the disgust of the old fogies, who had prophesied that bicycles would lead to endless accidents from frightening horses in the street.

As some physician of this city has been publishing a sensation statement about certain injurious effects likely to occur from the use of the velocipede, the following from a leading practitioner may serve to counteract any fears that may have been created in the minds of the timid. He says: "I look upon this mode of exercise with this physiologically constructed machine, as one of the most brilliant discoveries of the nineteenth century; the grand desideratum that will emancipate our youth from muscular lethargy and atrophy that are so common."

The *Ironmonger*, an able London periodical, thus speaks of the utility of the velocipede: "Recognizing, as we do, in the velocipede a positive addition to the locomotive powers of man, we feel justified in again recurring to the subject, more particularly with the view of placing our readers *en courant* with what is being done to meet present requirements. Since our last issue new evidences have been presented, that, although England has been slow to follow the movement in France and the United States, a general demand is springing up, so much so, indeed, that our velocipede manufacturers experience already the greatest difficulty in supplying orders. We hear of Sheffield and Birmingham houses being engaged to fulfill the orders of London manufacturers, while velocipedes are being daily imported from France. Already West-end and City clubs are forming; and if there is no intention, as in France, of seating professors of the noble art of 'velocipeding' in the chairs of colleges, there is every prospect that large training schools will shortly be opened. Nor is this remarkable; the velocipede is already recommended by convenience, utility, and economy."

To this may be appropriately added the statement of the *Velocipedist*, for March: "The shipment of velocipedes from this country to England has commenced; the Inman steamer of Saturday last took a 'Pickering' machine, which is to be followed by others as soon as completed."

We have received the following communication:

MESSRS. EDITORS:—There is to be erected here a large rink, and the committee desire to be informed where rubber tire can be procured and put on to velocipedes. If you will be kind enough to refer us to some one who can do it, you will very greatly oblige a subscriber to, and an admirer of the SCIENTIFIC AMERICAN. GEO. A. COLES.

Middletown, Conn.

Having referred this communication to a prominent rubber manufacturer, we were informed that he knew of no place where these tires could be obtained. Every velocipede manufacturer in the country is trying to get this done, but none of them have as yet succeeded. It is a difficult job to do.

A Silk Community in California.

The latest and most novel idea in the silk culture is Mr. D. F. Hall's embryo "silk community." According to the Los Angeles *Star*, Mr. Hall has bought a large tract of land, forming part of the San Jose Ranch, about thirty-two miles east of Los Angeles. He proposes to lay off the entire tract, which is two miles and a quarter one way, by one and a quarter the other, into blocks and streets of suitable dimensions, for the convenience of the residents, and offer it for sale to actual settlers. The blocks will be forty acres in size, to be subdivided into lots of from one to ten in size. Ten-acre lots will only be sold to those who will make improvements thereon.

"There are certain benefits to be derived from a settlement of this kind, entering upon and making a specialty of the silk culture, that will particularly commend themselves to those wishing to enter the business, and particularly immigrants from the densely populated countries of Europe. For an extensive cocoonery, but a comparatively small quantity of land is required, as it is computed that seventy-eight tuns of mulberry leaves will produce one million cocoons, and that three acres planted in mulberries will yield ninety tuns of leaves. Upon this basis a ten-acre lot will be ample for producing three millions of cocoons, leaving sufficient spare grounds for buildings, fruit, and flowers, without which, no place is fit to be called home. By this small subdividing, the community will have all the enjoyment of suburban life, with the benefits of churches, schools, lyceums, libraries, etc., etc., all of which are the necessary adjuncts to an enlightened, prosperous, and happy community."

Correspondence.

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

Power of the Crank.

Messrs. Editors:—Your correspondent, J. W. H., on page 151, current volume, asks some questions in relation to the effective force of steam, at a given pressure, when applied at different points on the crank.

These are no new questions. Almost every mechanical student, at some point in his investigations, takes a tilt at the crank. When this attack is made with courage, and pursued with sufficient energy to really test the mettle, and bring out the qualities of this cranky old veteran, the valiant student surrenders, and embraces the ugly monster—the abrupt angles become lines of beauty, and no amount of argument or urging can induce him ever again to renew the attack.

I have thought that much of the mystery which envelops the movement of the crank, is thrown around it by the foggy explanations often given by our teachers. We are told of the "leverage" of the crank. We are lectured about levers of the "first power" and of the "second power," of "third and fourth powers." All such numerical terms applied to the levers and to the crank, tend to mystify rather than to elucidate the principles of their operation.

As a mechanical device, the crank is governed by the great laws that underlie and govern all mechanical devices. In transmitting motion, or power, it communicates just what it receives—no more, no less. It does this equally and exactly at all points, as well when in a line with the reciprocating mover, or when at right angles to it. To comprehend this truth, we need no harangues about the numerical powers of levers, but we must understand that to constitute a power, that is, force producing motion, two elements or conditions are requisite: First, an inclination to move; and secondly, space, or distance through which to move. The sum of these two conditions, is the measure of the power. Neither the one nor the other condition, alone, can exert any effective force.

In the steam engine, we have, as the first element of power, the pressure of steam in cylinder. This pressure is a tendency to move in all directions; but while it is held motionless behind the unmoved piston, it is mere statical pressure, and is no more a power than the cohesive strength of the iron that holds it is a power. When the piston moves, then the pressure becomes dynamical, and we have a power. Then if, as J. W. H. suggests, the pressure is 4,000 lbs., and the distance moved two feet, we have 8,000 foot-pounds; but if the distance moved is but one inch, the power is $4{,}000 \div 12 = 333\frac{1}{3}$ foot-pounds. And it must be carefully borne in mind that this is not only the measure of the power given off by the crank, but that it is also the exact measure of the power exerted by the steam.

I have said that the crank gives off at all points, the whole power that it receives. Of course the whole is not given off as effective work. Like all other devices, the crank must pay a tax to friction, and whether that tax is more or less on the crank than on other movements, is not what I propose now to consider. But the working of the crank, apart from friction, is the question.

J. W. H. complains that the crank gives no power "at either of the dead centers." Does it receive any at the dead point? While the piston stands still, does it cost anything? If, then, no power is expended on the crank at these points, none should be expected from it. But let us consider, for a moment, what is the effect when the piston moves forward.

We will take the engine as J. W. H. proposes, 24-in. stroke, 50 inches of piston area, with 4,000 lbs. pressure. When this piston has advanced one inch, the crank pin has passed nearly five inches, and has reached a point where the 4,000 lbs. on the piston will amount to 1,500 lbs. on the wrist. Now, if we carefully compute the pressure upon each inch of this arc, we will find their sums to make 4,000 lbs. raised one inch, or $333\frac{1}{3}$ foot-pounds. While the piston is moving the second inch, the crank moves about two inches; but a computation of the pressure on these two inches, will gives us $333\frac{1}{3}$ foot-pounds as before. Near the point of half-stroke, the piston and crank pin move in nearly the same line, and the pressure upon them is about equal; but here, while the piston travels one inch, the crank travels but one inch also, and as it has here but the 4,000 lbs. pressure and one inch travel, it gives still but $333\frac{1}{3}$ foot-pounds. We might follow this, inch by inch, through the whole stroke, and show that wherever the pressure is nearest to the line of travel of the crank, the movement of the wrist is least, and where the pressure is most indirect, the motion of the crank is greatest, so as to make the pressure and distance together, exactly equal at all points. The pressure on the piston being constant and equal to 4,000 lbs. per each inch moved, while that on the crank varies as the line of motion varies from that of the piston; but the distance traveled by the piston is everywhere just as much less than that of the crank as the pressure on it is greater.

Now if J. W. H. will take the distance traveled into the calculation, he will obtain the solution to his problem. He asks, "What number of inches of piston area will equal the above (the fifty inches as just considered) if applied six-sevenths of the entire circle, under same pressure of steam and same leverage of crank." About 37·5 inches of area would be equal in pressure to the fifty on the crank, but the travel, to make six-sevenths of a 24-inch circle, would be, in round numbers, 64 inches. With his arrangement, J. W. H. will have 37·5 inches area and 64 inches length; hence, will use $37{\cdot}5 \times 64 = 2{,}400$ inches of steam per revolution. With the crank, the travel of piston is 48, and the area 50 inches. Hence, $48 \times 50 = 2{,}400$ inches—exactly the same in both cases.

However much the friction may be lessened, or the motion regulated by applying the power regularly in the line rotation, it is clear that, apart from these, no power can be gained.

Keokuk, Iowa — E. S. Wicklin.

The Dynamic Lever.

Messrs. Editors:—The "Dynamic Lever" man, who furnished the article at page 165 of your last number, signed F. R. P., has a kink in his brain which needs to be straightened out only for the purpose of saving him from wasting his thoughts upon a fruitless inquiry, but your columns from being further occupied with it.

He says, referring to the diagram which accompanies his article, there is a force of 70 lbs. at C in the direction of the motion of the boat, and that this force will propel the boat against a resistance of 70 lbs. Now, if this were true, under the circumstances, which he defines, we should have no further use for balloons and flying machines, since every man could at his pleasure, lift himself into the air by the waistband of his pantaloons.

As in celestial mechanics, the mutual actions and reactions of the bodies of a system have no effect upon the motion of the center of gravity of the system; so in terrestrial mechanics the mutual action and reaction between the connected parts of a structure have no effect to move the structure.

F. R. P. overlooks the fact that while there is a forward force of 70 lbs. at C, there is an equal and opposite reaction at the same point, and that these equal and opposite forces being both received upon the connected parts of the same structure neutralize each other, just as the upward draft upon the waistband of the pantaloons is neutralized by the down ward draft upon the hands. The point, C, is not the place where we are to find the force that propels the structure, but the point, B, where one of the equal and opposite forces is received upon matter which forms no part of the connected structure. There the force is 10 lbs., and it is capable of moving the boat against a resistance of 10 lbs. only.

These considerations, which are so simple and obvious that it would seem they could hardly need to have been presented, cover all cases of "dynamic levers" whether found in animals or elsewhere. — B.

New Haven.

Manufacture of Glass by Rolling.

Messrs. Editors:—I notice an article by Mr. C. Boynton, in your number for March 13th, under the head of "Window Glass," in which he asks "Why a pot of glass cannot be drawn out into sheets, as well as a continuous sheet of paper? and also asks, "Who is there that has capital, and spunk enough to try the experiment?"

In reply I would say that about twenty years ago Messrs. Chance Bros. & Co., of Birmingham, England (the largest window glass manufactures in the world), erected extensive works in London, for experiments in passing molten glass through two rollers (a patent for which had been obtained by Mr. Bessemer). After trying everything that ingenuity and skill could conceive of, it was found impracticable. Probably as much as £100,000 was expended in carrying on these experiments. The object of these trials was to make sheets of glass free from the undulations which are always presnt on the surface of blown window glass. Even had they been successful in rolling out the sheets, nothing would have been gained, as the surface of the glass would have been almost—if not quite—as undulating as the blown glass. This is apparent to any one who has seen the casting of plate glass, or to any one who will examine the smooth surface of a sheet of rough plate glass. The smooth side is the one over which the roller had passed, and which presents a very uneven surface. Did it pass between two rollers, of course both sides would be the same. To overcome the great defect in window glass, viz., the undulating surface, Mr. James T. Chance, one of the above named firm, invented ingenious machines for grinding and polishing such thin glass, after which process it is equal in effect to the expensive plate glass.

I believe it to be an impossibility to make sheets by passing the smelted glass between two rollers, and any one practically acquainted with the manufacture of glass, would, I have no doubt, agree with me.

Many reasons might be given showing its impractibility, were it worth while to mention them. I trust after reading this statement, Mr. Boynton may not think that it "seems to him to be a disgrace to American inventive genius that they have not accomplished that which is impracticable."

Geo. F. Neale.

Lenox Furnace, Mass.

A Problem for Inventors---Plow Wanted.

Messrs. Editors:—Possibly some of your readers—inventors—could invent or adapt a "breaking and turning plow" for our tough, heavy, and adhesive black and red lands, which—in consequence of the treatment they annually receive—require every spring to be as thoroughly "broken up," as they were when first reduced to cultivation. The treatment referred to, is that of pasturing all kinds of stock upon them after the crops are gathered, and during the winter, for scarcely any one, however practical, can refuse his stock the benefits of the luxuriant pastures which succeed our crops. Hence, they become greatly consolidated and indurated, requiring "re-breaking" every spring, and also, with the species of plows used, a much greater amount of horse or ox power than would be needed, were our plows exactly adapted to the work. As illustrative of the resistance these compacted soils present to the plows used, may be mentioned the fact that it requires four yoke of oxen to draw a Satlee gang plow of two plows. Yet these same lands, when properly broken up and submitted to the action of rain and sunshine, become so loose and mellow, or friable, as to be worked very easily the remainder of the season. All of the plows adapted to your light loamy lands present too much resistance in "breaking up" our heavy ones. They are too short and bluff up too much, and we are compelled to have manufactured locally, at much greater cost, a long plow with a wooden mold board, called a a "carey;" but this plow, better for the purpose than those imported from Northern manufactories, does not come up to the kind needed. The inventor should come and see the land in the condition it is when being broken up in the spring, in order to form a correct idea of the plow needed. It may be stated, that the plow that our heavy soils require, should be long, going into the land like a wedge, to which the resistance would be gradual and be distributed along the entire line of surface. Such a one as some agricultural writer describes as being used in the heavy stiff clay soils of Scotland. Some or the "carey" plows mentioned do fit the want, but as they are made, each one to the fancy or taste of the various makers, there is no certainty of the plow proving what is wished—so a cast or molded plow is needed.

A plow of the kind indicated, would, I am persuaded, upon due exertion and demonstration before our farmers, come into general use, and insure to to the inventor large demand and profits.

I am secretary (corresponding secretary) of the Montgomery county (Texas), Agricultural Society, and am authorized to write, etc., in its name, and so take the liberty of addressing you this letter.

C. B. Stewart,
Cor. Sec. Agricultural Society.

Montgomery county, Texas.

Transmission of Power---An Ingenious Device.

Messrs. Editors:—I have given the subject of compressed air much study and attention for the past few years, and have made some practical applications, hence, I watch with much interest the progress made by others in its application to various useful purposes. I saw a few days since a very ingenious application of compressed air as a means of transmitting power to the point where it was to be used, and, at the same time, admitting of a motion perfectly free in any direction. The device alluded to was operated by a dentist of this place. It was a rotary engine on a very small scale. The compressed air to propel the engine was furnished by a small foot bellows, which was double-acting, being two common bellows joined together. It was twelve inches long, by seven wide, and two and one-half inches high, and was operated by the dentist without inconvenience. The engine was run at a very high rate of speed, which I have since seen tested, and also the power. The speed attained, when running, at about the usual rate, was four thousand per minute, by actual count, by means of two pairs of watch wheels, which reduced the motion sixty times. It raised a weight of one and one-half pounds over a pulley of one-fourth of an inch in diameter on the engine shaft. The air was conducted to the engine through a one-fourth inch rubber tube. It was evident that the friction of this little instrument must be very small, else the power would have been absorbed at that very high motion. The instrument was used to rotate small burrs to dress out and undercut the cavities in teeth before filling them, and to dress off the foil after filling. It also had a reciprocatory attachment for operating a small saw or file to cut between the teeth. The same motion was used for polishing. The engine formed a part of the instrument, and the whole together weighed but eight and one-half ounces. The dentist claimed that he could accomplish as much, by the use of this instrument in two minutes' time, as would have taken him one hour in the ordinary way. The applications are very numerous where this mode of transmitting power can be used with equal advantage and that too without the use of any gearing or belts to produce the motion desired. There are some other points which occur in the application of air to mechanical purposes to which I would like to call the attention of practical men. One is the construction of valves in the various pneumatic instruments. The principles which govern their operation do not appear to be generally understood. The same is also applicable to steam or gas under similar circumstances. The valves to blacksmiths' bellows are quite often at fault. I have known instances where the power required to operate the bellows of the same dimensions would vary one hundred per cent simply from the difference in the construction of the valves. A good illustration of the principles governing their operation may be had in the following experiment: Take a piece of board planed smooth on on one side, and bore a hole through it of suitable size to receive the end of a piece of rubber tubing from the under side of the board, not so large but that you can blow a sharp blast of air through it. Then take a common business card, punch two holes through one end of it, place the center of the card over the hole in the board, and stick a pin through the holes in the card into the board to prevent the card from moving sidewise. Now take the other end of the tube in your mouth and blow strongly. It will be found impossible to raise the card from the board, no matter how good a blower the experimenter may be. If not satisfied with this, and it is desired to try a higher pressure, the tube may be attached to a steam boiler, using a piece of rubber packing in place of the card, the result will be the same, except that the noise occasioned by the steam passing through the shallow space allowed will be much louder. I have tried the last experiment with a pressure of sixty pounds of steam. The steam or air will get out from under the card, but its passage will be very much obstructed.

In the construction of the valves to the various kinds of bellows and other pneumatic appliances, the evil consequences resulting from the above-mentioned cause may be obviated by raising the valve seat a half inch or more for large valves, and making the edge of the seat quite narrow. Another mode of exhibiting the same law may be seen by placing a piece of newspaper over a concave space three or four inches long, and from one to two inches deep. Then, by means of a small tube or gas pipe, direct a sharp blast of air through the concave space under the paper, which space should form something like a half circle. Hold the end of the tube about one inch back from the end of the space. If the blast is sharp enough, the paper will be at once drawn down very near the bottom of the space, leaving but a very narrow place for the air to get through under the paper.

I could add much more on the subject, and also give my version of its philosophy, but I am aware that my article already calls for more space than may be thought proper to give it. P. ANDERSON.

Kalamazoo, Mich.

Gold Leaf a Protection from Sunstroke.

MESSRS. EDITORS:—In No. 11, current volume of your journal, I notice among your list of recent patents, a patent for a "safety hat," the object of which is, to protect the head from the sun's rays by means of an absorbent of moisture, such as sponge, inserted in a double crown.

This object, it appears to me, may be attained more readily and scientifically, by following the suggestion of Prof. Walker, of Washington College, at Lexington, Va., whose idea is based upon the following experiment of John Tyndall, before the Royal Institution:

"It is wonderful what a slight and trivial thing will be sufficient to prevent the absorbtion of radiant heat. I have here an exceedingly instructive substance. It is a piece of paint * * * * a portion of which is coated with gold leaf, and though the gold leaf is infinitesimally thin, it has been competent to protect the surface of the paint from the action of radiant heat to which the whole thing was exposed, while the other part of the surface, which was not covered with gold leaf, has become blistered.

"I have here a sheet of paper covered on one side with iodide of mercury, a substance which has its color discharged by heat. On the other side of the paper there are certain figures represented by a thin coating of metal. I place the iodide of mercury side downwards, and over the other side I will hold a hot spatula which will radiate heat to the surface of the paper. Where the thin coating of the metal is, the heat will be rejected, but where the paper is not coated the heat will be absorbed and then it will reach the iodide of mercury on the other side and destroy its color." The experiment was successfully performed.

Professor Walker suggests that a thin coating of metal worn in the hat, would prevent the passage of the heat rays, and thus prove a protection from sun stroke. He finds that gold leaf applied to bobbinet and protected by silk illusion, or another fold of the former material, answers best, without inconvenience in weight, liability to tear, or stopping the aqueous evaporation from the head. G. W.

[The cheapest and best thing to do in summer is to put a cabbage leaf in the hat.—EDS.

Bread Again.

MESSRS. EDITORS:—Please accept our warmest thanks for the very good recipes and hints yon have given on "bread making." "The staff of life," is certainly a subject worthy every lady's attention. If any of your lady readers wishes to read more upon the subject please give this "one more" recipe for their benefit. There are some families that must, and will, have warm biscuit every morning and evening, to such I say all that is necessary is to keep a jar of "bread sponge," made as thick as stiff batter; a quart of this and one teaspoonful of baking soda stirred stiff with flour so as to be molded, makes excellent biscuit for breakfast or tea. To renew the sponge every day, take one cupful of hop water or hop tea, three cupfuls of flour, three cupfuls of boiling water, one teaspoonful of salt, two teaspoonfuls of sugar and three teaspoonfuls of butter or lard, and after stirring all together pour into the jar to replenish it. The jar should hold at least twice or three times the quantity that is daily used out of it. H. B. M.

Extinguishing Kerosene Lamps.

MESSRS. EIDTORS:—I see in your paper many plans proposed for extinguishing kerosene lamps, all of which may be good, notwithstanding which, I send you a plan which I have adopted, and one I think perfectly safe, viz., turn the wick down until it is out, then turn it up ready for lighting. There is in this no danger from blowing "up," "down," or "across the chimney." C. LEAVITT.

Windsorville, Conn.

Contents of a Cylindrical Vessel in Gallons.

MESSRS. EDITORS:—On page 182, of present volume of your paper I notice a method for finding the number of gallons in a cylindrical vessel, communicated by M. T. St.——

The following method requires much less work, and is more accurate: Find the product of the square of the diameter, the hight, and 34. Point off four places from the right of this product and we have the contents in gallons to great accuracy.

Salem, Ohio. M. C. STEVENS.

Absinthe.

It appears that until 1864 the belief that there was nothing injurious in absinthe except the alcohol, was general enough. In that year, however, a mad doctor named Marce, communicated a paper to the Academy of Sciences, in which he demonstrated that the essence of wormwood was contained in the liquor called absinthe, in the proportion of twenty grammes of essence to 100 liters of alcohol, and argued that this essence had a peculiarly injurious effect on the brain. In 1867 a petition was presented to the Senate, praying that the sale of absinthe might be absolutely forbidden. Nothing came of it; and now the "question of absinthe" has been once more brought forward by two physicians, MM. Magnan and Bouchereau, who, for the first time, have made regular scientific experiments with the questionable stuff. The object of the experimentalists was to show what the effect of pure alcohol would be on a guinea-pig, and what the effect of absinthe. With this view, they placed a guinea-pig under a glass case, with a saucer full of essence of wormwood by his side, another guinea-pig being placed under another glass case with a saucer full of alcohol. The guinea-pig, who, so to say, was being "treated" with absinthe, sniffed at the fumes, and for a few moments seemed, like the ordinary absinthe drinker, "supremely happy." Gradually, however, he became heavy and dull, and at last fell on his side, agitating his limbs convulsively, foaming at the mouth, and presenting all the signs of epilepsy. The same epileptic symptoms were manifested on the part of a cat and rabbit, who, in a similar manner, were made to inhale the fumes of absinthe.

The Tea Plant.

A current item says: "The tea plant is now successfully cultivated near Knoxville, Tennessee, on the farm of Captain James Campbell. It is a deep evergreen shrub, and grows about five feet high. It is said that it can be raised in East Tennessee with very little trouble."

About ten years ago, the Agricultural Department of the United States Patent Office, expended several thousand dollars in introducing the tea plant to this country; and rooted plants were widely distributed. They were not expected to prosper in the North; but many were sent northward for trial, merely because of their novelty. In the South they should have lived, though neglected. Two were planted in a garden at the residence of T. C. Connelly Esq., No. 630 M street, north, Washington, and, to test their hardiness, they have been wholly unprotected through nine winters. Though not large they are healthy, and are full of green leaves at this time. It is often said that cheap labor in Eastern countries affords advantages forbidding our competition with them in producing tea. To this it may be properly replied that American skill is superior to Chinese labor. A tun of tea may be dried, or roasted, in a cylinder surrounded by a "steam-jacket," with less labor than a Chinese producer expends upon ten pounds; and the finger curling and the coloring are just what American tea drinkers do not desire. The aroma of certain plants and flowers is transferred to tea in China, in the process of manufacture; but this can soon be learned in practice. That people drink pure tea, but color and doctor it for the "outside barbarians."

Yellow-Wood.

This dyestuff is the wood of a tree which grows to a hight of from fifty to sixty feet, and is a native of South America and the West Indies. Its botanical name is *Broussonetia tinctoria*. The most esteemed variety is produced in the island of Cuba, and its comes to this country in blocks of about $1\frac{1}{2}$ feet in diameter by 2 feet in length, weighing between fifty-six and a hundred and twelve pounds. It generally presents cracks and fissures in its substance, which are filled with a bright sulphur-yellow, mealy, coloring matter.

The Jamaica yellow-wood is next in value, but varies much in quality. That from Maracaibo is split into blocks of much smaller size. The European markets are supplied with this substance through the ports of the United States, Mexico, Central America, West Indies, and Brazil. The wood having been rasped into powder, the coloring matter is extracted from it by the simple operation of boiling in water. The extract of yellow-wood, or "Cuba extract," as it is sometimes called, is much used by dyers and printers in colors. It is sold in gummy lumps of a yellowish-brown color or in the shape of sirup, which is often largely adulterated by admixture of molasses. The chemical constituents of this dye are known by the names of *morin* and of *maclurin*.

Manufacture of Vinegar.

Dr. Artus has discovered a process for making vinegar from alcohol, which he says has proved entirely satisfactory. There is a very general complaint that the oxidization of spirits of wine in the vinegar process is far from complete, and that the results are not equal either in quality or quantity to what ought to be expected from the materials employed. Dr. Artus takes half an ounce of dry bichloride of platinum, and dissolves it in five pounds of alcohol; with this liquid he moistens three pounds of wood charcoal broken in pieces to the size of a hazel nut; these he heats in a covered crucible, and afterward puts them in the bottom of a vinegar vat. Here the platinum in its finely-divided spongy state absorbs and condenses large quantities of oxygen from the air by which the alcohol is rapidly oxidized. When the charcoal has been in use for five weeks it should be again heated in a covered crucible.

CARBOLIC ACID, it is stated, can be deodorized. Two parts by weight of gum camphor are mixed with one part of crystallized carbolic acid. After this compound has been well rubbed together, it is mixed with whiting, and in that form is said to be a valuable disinfectant and a good protection to furs in summer.

Philosophical Uses of the Beard.

The inhaling of metallic particles to which certain workmen are exposed, is replete with serious and lasting effects. In autopsies of persons who have died from pulmonary consumption, the lungs are frequently found filled with the substance belonging to the peculiar business which they have pursued during life. Cotton, in the form of dust, metal filings, chemical vapors, fumes of copper, arsenic, etc., are but a small number of the many substances which enter the lungs and finally destroy the lives of those engaged in such occupations. The lace weavers of Germany, and those occupied in the paper-staining factories are particularly exposed to these pernicious effects. Many temporary means have been tried to protect the artisans from such fatal consequences, but none have been found as effectual as the wearing of a beard and moustache. These and the hair which grows in the nostrils are found to be the best protection. All who have permitted their growth can testify to their efficacy in preventing the entrance of particles of dust, etc., and by a proper attention to cleanliness they will serve their purpose.

Corn Mills in Hungary.

The great mills in Pesth have nine pairs of stones, one above another, each pair set to grind more finely than the pair next above, and so the wheat, entering at the top of the mill, is roughly broken by the uppermost pair of stones, divided more effectively by the second pair, more triturated by the third pair, still more by the fourth pair, more and more finely granulated by the fifth, sixth, seventh, and eighth pairs, and finely reduced to a soft powder, flour, sharps, shoots, and bran altogether, by the ninth and lowest pair of stones. The product is precisely conformable to the views of the chemist, and, in addition, makes itself delightfully agreeable, instead of irritating, to the animal economy. Mechanically igenious, too, these mills are fitted with stones somewhat differing from those ordinarily seen in England and America. The eye, or central opening, is very large, so that all the grinding is done between the faces of the stones, far from the center, and therefore (as reason would point out) where the motion of the runner is most rapid.

Discovery of a New Mineral.

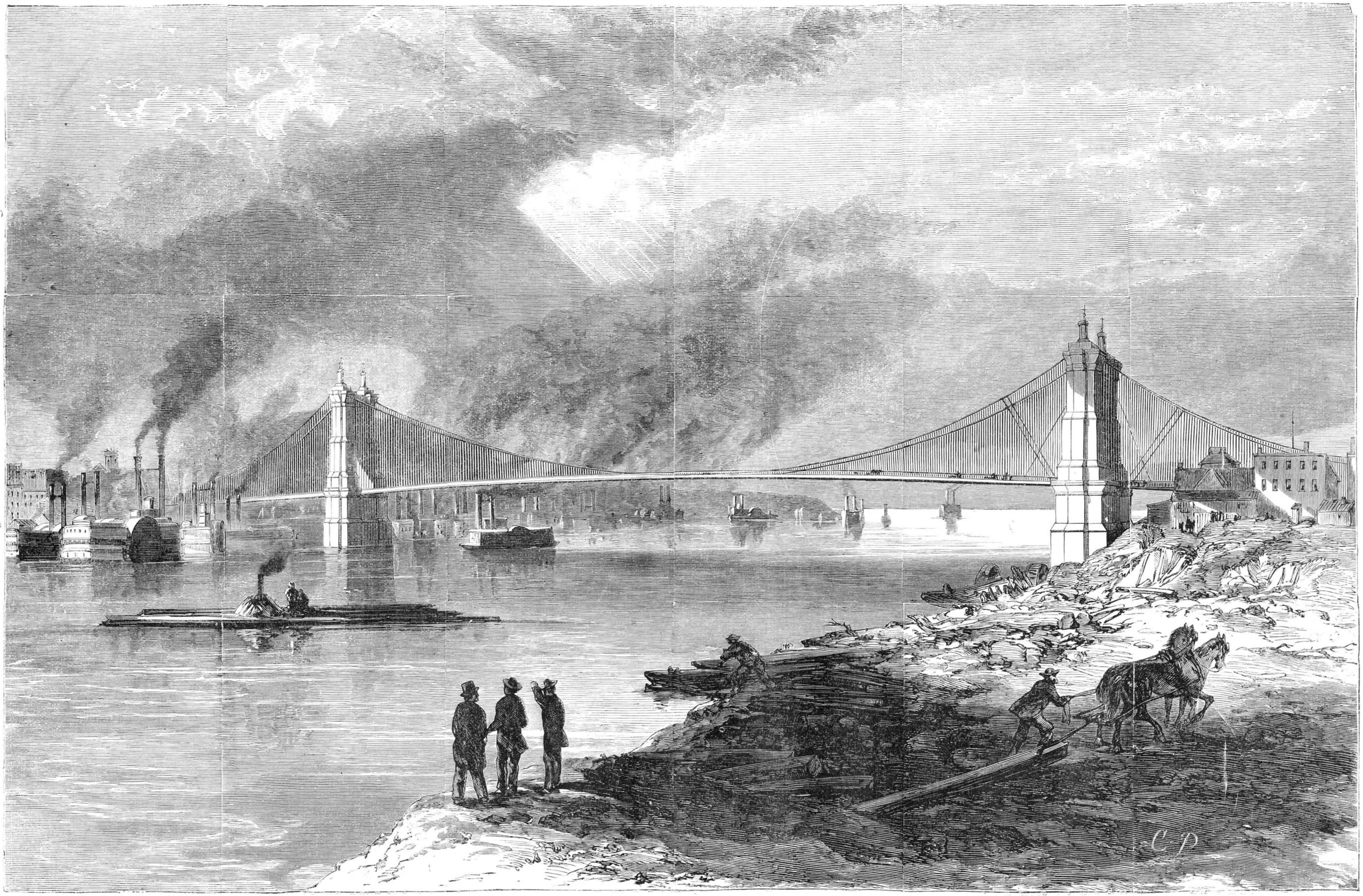
Bauxite is the name of a new mineral, which, it is stated, has recently been discovered in France. It is reported to be a hydrated oxide of alumina, in which iron has been replaced by alumina. The most remarkable peculiarity of this new mineral is the entire absence of silica, so that it does not resemble kaolin or potter's clay. Bauxite is employed in the manufacture of aluminum; it forms a soluble compound with baryta, which enables the manufacturer to obtain alumina free from iron. By fusing bauxite with soda ash an aluminate of soda is produced, which is extensively used in calico printing, and which could be employed in the manufacture of glass and of ultramarine. It is also proposed to fuse it with common salt, as a first step in a new process for the manufacture of soda ash. It is stated that a large establishment in Newcastle, England, prepares sixty tuns of sulphate of alumina every month from bauxite. They also make aluminate of soda and sulphite of alumina from it, the latter salt being of great value in the manufacture of beet sugar.

PARAFFINE WAX.—A correspondent of the *Public Ledger*, (Philadelphia), from practical experience, recommends lard and paraffine wax as the base of ointments used to dress running sores. It is stated that beeswax, the usual ingredient for giving consistency to the ointment, is melted by the heat of the body, and permits the humors to be absorbed by the linen bandages, which, therefore, in drying, adhere to the wound and cause great pain. Trouble of this kind, it is asserted, is entirely obviated by the use of paraffine wax. It may also be mentioned here, that a mixture of from one to three parts of coal tar with one hundred parts of fine plaster of Paris, well rubbed together and applied on lint, or used in a cataplasm, has a healing effect upon sores, and corrects the disagreeable odors from the suppurating surface.

IMPROVED SAFETY LAMP.—An ingenious self-extinguishing safety lamp, recently invented by M. Louis Dessens, consists in attaching to the wick holder a spring, the tendency of which is to draw it downward into the wick tube. One side of the holder, which is notched, passes through a slot in the tube, and is worked by a screw from below the oil chamber. There are a spring and pins, which permit of the closing of the lamp after it is lighted; but if any attempt be made to screw off the top, the spring is brought against one of the pins, and the unscrewing being continued, the wick tube revolves, taking the rack off the screw, and permitting the spring in the wick tube to draw the wick downward and extinguish the light.

SCARLET FEVER.—Dr. Budd, of Bristol, England, who has given a great deal of attention to the subject, recommends the anointing of the whole body, including the scalp, with olive oil twice a day, beginning when the white dry symptoms appear, commonly about the fourth day. This he declares will counteract the diffusion of the poison in the dry scurf of the skin. This is an old theory and was given many years since in the SCIENTIFIC AMERICAN.

A VALUABLE COMMENDATION.—The *Medical Investigator*, one of the most excellent of the American medical monthlies, published by C. S. Halsey, Chicago, in its issue for March speaks of us as follows: "The SCIENTIFIC AMERICAN is a journal that needs no praise. It is without a peer. It often has articles bearing directly or indirectly on medical science. We know of no better stimulus to a lethargic mind than its perusal."



SUSPENSION BRIDGE OVER THE OHIO RIVER, CONNECTING OHIO WITH KENTUCKY.---SEE NEXT PAGE

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NEW YORK, SATURDAY, APRIL 3, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

VIS VIVA AND INERTIA.

The exact import of the terms "vis viva" and "inertia," as understood by writers on physics, is difficult of comprehension by ordinary minds, and difficult to explain clearly when comprehended. An engineer of some note once remarked to us, "I know exactly what *I* mean by 'vis viva,' but I find it very difficult to tell it." We do not propose to here enter upon an elaborate discussion of the doctrines of "vis viva" and "inertia," but merely to notice some recent opinions published in the American reprint of the *London Chemical News*, and also a paper by Professor Henry Morton, on the "Resistance and Transmission of Motion," published in the *Journal of the Franklin Institute.*

Prof. Morton charges that the subject has been inadequately treated by some even of the highest authorities, an opinion with which we perfectly coincide. He says, "we say and know that 'vis viva,' or work done by a moving body, varies with the square of its velocity, while we know, by our previous reasoning, that the force expended in giving it that velocity, only varies with the velocity itself. Thus, the force of gravity will give a falling body a double velocity in a double time, during which it must have exerted a double force upon it. Here, then, we have a double force doing a quadruple work. Is this because, by some wonderful and recondite property inherent in 'velocity,' the double power has been indued with an again double efficiency? Many writers leave us to think so; but we, on the contrary, believe that the work done *only seems to increase* more rapidly than the power implied in the increased velocity, by reason of a *loss of efficiency* in the resistances, in the overcoming of which the 'work' consists, and in fact, that work in this sense, is no true measure of force."

This argument is most forcibly and clearly expressed, and is further sustained by reasoning and illustrations which evince close thought upon this abstruse subject. We would be glad to notice this able article more at length, but want of space compels brevity.

The *Chemical News* says, the statements in the works on physics in regard to "vis viva" and momentum, are in its judgment, not sustained by reason or experience. It denies that the power required to maintain a train or a ship in uniform motion, varies as the square of the velocity, and asserts that there is really no such mathematical relation, and there is no close approximation to it. It asserts, moreover, that the case of a ship is so different from that of the train, that many engineers, who strive to measure facts on a procrustean bed of simple mathematical formulæ, represent that the power required to drive a ship varies as the cube of the velocity; and and no experienced engineer will say that within ordinary limits of speed four times as much power is ever required to maintain a train at double velocity. It sums up the case by stating that as it understands the subject of "vis viva," it relates only to change in velocity, and does not apply to the maintenance of a uniform velocity after it has been once attained.

These papers are an index of the effort which thinking minds are now making to disencumber themselves of ideas originating in the old notion of occult force. The terms, "vis viva" and "inertia," were born of that notion; as their parent may be said to be at the last gasp, we say let them die also.

As soon as we shake ourselves free from these clinging errors, and discard the illogical language they have imposed upon us, we shall find our way totally unobstructed; we shall have "cleaned our path from briars." We shall have to come down at last to the simple fact that *motion is force, and force is motion*, that is, so far as the human mind is capable of comprehending force. Motion can only produce an equivalent amount of motion, and hence the only measure of an existing motion is a previously existing or co-existent motion. When we get on to this plane we have got out of the slough of metaphysics and are on solid ground.

HORTICULTURAL PROTECTION.

The proposed granting of patents for new horticultural varieties is meeting with some opposition. The *Evening Post,* in an answer to a correspondent upon the subject, arrays itself with the opposers of the measure. This correspondent, who signs himself "Præsidium," gives some quite valid reasons for granting such patents.

The *Post*, in its editorial, in discussing the subject, restates these reasons in a very uncandid manner. It says: "'Præsidium' presents three reasons for patenting garden products. First, because the author of a book has a copyright, and the inventor of a machine may obtain a patent, therefore the owner of a garden in which any plant may grow which he considers new, ought to have the exclusive right to cultivate that plant." This, after the previous remark, that "respect for the very worthy gentlemen who have devised and now support the plan, demands that both Congress and the public shall give their case a candid hearing," surprises us somewhat. What is claimed by Præsidium and all others who favor the granting of horticultural patents, is not that *because* copyrights are granted to authors, and patent rights to inventors of machinery and devisers of new chemical processes, they should also be granted to cultivators of new varieties without regard to the merits of the case. They claim, what the *Post* grants in a subsequent paragraph, that "it is true that the work of the gardener is often of a highly intellectual and scientific character. His selection of varieties for a cross, his devices in the treatment of his plants, with reference to soil, temperature, and all the varied circumstances of culture; his ready discernment of valuable modifications of every kind, and his ability to develop and strengthen them; all these require powers of a high order—powers which deserve a rich reward."

Is the *Post* ignorant that new varieties of value are more rarely produced by accident than are mechanical improvements? If so, let it study awhile the works of Darwin or Randall, and post itself in the mysteries of reproduction. It says the intellectual labor of the horticulturist, is analogous to that of the scientific investigator and discoverer, rather than to that of the practical inventor and producer. It was rather hard on the "analogies," which it characterizes as "Præsidium's stronghold," but it sees none between the work of the inventor and that of the scientific investigator. Evidently the *Post's* highest idea of an inventor is a man who whittles until he, by accident, gets his stick into a shape that suggests a possibility, and having got the idea of the possibility goes through a series of tinkering till he gets, if not what he sought, something that can be patented. Its idea of the production of new varieties is scarcely better, being, as near as we can infer from the article in question, that they can be obtained, *ad libitum*, by accident. Now any man who has grown up among flowers and fruits, and is aquainted with the laws of their growth, knows better than this. He knows also that within certain limits, judicious selection will enable him to approximate to a type previously determined upon, notwithstanding the *Post's* dictum to the contrary, and that it is as Præsidium claims, "a complete and exclusive expression of his inventive thought."

We have already expressed our opinion upon the desirability and practicability of granting such patents, and although our esteemed cotemporary deems it as absurd as would be the issuing of patents "upon mathematical processes, upon chemical affinities, upon new planets discovered by astronomers, or upon new laws of life announced by physiologists," we fail to see any grounds for so considering it. Indeed, if mathematical processes, new plants, or new laws of life, could be made to pecuniarily reward their discoverers, by the granting of patents upon them, we should be glad to see their labors thus recognized.

MECHANICAL TOYS AS A MEANS OF PRACTICAL INSTRUCTION.

He who will introduce toys with the double object of amusing and instructing will be a benefactor to the race. We are aware that many of the popular toys now in use, are based upon mechanical laws, and, in a degree, illustrate mechanical facts; but this elucidation is not a primary or principal object in their construction, and can be found generally, only by a close study or a partial dissection of the toy. It is not apparent to the casual observer; indeed, the object seems to be to conceal the mechanism and exhibit only the result, tempting the inquiring mind—one that likes to understand the why and wherefore, that "seeks to know where faith should trust"—to copy the example of the boy who burst the heads of his drum to see where the sound came from, or ripped the bellows to find the source of the wind.

From the great steam man to the flying top, from Maelzel's antomaton chess player to the pasteboard acrobats and dancers, the source of power and its modes of transmission are concealed as much as may be. Yet this is the best, most valuable, most interesting exhibition of the device. Concealment is not knowledge; mystery is not wisdom.

The zoetrope or "wheel of life" is a play upon the organs of vision, a valuable exemplification of the science of optics. As such it is amusing, and bewildering. But how valuable it would be to show the action of machinery, to illustrate mechanical movements. A machine or its parts might, by its use, be presented in actual, or rather apparent motion, showing not only the parts of the machine and their relations, but also their action. Why could not the principle of the zoetrope be extended to exhibit, simultaneously to every individual of a large audience, the movements of machinery? Certainly here is room for invention, or, at least, improvement. This toy might be made a valuable aid to impart scientific and mechanical knowledge. The lecturer who first succeeds in introducing the zoetrope to his class, or audience, to illustrate mechanical movements will inaugurate a profitable and valuable means of imparting knowledge. These suggestions are worthy the attention of our inventors.

DETERIORATION IN THE MATERIAL AND WORKMANSHIP OF MANUFACTURED ARTICLES.

We have no sympathy with those who are perpetually bewailing the growing degeneracy of the race and regretfully mourning the "good old times," but, in one respect, at least, the facts give reason for their animadversions of the present compared with the past. The honor of the manufacturer is too often made entirely subservient to his avarice. Articles of common and daily use are made to sell, rather than to last; sham and cheapness are made to take the place of reality and worthiness; paint and putty are used to cover the lack of painstaking and patience; even labor-saving machinery is made to contribute its quota to the revenues derived from the practice of sham. The commonest articles of household use are shams compared with those made by our fathers.

Tin ware will not stand scouring. The brilliant array of tin vessels, once the pride of the housewife, is not readily attainable. The iron sheet, thin as vanity, is slightly washed with a pewtery solution that, always dingy, wholly disappears in a few weeks' use, and the cup, kettle, or pan shortly becomes a sieve, wholly worthless. In wooden ware it is no better. The pail or bucket is made of unseasoned or knotty lumber, bound with hoops of iron foil, and painted with a mixture of ochre and benzine, or washed with some earthy pigment dissolved in water. The tubs fall to pieces unless kept filled with water; the trays and mixing bowls are carved from green wood that splits after a few months' exposure to the kitchen atmosphere. Brooms are bound lightly with rotten twine, instead of being well secured with lasting wire; a cleanly housewife will use one up in a week. Blacking brushes are stuck together with glue and brads; the boots blacked with them bristle like the porcupine.

In the article of furniture—common furniture for the kitchen and dining-room—it is still worse. The chairs are a delusion and a snare; they are built for a race of pigmies, and if they hold together during six months' use the first removal from one habitation to another makes them a wreck. Tables are skaky in the legs, or have lumbago or spinal complaint their backs diversified with prairie scenery, a rolling surface. Bedsteads when once unjointed object to resuming their original fair proportions. The drawers of bureaus recede from the frame and laugh at the impotency of the lock bolt.

And so we might go on indefinitely, and give many other illustrations of the endless variety of shams, sham in material, sham in making up, and sham in appearance. The picture is not overdrawn. Let any one look back twenty or thirty years, and call to mind the Lares and Penates of his father's house, comparing its "fixings" with those now made, and he will see that the times have changed. The furniture bought by the newly-married couple, witnessed the gambols of a large family of children, and served to assist them in their life-start when grown up. New tin ware came at rare intervals, usually the result of the housewife's careful saving of worn-out rags. The advent of a new water bucket or wash tub was an event in the household; they were made to last, intended for use, and they fulfilled their destiny.

We do not believe that the making of money should be the highest motive to actuate the manufacturer; a reputation is really valuable, and in time it pays pecuniarily. We could point to a manufacturer of tin ware who, for twenty years and more, during which he has carried on his business, never allowed any article to go out from his concern which was not, in all respects, first class. He gets good prices, and has a steady custom, which has secured him wealth—wealth honestly earned. Is it not to be supposed that he values his good name as much as his dollars? Is it not as much a source of satisfaction as his accumulations of wealth? When honor shall guide rather than sordid avarice, when a "good name shall be chosen rather than great riches," we may hope a return of those "good old times" when honest workmanship was the workman's best recommendation.

THE CINCINNATI SUSPENSION BRIDGE.

(*See Illustration on preceding page.*)

Suspension bridges are of very remote origin. One mentioned by Kirchen, still in use in China, was built, according to tradition, in the year A. D. 65; it is 330 feet long, a roadway of plank supported by chains. Rope suspension bridges were built by the ancient Peruvians, and they have been used in Europe. The first iron suspension bridge was built in 1819, across the Tweed, at Berwick-on-Tweed, by Captain Sir Samuel Brown. It was supported by chain cables, six on a side, and its span was 449 feet. The same engineer constructed the Brighton chain pier and the bridge at Montrose. The former was built in 1823, having four spans of 255 feet each; the latter was finished in 1829, and nine years afterward was destroyed by a hurricane. The Menai suspension bridge was built by Telford in 1826. Its span was 580 feet, and hight above the water 102 feet. A violent gale produced such an oscillation that the chains were dashed against each other, and the heads of many of the bolts were broken. The chains were similar to those used on lathes, planers, etc., made of plates bolted or riveted together. The Conway bridge, connecting Chester and Bangor, also built by Telford, has a span of 327 feet. It was built in 1826. The Freyburg (Switzerland) bridge is suspended by wire cables, and has a span of 870 feet.

In the United States, the most remarkable suspension bridges are Ellet's Wheeling bridge over the Ohio, with a span of 1,010 feet; erected in 1848, and blown down in 1854. The Lewiston bridge, seven miles below Niagara Falls, built by E. W. Serrell, spanned 1,040 feet. Roebling's bridge, at the falls, spans 821 feet; McAlpine's new Niagara bridge has a span of 1,264 feet, and the proposed bridge to connect New York and Brooklyn is to have a span of 1,600 feet.

The bridge seen in the full-page engraving crosses the Ohio River from Cincinnati, Ohio, to Covington, Ky., and has a span of 1,057 feet, with an elevation of roadway of 103 feet. This elevation is the mean, extreme cold raising the bridge, by contraction of the cables, twelve inches, and extreme summer heat allowing it to sink the same distance. At a mean temperature of 60 deg. the hight is 103 feet. The foundations of the towers were begun in September, 1856. Work was suspended in 1857, and not resumed until 1863. The bridge was opened for travel for foot passengers Dec. 1, 1866, and for carriages one month later. At the water level the space between the towers on either shore is 1,005 feet. The floor of the bridge is composed of a strong wrought-iron frame overlaid with several thicknesses of plank, and suspended to two wire cables by suspenders placed every five feet. The suspenders are between the roadway and footpaths, the former being twenty feet and the latter seven feet wide. No lateral or transverse stays or guys are employed in this bridge, the requisite stiffness being assured by two wrought-iron girders extending from abutment to abutment, and running through the center line of the bridge, under and over the floor beams. One is twelve and the other nine inches deep, the former under the beams and the latter over, secured together and to the beams by bolts, thus making a combined and continuous girder of a depth of twenty-eight inches.

The base of each tower is 82 by 52 feet, with a hight of 165 feet to the spring of the arch. The towers are buttressed from foundation to top. On the Ohio side the substructure is similar to that proposed for the New York tower of the proposed East River bridge—a mass of timber work resting on compacted sand, and firmly bolted together, the whole infilled with concrete grouting. The depth excavated on this side was so great that most of the wells in the vicinity were drained. The total weight of one tower is estimated at 60,000,000 pounds.

The cables are two in number, twelve and one-third inches diameter, composed each of 5,180 wires of No. 9 gage, twisted *in situ*, and overlaid with No. 10 wire, the total weight of wire used being 1,050,183 pounds. Each cable rests upon cast iron saddles at the top of the towers, each saddle resting upon 32 rollers. The bridge is the work of the celebrated engineer, John A. Roebling, to whom we are indebted for the facts herein stated. The view in the engraving is taken from the Kentucky shore.

WHY DON'T BOYS LEARN TRADES?

This subject was treated on pages 169 and 183, current volume. We do not assume to dictate to correspondents either the subject or the style of their communications, nor do we wish to interfere in the arrangements the members of Trades Unions may choose to make. Yet, whatever good these organized combinations may be capable of accomplishing, it is certain that some of their regulations operate harshly on outsiders. Especially is this the case as regards apprentices. A letter from Baltimore, Md., evidently written by a female hand, says: "The main reason why more boys do not learn trades is owing to the fact that trades combinations (the greatest evil society has to deal with) fix the number of apprentices each employer is allowed to have, and unless the employing mechanics of the different trades break up these combinations effectually there is no remedy, and the number of good journeymen will become so scarce that mechanical business will remain stationary.

"A case in point in this city illustrates the working of these trades combinations. An employing tinman working about thirty hands, took a lad, the soon of a poor widow, promising to teach him the trade. Soon after he put him to the bench every journeyman left his work, demanding the dismissal of the boy, refusing to return until he was sent away. Although the proprietor stated the case to them, that he was the 'only son of his mother, and she a widow,' they were firm in their determination, and the lad was dismissed.

"This is only one case. Parents, after repeatedly trying to procure opportunities for their boys to learn trades to fit them for usefulness in after life, are compelled to get them into any hand-to-mouth employment rather than bring them up in idleness."

Another, writing from Pleasantville, Pa., says he is a foreigner, two years in this country, at home a clerk and bookkeeper. Here he has been employed in boring and pumping oil wells. He wishes to learn the trade of sign and carriage painting, but doubts procuring an opportunity. He asks advice.

In relation to the Baltimore correspondent's complaint, we cannot agree fully with its main proposal. We do not think employing mechanics should unite to break up the combinations of the workers. The principal objection to such combinations of workmen as now exist, is that they are composed of employés alone, and we cannot see that a combination of employers alone would be free from this objection. Capital and labor, the employer and employed, are not properly antagonistic; the interest of one is the interest of the other. These class combinations appear to us to be not only unnatural, but absurd. We can see no valid objection or insuperable difficulty in the way of harmonious combination of employer and employed—a combination, or society, that shall regulate, by mutual conference and mutual concession, if necessary, the status of different workmen, rate of compensation, rules for the admission of apprentices, etc. All this could, and can be done without injustice to employer or employed, and with advantage to the apprentice.

After all, however, we believe such cases of hardship as that mentioned by our correspondent are to be attributed not to trade combinations but to the lack of proper regulations defining the duties of apprentice and master. When a lad can enter a shop ostensibly as an apprentice, and, after six months or a year, leave and set up for a journeyman, it is not surprising that journeymen who have faithfully served their time object to the reception of apprentices. But legislation is unnecessary in this case; if employers and workmen would institute and enforce rules for the reception and training of apprentices, the difficulties that now hamper and embarrass employer, journeyman, parents, and would-be apprentices would disappear.

CONVERSION OF CAST IRON INTO WROUGHT IRON--THE HEATON PROCESS.

The discovery of a cheap and simple process for freeing cast iron from carbon has long been a subject of earnest inquiry on the part of scientific and practical men. Mr. John Heaton's process for making wrought iron and steel seems to be pretty generally admitted to be a most expeditious and thorough method, but it is still an open question in the minds of many whether it is sufficiently economical.

Our readers are already aware that the basis of the method is the conversion of the carbon by means of nitrates of soda or potash. He also claims the use of chlorates. The application of these oxidizing agents is to be made to the under surface of the molten iron, so that the oxygen may act from below upward through its mass. The nitrate or chlorate is to be placed in chambers within the receiver of the melted iron, which is made to revolve, so that the chambers may come under the molten metal, and the nitrate or chlorate may act through it. The surface of the nitrate or chlorate is protected from a too rapid action of melted iron by means of an iron plate perforated with numerous holes. Mr. Heaton says, that if the cast iron contains about five per cent of carbon, one hundred weight and a quarter of nitrate or chlorate will be sufficient for each tun of iron, and that the effect will be produced in three minutes. The same process may also be used for the conversion of cast iron into steel.

A hot dispute has arisen in regard to the relative merits of this process as compared with that of Bessemer, culminating in two actions at law against the editor of *Engineering*, a leading scientific journal in England. This plan has taken a most decided position against the merits of the Heaton process. Indeed, looking upon the contest with entirely disinterested optics, it has seemed to us that its position was untenable on scientific grounds, and that it desired nothing so much as the failure of the new method. Its language has been that of deprecation, and its spirit, as evinced in the course of the discussion, seemed any thing but candid.

The matter has, however, fallen into excellent hands, and has been investigated by Professor Miller, of world-wide reputation as a chemist, in connection with Dr. Mallet and Mr. Kirkaldy. Each of these gentlemen has made elaborate reports entirely favorable to the success.

Prof. Miller's preliminary report describes Heaton's process thus:

On the occasion of our (namely, his and Dr. Mallet's) visit to the works of Langley Mill, on the 10th of July, 1868, 6¼ cwts. of Clay Lane forge pig, No. 4, were charged into a hot cupola which contained no other iron; and immediately 6¼ cwts. of Stanton forge pig, No. 4 (produced from two-thirds of Northamptonshire brown ore, one-sixth of Chesterfield clay ore, and one-sixth of puddling cinder) were added, and the whole, when melted, was drawn off into a ladle, from which it was transferred to the converter.

The converter is a wrought-iron pot, lined with fire-clay. In the bottom of it was introduced a mixture of 169 lbs. of crude nitrate of soda, 40 lbs. of silicious sand, and 20 lbs. of air-slaked lime; but these proportions in practice are varied considerably. On the top of this mixture a cast-iron perforated plate, weighing 95 lbs., was placed. The converter was then securely attached to the open mouth of a sheet-iron chimney, and the melted iron from the cupola (sample of this marked No. 4) was poured in.

In about two minutes a reaction commenced; at first a moderate quantity of brown nitrous fumes escaped, these were followed by copious blackish, then gray, then whitish fumes, produced by the escape of steam carrying with it, in suspension, a portion of the flux. After the lapse of five or six minutes, an intense deflagration occurred attended with a loud roaring noise, and a burst of a brilliant yellow flame from the top of the chimney. This lasted for about a minute and a half, and subsided as rapidly as it commenced. When all had become tranquil, the converter was detached from the chimney, and its contents were emptied upon the iron pavement of the foundery.

The crude steel was in a pasty state and the slag fluid; the cast-iron perforated plate had become melted up and incorporated with the charge of molten metal.

The slag had a glassy, blebby appearance, and a black or dark green color in mass.

A mass of crude steel from the converter was then subjected to the hammer (No. 7).

About 4½ cwts. of the crude steel were transferred to an empty, but hot reverberatory furnace, where, in about an hour's time, it was raised to a welding heat, and forged into four blooms under the steam hammer, then rolled into square billets, which were cut up, re-heated, and rolled into finished bars, varying in thickness from an inch to five-eighths of an inch (No. 8).

Three or four cwts. of the crude steel from the converter were transferred to a re-heating furnace, then hammered into flat cakes, which, when cold, were broken up and sorted by hand for the steel melter (No. 9).

Two fire-clay pots, charged with a little clean sand, were heated, and into each 42 lbs. of the cake steel were charged. In about six hours the melted metal was cast into an ingot (10 B). Two other similar pots were charged with 35 lbs. of the same cake steel, 7 lbs. of scrap iron, and 1 oz. of oxide of manganese. These, also, were poured into ingots (10 C). The steel, 10 B and 10 C, was subsequently tilted, but was softer than was anticipated.

These results, on the whole, are to be considered rather as experimental than as average working samples. I have, therefore, made an examination of the following samples only:

No. 4.—Crude cupola pig. No. 7.—Hammered crude steel. No. 8.—Rolled steely iron. No. 5.—Slag from the converter.

I shall first give the results of my analysis of the three samples of metal:

	Cupola Pig. (No. 4.)	Crude Steel. (7).	Steel Iron. (8).
Carbon	2·830	1·800	0·993
Silicon with a little titanium	2·950	0·266	0·149
Sulphur	0·113	0·018	traces.
Phosphorus	1·455	0·298	0·292
Arsenic	0·041	0·039	0·024
Manganese	0·318	0·090	0·088
Calcium	—	0·319	0·310
Sodium	—	0·144	traces
Iron (by difference)	92·293	97·026	98.144
	100·000	100·000	100·000

It will be obvious from a comparison of these results that the reaction with the nitrate of soda has removed a large proportion of the carbon, silicon, and phosphorus, as well as most of the sulphur. The quantity of phosphorus (0·298 per cent) retained by the sample of crude steel from the converter which I analyzed, is obviously not such as to injure the quality.

The bar iron (No. 9) was, in our presence, subjected to many severe tests. It was bent and hammered sharply round without cracking. It was forged and subjected to a similar trial, both at a cherry red and at a clear yellow heat, without cracking; it also welded satisfactorily.

The removal of the silicon is, also, a marked result of the action of the nitrate.

It is obvious that the practical point to be attended to is to procure results which *shall be uniform*, so as to give steel of uniform quality when pig of similar composition is subjected to the process. The experiments of Mr. Kirkaldy on the tensile strength of various specimens, afford strong evidence that such uniformity is attainable.

I have not thought it necessary to make a *complete* analysis of the slag, but have determined the quantity of sand, silica, phosphoric and sulphuric acid, as well as the amount of iron it contains. It was less soluble in water than I had been led to expect, and it has not deliquesced; though left in a paper parcel. I found that of 100 parts of finely-powdered slag, 11·9 were soluble in water. The following was the result of my analysis:

Sand, 47·3; silica in combination, 6·1; phosphoric acid, 6·8; sulphuric acid, 1·1; iron (a good deal of it as metal), 12·6; soda and lime, 26·1. Total, 100.

The result shows that a large proportion of phosphorus is extracted by the oxidizing influence of the nitrate, and that a certain amount of the iron is mechanically diffused through the slag.

The proportion of slag to the yield of crude steel was not ascertained by direct experiment, but, calculating from the materials employed, its maximum amount could not have exceeded 23 per cent of the weight of the charge of molten metal. Consequently the 12·6 per cent of iron in the slag could not be more than 3 per cent of the iron operated on.

In conclnsion, I have no hesitation in stating that Heaton's process is based upon correct chemical principles. The mode of attaining the result is both simple and rapid. The nitric acid of the nitrate in this operation imparts oxygen to the impurities always present in cast iron, converting them into compounds which combine with the sodium, and these are removed with the sodium in the slag. This action of the sodium is one of the peculiar features of the process, and gives it an advantage over the oxidizing methods in common use.

We may hereafter allude to the reports of Dr. Mallet and Mr. Kirkaldy, both of which contain further matters of interest.

RUSSIA SHEET IRON.

We learn that a new company has just commenced the manufacture of this article at Brooklyn, N. Y., with every prospect of success. The peculiar color and polish of Russia iron is said to be due to the method of carbonization and thorough hammering. No country has yet been able fully to compete with Muscovy, on account of the greater cheapness there of unskilled labor; but some of our Yankees think they can do the work here for less money by substituting steam for human muscle. At any rate the attempt is now being made.

At the works in Brooklyn an engine of 200-horse power drives an automatic steam hammer weighing seven tuns. The rolled sheet iron is greased and arranged in packages of thirty or more sheets. Each sheet is about 2½ feet wide and 7 feet long. The packs are then run into an oven and exposed to heat until the surface has attained the proper degree of oxidization. The packs are then transferred to the hammer, all the sheets in the pack being hammered at once. The anvil is movable, and the workmen change the position of the pack at each stroke of the hammer so that every portion of the iron will be acted upon. We are informed that Russia iron of excellent quality is being produced at these works, and that the company has large orders in advance.

The machinery is from designs by Mr. Morris. The steam boiler is rather novel in construction. It consists of a circular water drum, and a corresponding steam drum, placed one above the other, and connected by a large number of small pipes arranged spirally. The fire acts upon these spiral pipes, and the boiler is said to generate steam with economy. The construction of the boiler is cheap and simple.

The boyish test of good steel or good tempered steel blades, made by breathing on the polished surface, and noting the time of the evaporation, has lately been claimed by a prominent English mechanic to be founded on correct principles.

Two hundred thousand dozen toy drums are manufactured in Paris every year.

BEET ROOT SUGAR.

No. II.

THE BEET.

Many varieties of the beet, *Beta vulgaris*, are known to botanists, some of these, the mangel-wurzels, being used as food for cattle and for other purposes; others, the garden beets, as edibles for the table, while quite a number are mere horticultural curiosities.

Among the first, we find the *white Silesian*, or *white sugar beet* which is the only kind at present used by sugar manufacturers. It has been chosen from among all others on account of its superior richness in saccharine substance and its comparative freedom from coloring matter.

Margraff, in the year 1747, was the first to discover sugar in this plant, and Achard, of Berlin, made the first loaf sugar from it. After 1812 the manufacture of beet root sugar became a regular branch of industry in France, from whence it has gradually spread itself over the whole of continental Europe, and has recently penetrated into the British Isles.

Crystallized beet root sugar is perfectly identical in composition with cane sugar, and is undistinguishable from it by the sight, the taste, or by chemical tests.

The average composition of French sugar beets, according to A. Payen, in his last treatise, on the distillation of the juice of this root, is as follows:

Water	83·5
Sugar, with traces of dextrine	10·5
Cellulose and pectose	0·8
Albumen, caseine, and other nitrogenous substances	1·5
Fatty matter	0·1
Malic acid, pectic acid, pectine, gum, aromatic substance, coloring matter, ethereal oils, chlorophylle, oxalate and phosphate of lime, phosphate of magnesia, chloride of ammonium, silicate, nitrate, sulphate, and oxalate of potash, oxalate of soda, chloride of sodium, chloride of potassium, pectic acid salts, sulphur, silica, oxide of iron, etc., together	3·0

Braconnot had found:

Water	87
Soluble matter (sugar)	8
Insoluble matter	5
	100

Payen finds:

Water	83·5
Sugar	10·5
Various other substances	6·0
	100

Peligot says his experiments on French beets gave him an average of between 12 and 18 per cent of sugar; Krocker finds 13·3 for German sugar beets.

The percentage of sugar in American grown beets is highly satisfactory, as is shown by many analyses which have been made of them, as recorded by Grant, Blodget, and others. Roxbury beets contained 11·2 to 12·6 and 13·1 per cent of sugar; Dedham beets, 10·2; Shirley beets, 12·6 to 14·3; Deer Island beets, 10·4; Chatsworth beets, 9·12, 12·5, and 14; Hackensack beets, 14·4 to 17·6 per cent of sugar. The general average is 12·9 per cent of sugar, which, by recent processes, ought to furnish 10·3 per cent of raw sugar to the manufacturer.

The quantity of sugar in beets varies more or less according to the nature of the soil, the method of cultivation, the meteorological status of the season, and the nature of the fertilizers employed, all of which we shall practically discuss in our next article.

The average crop to the acre, grown in any one locality, does not seem to differ very materially from one year to another, as is shown by recorded experiments.

In various parts of France, Boussingault finds that this average is:

For the department of	Pas de Calais	14 tuns to the acre.
"	Aisne	11½ "
"	The Nord	16 "
"	Cher	17 "
"	Seine et Marne	13½ "

Gasparin gives the present average for the north of France as 40,000 kilogrammes to the hectare or about seventeen tuns to the acre.

In Belgium the average crop is 18 tuns to the acre. In 1867, the product of beets, for the German Zollverein, was 23½ tuns to the acre, the total supply being grown on 239,775 acres, and producing 4,000,000 quintals of sugar.

To arrive at a definite conclusion as to the average product of sugar beets per acre in the United States, we have had to gather notes from many different authorities, whose names and places of residence we here furnish so as to substantiate our figures. They are: 1, A. P. Goodridge, of Worcester, Mass.; 2, S. D. Smith, of West Springfield, Mass.; 3, W. Birnie, of Springfield, Mass.; 4, T. Messinger, of Long Island, N. Y.; 5, P. T. Quinn, of Newark, N. J.; 6, I. C. Thompson, of Staten Island; 7, Emory Rider, of Hackensack, N. J., 8, the Hon. Ezra Cornell, of Ithaca, N. Y.; 9, W. H. Belcher, of St. Louis, Mo.; 10, Theod. Gennert, of Chatsworth, Ill.; 11, Maurice Mot, of Cherry Valley, Newark, Ohio; 12, the late John W. Massey, of Morris, Ill.; 13, John W. Walsh, of Chicago; 14, T. Payson, of Deer Island, Boston Harbor; 15, E. B. Grant, of Boston; 16, M. Ogden, of the Illinois Central Railroad; 17, Agricultural Department of the United States; 18, D. L. Child, of Northampton, Mass.

We exhibit in a tabular form the results of the experience of the above-named parties, the numbers in the table corresponding to those preceding their names:

	1	2	3	4	5	6	7	8	9
Tuns per acre	17¼	17	34	49½	25	30	20	20	—
Cost of production per tun	$4·05	2·23	2·38	1·15	0·64	0·84	0·70	1·50	2·00

	10	11	12	13	14	15	16	17	18
Tuns per acre	—	—	20	15 to 42	—	20	20	—	13
Cost of production per tun	$3·00	2·65	1·50	2·00	3·50	1·38		2·60	3·00

We see by these figures that the lowest estimate of beet production in America is rated at 13 tuns to the acre; the highest at 49½ tuns, and that the general average is 24·48 tuns. We further notice that the lowest cost of growing beets was 64 cents per tun; the highest, $4·05, and the general average $2·42 per tun. Multiplying 24·48 tuns by $2·42 we perceive that the cost of growing one acre in sugar beets would average $59·24 for the whole country.

The farmer selling his beets at $3·50 would clear a profit of $26·44 to the acre.

For fear of being taxed with exaggeration, we shall, in all future estimates, average a United States crop at 20 tuns to the acre, the cost of production at $3 per tun, and the percentage of sugar at only 8 per cent, instead of 10·3 per cent.

According to the reports of the Commissioners of Agriculture, the average yield and cash value of grain crops per acre in the United States during four years, from 1862, to 1865 inclusive, was as follows:

	Bushels.	Price per bushel.	Value per acre.
Corn	32·99	$0·86	$28·57
Wheat	14·34	1·57	22·44
Rye	15·94	1·03	15·98
Oats	28·56	0·58	16·52

So that the *total* average *value* of a crop of grain gathered on one acre of land in the United States was only $20·87, or considerably less than the *net profit* to be derived from the sale of the beet roots made on the same extent of ground.

In France, the ratio of growing and harvesting a crop of beets, compared with that of growing and harvesting a crop of wheat is as 42·75 to 35, or in other words it costs 22 per cent more to produce one acre of beets than it does to cultivate one acre of wheat.

The proportion of leaves to roots in beets varies from 50 to 78 per cent by weight.

The elementary chemical composition of the plant is, according to Gasparin, as follows:

	Dry root.	Dry leaves.
Carbon	42·75	38·11
Hydrogen	5·77	5·10
Oxygen	43·58	30·80
*Nitrogen	1·66	*4·50
Carbonic acid	1·00	
*Sulphuric acid	0·10	
*Phosphoric acid	0·37	
*Chlorides	0·32	
Lime	0·42	
Magnesia	0·28	
*Potassa	2·51	
Soda	0·37	
Silica	0·52	
Iron and alumina	0·15	

Those substances marked with stars have to be furnished by the fertilizers, which, it will be noticed, will have to be rich in potassa and phosphoric acid, and must furnish 0·21 per cent of nitrogen to every 100 lbs. of root and 0·45 per cent of nitrogen to every 100 lbs. of beet leaves produced, unless these last are returned to the soil, which would diminish the quantity of nitrogen needed, by the weight of what they contain of this substance. The quantity of water in beet roots varies from 83 to 88 per cent.

According to Boussingault, four pounds of beet are equal in nutritive power for feeding purposes to one pound of dry hay; according to Count de Gasparin, five pound of roots equal one pound of hay.

Beet root pulp, after it has been pressed for the extraction of the juice, has the same value as the original root which produced it, weight for weight, so that its price may readily be established on the basis of 4½ lbs. pulp being the equivalent of one lb. of hay; that is, 100 lbs pulp equal to 22 lbs. good hay.

If 20 tuns of beet are made to the acre, and if the weight of pulp averages 18 per cent of that of the beet roots, we find 8,064 lbs. of pulp (equal to 1,774 lbs. of hay) to the acre, to be available for the purpose of feeding or fattening live stock.

The growing and harvesting of one acre of beets need 46 days of human (partly children's) and of 14 days of horse labor. In the West Indies one acre of sugar cane necessitates 172 days of human labor.

In our next issue we shall furnish practical details for the cultivation of the sugar beet, with the necessary conditions of soil, climate, and manure suited to its proper development.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

There is said to be a great and very profitable salt mine in the lands occupied by the Choctaw nation, and within a few miles are several hundred acres of land underlaid with coal of a fine quality, enough to supply the whole country for a hundred years.

India has had a curious railway accident. An elephant, seeing the red light and the smoke, concluded that the noisy locomotive was an enemy to be summarily demolished. He accordingly placed himself on the track, and met the strange creature head on, with trunk and tusks. The result was a dead elephant, and eleven cars capsized.

The communication between France and England by telegraph, were recently said to be entirely cut off. It is now officially stated that of the five cables which connect France and Belgium with England, two had been ruptured by the tempest, and that the land communications which join the three others on each side of the channel had also been broken.

The Chicago *Journal of Commerce* says, a man in Des Moines, Iowa, has erected a dwelling house for himself, built mostly of paper. The weather boarding, inside walls, and shingling, are of that material known in the West as the "Rock River Company's Building Paper." The cost is about two-thirds that of the ordinary materials, and the house, it is said, is much warmer than where plaster and wood are used.

The Chicago *Journal of Commerce* estimates that 1,656,708,538 feet of lumber, exclusive of laths, pickets, and shingles, were manufactured in Michigan in 1868. Saginaw leads off with 457,396,222 feet; Muskegon comes next with 245,000,000, and Manistee third with 155,000,000.

The Southern Pacific Railroad, says the San Francisco *Bulletin*, cuts one of the richest mineral belts in the world, in California, Arizona, and New Mexico. The road will thread its way among gold, silver, and copper mines.

Unionville, in Hartford County, has water power estimated to be equal to 4,000 horses. This drives the machinery of two grist and saw mills, one wood-turning shop on a large scale, three large paper mills, one musical instrument shop, one each of nuts and bolts, saws, straps, carpenters' tools hooks and eyes, foundery and plow and machine shops.

A Hartford company have recently made several steam gongs six feet, high and sixteen inches in diameter. We hope they will not "all speak a once" while we are around.

A firm in Springfield, Mass., turns out 400,000 gross of patent steel watch keys, besides jewelers keys, combined knife and tweezers, and other notions.

Three Dubuque miners have struck a lead lode, the sheet of mineral in the cap of which is two feet thick, and mineral shows in all directions in the black mud. The *Herald* says the prospect rivals the richest of the day.

The value of the boots and shoes made annually in Massachusetts, is said to foot up the enormous sum of one hundred millions of dollars.

Kansas boasts that its salt springs are inexhaustible and produce the purest salt of any in the United States.

Great activity in copper mining stocks is reported since the passage of the copper tariff.

Thirty miles above Cairo, in the Mississippi, there has been discovered a fine coal seam, four feet thick, width undetermined.

About seventeen thousand bushels of coal are daily mined in Rock Island county, Illinois.

Chicago has nearly sixty miles of Nicolson pavement.

Chicago shipped last year forty million bushels of wheat.

A company in Springfield, Mass., make 125,000 paper collars daily.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

M. N. R., of——It is difficult to designate a book teaching a machinist the "science, reasons, and demonstration of his business.' Such information is scattered in a number of publications. Hand-books and manuals, together with works on natural philosophy, and Byrne's Dictionary of Engineering, or similar later publications, will be useful as aids.

J. B. C., Jr., of N. Y., asks for the rules for setting Stephens' cut-off. We never knew this cut-off to be set by measurement; it is done usually by trial, setting the engine on its centers, covering the ports, etc. No instruction (verbal) could give you the knowledge desired; the work belongs to an experienced engineer.

J. W. H., of Iowa asks "what is the expansive force of steam when cut off at half stroke, the pressure being eighty lbs per square inch?" The average pressure is 67·7 lbs., less 10 per cent allowed for attenuation of steam.

J. B. S., of Ind.—We cannot give the actual power of a turbine wheel unless we know its style, size, and the amount etc. of water used. Some builders claim a yield of 90 per cent of the power applied For reply to your other question we refer you to answer to "H. & Co., of W. Va." on page 204, current volume.

J. E. B., of Ind.—Portable engines as usually built—the best class—are as light as they can be, unless the boiler be made of sheet steel and all the connections. shaft, etc., also of steel. It is a fact that the larger the engine the less its proportional weight. We know nothing about the engine you refer to weighing only 16 lbs. to the horse power.

T. S. B., of Mo.—The oil of tobacco may be removed in a great measure from an old meerschaum pipe by boiling it in melted tallow and wax, say about equal parts of each.

T. B., of Ill.—The less the specific gravity of coal oil is, the more inflamable it is, but we are not aware that any exact relation between the specific gravities of such oils and the temperature at which they will ignite has been established.

H. C of Toronto, Ca.—The amount of gas obtained from a tun of coals, varies very much with the kind of coal used, and the way in which the distillation is performed. It varies from 6,500 cubic feet to 15,000. Boghead cannel is according to Hughes the richest in illuminating gases. To give the average of all the varieties would involve considerable computation. An allowance of 25 per cent is made by some authorities for losses by leakage, condensation, etc.. but we believe that in well managed works this is too large.

N. O. H., of Minn.—According to De Saussere, freshly burned boxwood charcoal absorbs ammonia 90 parts of its own bulk; hydrochloric acid 85 parts; Sulphurous acid 65 parts; Sulphureted hydrogen 55 parts nitrous oxide 40 parts; carbonic acid 35 parts; olefiant gas 35 parts. Car bonic oxide 9·4 parts oxygen 9·2 parts; nitrogen 7·5 parts; marsh gas 5 parts; hydrogen 1·7 parts. Soluble glass is made by melting together in a Hessian crucible, 8 parts of carbonate of soda, or 10 of carbonate of potash, with 15 of pure quartz sand, and 1 of charcoal. The materials should be perfectly fused, and remain so for some time. They should be poured out before cooling into an iron vessel as otherwise it may be difficult to remove it from the crucible. It dissolves in from 5 to 6 times its weight of boiling water. It is a cheap material for lining cisterns, and is said to serve the purpose very well.

W. M., of Conn., asks if we know of any steam engine without "dead points" (single engine referred to), and if constructed, simple in its parts and certain in working, it would be valuable. We have never seen such an engine. We have seen some that *claimed* to be without dead points (*i. e.* points where no power was delivered), but never saw either a reciprocating or rotary engine of that character. If you can build such an engine, "simple" and "certain" etc., trot it out. It will pay as a curiosity, if it is otherwise valueless.

W. S. T., of Ill., superintendent of works employing steam power, says he has tried every advertised means, or substance, to prevent incrustations on his boilers (the water being limy), without avail, until he used white oak bark, or rather poles of that wood, and since that has had no trouble. He advises others using water impregnated with lime to do likewise. We cannot see the connection. The oak bark contains tannin and quercitric acid, neither of which we understand affects lime, unless this acid may combine with the lime to make a soluble salt. Certainly however, the oak saplings will not injure the boiler, and the remedy is simple and inexpensive enough to warrant a trial.

F. W. K., of Ill.—There *are* instruments made for the calculation of power transmitted by belts. One is the dynamometer of James Emerson, Lowell, Mass., illustrated and described on the first page of No. 1, current Vol. SCIENTIFIC AMERICAN, and another Neer's dynamometer, also described and illustrated on page 296, of Vol. XVIII, same paper, address being Geo. C. Roundey, 254 Broadway, New York city. The steam engine indicator is another method of determining the power transmitted by belts.

W. Y., of Mo.—Cooley's recipes are considered usually reliable. Your failure is probably due to impure materials. The best cement we know for glassware is that sold as the "Diamond Cement," imported from England.

J. J. W., of New Brunswick, says he derives great benefit from surface blow-off pipes for his boilers, which use salt water. He first tried them over the furnace, the hottest part of the boiler, but had much better success when he removed them to a cooler part of the boiler, having noticed the scum on the surface of water in a boiling pot to flow away from the point of ebullition. His pipes are plugged at the ends and pierced with small holes, the inner ends of the pipes being the highest. The plan is a good one, but if the pipe is jointed just inside the shell of the boiler and provided with a float to keep it always at the surface of the water the result is still more satisfactory. The blowing off should be attended to at least once a day.

C. C. L., of Ohio, sends us a sketch of a portion of the common hot water boiler usually placed in dwellings in connection with ranges and furnaces. He does not understand the necessity of the supplementary pipe connecting the hot water draw-off pipe above the boiler and the cold water delivery pipe at the bottom. It is evident that when the boiler is full, the cold water supply pipe—which descends through the top of the boiler to within a few inches of the bottom—will supply no more water until some of that in the boiler is drawn off, and, of course, circulation inside the boiler ceases. To keep up this circulation under these circumstances it is necessary to connect the hot water pipe with the cold water pipe that passes the water through the fire or heater. Of course, this circulation is, in a degree, an element of safety. Every boiler, however, should be provided with a safety valve, loaded simply to the pressure necessary to raise the water the required hight within the limits of the boiler's resisting strength.

A. E. W., of Ill.—We are sorry to say that there are not, to our knowledge, any published data on the resilience of springs. There is no reason why experiments could not be made and the results arranged in tabular form. It would be not only of very great general value, but would bring money and fame to the experimenter.

C. A. L. of Tenn.—Rock or swamp maple is a better step for a turbine than either lignumvitæ or elm. It will sustain the weight of any turbine built. Cast iron is worthless for the purpose. Don't try it.

I. N. S., Jr., of N. Y.—We have once or twice given the process of blueing gun barrels and also pieces of steel. It is simply heating the piece to be blued in powdered charcoal over a fire until the requisite color is obtained. It will not injure the gun barrel if carefully performed.

P. M., of Pa.—A lath or shingle saw, properly fitted up, may travel at a speed that gives a velocity to its edge of 11,000 or even 12,000 ft. per minute. See answer to "H. & Co., of W. Va.," on page 204 current volume for calculation of number of revolutions required. The rule is; divide the circumference in feet by the speed desired—9,000, 10,000, or even 12,000 feet—and the quotion is the number of revolutions.

J. P. J., of Mass.—Alabaster is a delicate translucent form of gypsum and easily contracts dirt and becomes soiled unless kept carefully under glass. When soiled it should be immersed in clear water four or five days, then in water containing a small amount of lime for about the same time, then rinsed in clear water and dried in the air. Wooden vessels should not be used as they may stain the work. If the work is jointed and the joints separate they may be re-united with plaster of Paris.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

LOCK FOR SEWING MACHINE CASES.—E. F. French, New York city.—This invention has for its object to furnished an improved lock, designed especially for locking piano and sewing machine cases, but which shall be equally applicable for other uses, and which shall at the same time be simple in construction and effective in operation.

COMBINED PLANTER AND CULTIVATOR.—W. C. Switzer, Nelsonville, Texas.—This invention has for its object to furnish an improved machine, combining in itself most of the instruments required for preparing the ground, planting the seed, and cultivating the plants, and which may be easily adjusted for the various uses for which it may be required, doing the work in all cases thoroughly and well.

CORN PLANTER.—W. H. Cox, Virden, Ill.—This invention has for its object to improve the construction of the improved corn planter, patented by the same inventor October 23, 1866, and numbered 58,988, so as to make it more convenient and effective in operation.

CAR COUPLING.—Thomas B. Smith and Acanthus Hinchman, Pleasant Hill, Mo.—This invention has for its object to furnish an improved car coupling, which shall be simple in construction, reliable and safe in operation, and which shall, at the same time, be self-coupling, so that the cars may be coupled without danger of injury to those making up the train.

PROCESS OF EXTRACTING SACCHARINE JUICES FROM CANES.—Horatio S. Lewis, Chicago, Ill.—This invention has for its object to furnish a simple, convenient, and effective means by which the saccharine juices may be conveniently, effectually, and thoroughly extracted from sugar canes, sorghum canes, etc., in such a way as to remove all the sugar from said canes, whether it may be in the form of sap or juice, or whether it may have become crystallized in said canes.

ATTACHING TUGS TO WHIFFLETREES.—Chas. H. Nye, Elizabethport, N. J.—This invention has for its object to furnish an improved device for attaching tugs to whiffletrees, which shall be strong, simple in construction, easily attached and detached, and not liable to become accidentally detached.

HARROW.—George Heffner, Homer, Iowa.—This invention has for its object to furnish an improved harrow, which shall be so constructed that each part may be lifted to clear it of rubbish without stopping the team, and which will adapt itself to the form of the ground to be harrowed, so that no part of the ground may be left unharrowed.

THRESHING MACHINE.—George M. Rhoades, Hamilton, N. Y., and Geo. B. Hamlin, Willimantic, Conn.—This invention has for its object to improve the construction of threshing machines, so as to make them more efficient in use and less liable to get out of order, or to be broken than the machines constructed in the ordinary manner.

SAIL CRINGLE.—Charles Lucas, Brooklyn, N. Y.—This invention relates to a new and useful improvement in the article known as the "cringle" used on the sails of sea-going vessels and other water craft, for attaching the sail to the yards, and for other purposes.

AIR-TIGHT CANS.—W. J. Gordon, Philadelphia, Pa.—This invention relates to a new and useful improvement in cans for preserving fruit and other articles, and for containing lye, paint, and all substances of a similar nature.

HARNESS CONNECTION FOR LOOMS.—J. T. Holden, Elmwood, R. I.—This invention relates to a new and improved means for connecting the harness of looms to the treadles of the same, and is designed to supersede the ordinary strap connections now used.

HAND DUMPING CART.—William Farmer, New York city.—This invention relates to a new and improved wheeled vehicle for moving various commodities or articles; and it consists in the novel construction and arrangement of parts.

DEVICE FOR PULLING HOP POLES.—O. B. Hale, Malone, N. Y.—This invention relates to a new and improved device for the purpose of pulling hop poles.

CAR HEATER AND VENTILATOR.—Edward Himrod, Dunmore, Pa.—This invention consists in generating the heat in a separate and fireproof chamber, and discharging the heated air into the car through registers, the same pipes and registers being used for ventilation in warm weather.

APPARATUS FOR BORING HUBS.—F. Jonas, Freeport, Ill.—This invention relates to a useful improvement in apparatus for boring hubs of carriage and wagon wheels, and for other purposes of a similar nature.

SELF-RAKE ATTACHMENT FOR HARVESTERS.—Ezra Ames, Austin, Minn.—The object of this invention is to provide a simple and effective self-rake attachment for harvesting machines, and it consists in a novel combination of devices.

SHEET-METAL ROOFING.—J. H. Shimmons, Lawrence, Kansas.—This invention relates to an improved arrangement of the form of the sheets for making sheet-metal roofs, whereby the seams will admit of being bent in the required form without cracking the metal.

HARROW.—A. Hamilton Ballagh, Wesport, Mo.—The object of this invention is to provide a simple and effective harrow. It consists of a frame braced by a stay rod, and provided with a number of oscillating cross beams which bear the harrow teeth.

ATTACHING CARRIAGE WHEELS.—Levi Adams, Amherst, Mass.—The object of this invention is to provide a simple and effective means for securing wheels on their axles, and to provide a means of excluding the dust from the axle box of vehicle wheels.

MOLDING SASH WEIGHTS.—Wm. Ferguson and James Anderson, New York city.—This invention relates to an improved method of molding for casting sash weights, and molds for the same, whereby it is designed to provide a more simple and expeditious mode of molding, and to produce smoother and better weights, especially in the formation of the eyes of the same.

TRUCK FOR PLOWS, ETC.—John G. Moore, Kingston, Ohio.—This invention relates to improvements in trucks, such as are employed in connection with plows or cultivators, to afford a means for the operator to ride while guiding them, whereby it is designed to provide a simple and cheap truck, more especially adapted for the purpose than those now in use, which may be readily attached to or detached from the plows or trucks.

COMPOUND FOR DESTROYING INSECTS ON TREES.—Joseph Bingaman, Jersey Shore, Pa.—The object of this invention is to provide a liquid, which will when applied to the roots of trees, destroy, any pernicious and other insects which may infest it. The ingredients are all cheap and easily obtained throughout the country generally, and the compound has been proved by repeated and careful experiments, to operate in exterminating all insects which infest trees and shrubbery, and inflict damage thereto by stinging and boring the same.

BRIDLE BIT.—J. Hout Minnich, Tuscarawas, Ohio.—This invention has for its object to construct a bridle bit, which can be used to readily manage and control even the wildest horse, and by which the habit of kicking can be readily broken. The invention consists in fitting the ends of the bridle bit through slotted plates, and in so connecting the bit with the reins, that it can readily be drawn up against the roof of the horse's mouth, and at the same time backward. Horses are thereby successfully prevented from holding the bit with their teeth, and can consequently be readily controlled.

SKATE SHARPENER.—John F. Cameron, Brooklyn, N. Y.—This invention relates to a new instrument for re-sharpening or re-shaping the running edges of skate irons, and consists of a grooved instrument which retains the grinding tool at the bottom of the groove, so that the iron is guided between the two flanges, to have the edge perfectly straight. The invention also consists in pivoting one plate of the holder to make the sharpening tool removable and reversible at will.

SPINNING FRAME.—Albert L. Sayles, Pascoag, R. I.—This invention relates to improvements in spinning frames, whereby it is designed to provide a means for lowering the ring rail previously to doffing the bobbins, and raising it again afterwards, so that the yarn may be wound on to the spindle to hold it and cause it to run up again on to the new bobbins, thereby saving the time and labor of threading the yarn through the travelers, and securing it to the spindles after doffing.

GAITER BOOTS.—Emile Nougaret, Newark, N. J.—This invention relates to a new manner of arranging the elastics on gaiter boots, with a view of preventing their wearing out, and of facilitating their attachment. The invention consists in setting the elastics in front of the boot close together, so that a narrow strip of leather is left between them.

MOSAIC FLOOR.—J. George Kappes, New York city.—This invention relates to a new manner of arranging the lower soft wood layer, of that kind of mosaic floors in which the ornaments are produced from very thin pieces of hard wood; and the invention consists in constructing the said soft wood layer of narrow pieces of bars, which are grouped together in such manner that the separate plates composed of such groups will not be able to shrink, so as not to displace the hard wood covering which is glued upon them. That class of mosaic floors herein referred to, and which is preferred on account of its cheapness, is as heretofore made, very apt to be destroyed by shrinking, the plates which constitute the lower layers being made of single pieces of wood. To prevent this, without materially increasing the cost, is the object of the invention.

RAILROAD RAILS.—Perry Prettyman, Paradise Spring Farm, Oregon.—This invention relates to improvements in railroad rails, the object of which is to provide rails, whereby the cars may be secured against the liability of running off from the track, and to provide more durable rails.

RIVET MACHINE.—Joel Miller, Swedesboro, N.J.—This invention relates to improvements in apparatus for heading rivets by hand, and consists of a riveting die provided with a handle shank and discharger.

MACHINE FOR MAKING SEAMLESS TUBING.—J. McCloskey, New York city.—This invention relates to improvements in apparatus for making seamless tubing, from molten metal, of copper, brass, lead, or other soft substance, that will fuse at a low heat, but is more especially intended for making lead pipe either tin lined or not.

STONE AND STUMP LIFTER.—B. and M. L. Oliver, Brooklyn, N. Y.—This invention relates to improvements in machines for raising heavy stones for loading, pulling stumps, and for other like purposes, and has for its object to provide an arrangement where great power may be applied by hand, in a convenient manner, and the weight may be readily lowered after having been raised.

LOCK FOR WAGON BRAKES.—J. Hoke, Cordova, Ill.—This invention consists of an eccentric dog, connected to the brake lever and to which the brake is connected, working in a circular groove in a metallic sector plate by the side of the lever, so arranged that it will move freely with the lever, when drawn back to "brake up," but will bite in the groove and resist the strain of the brakes when the lever ceases its action on the dog, and also arranged to be disconnected from the said adhesion to the walls of the groove by a backward movement of the lever.

MILK COOLING APPARATUS.—Ira Houghtling, Houghton, Mich.—This invention relates to improvements in apparatus for forcing air through milk and other liquids for cooling them; and it consists of a fan blowing attachment for vessels arranged to distribute the air throughout the liquid.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

GRATE BARS FOR FURNACES.—Jacob C. Schlough, Easton, Pa., has applied for an extension of the above patent. Day of hearing, May 10, 1869.

FAUCET.—Edward A. Sterry, of Norwich, Conn., has applied for an extension of the above patent. Day of hearing May 24, 1869.

MACHINE FOR CUTTING OUT BOOT AND SHOE SOLES.—Caleb H. Grifiin, of Lynn, Mass., has applied for an extension of the above patent. Day of hearing May 24, 1869.

NEW PUBLICATIONS.

THE AMERICAN ENTOMOLOGIST.

The March number of this valuable monthly comes to us, as usual, replete with interesting matter, and fully and beautifully illustrated. We notice, also, that it has eight additional pages of reading matter, including, among other things, a facetious article on our large Polyphemus Moth, a valuable and lengthy article on "Wasps and their Habits," "Do Toads Eat Worker Bees?" "Answers to Correspondents," Reviews, etc., etc. Published monthly, at $1·00 per annum, by R. P. Studley & Co., St. Louis, Mo.

Official List of Patents.

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FOR THE WEEK ENDING MARCH 16, 1869.

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Patent Solicitors, No. 37 Park Row, New York

87,750.—CHILLED PLATE FOR ORE CRUSHERS.—John L. Agnew and Charles E. Wright, Negaunee, Mich. Antedated February 27, 1869.
87,751.—CHOCK FOR VESSELS.—C. G. Bachelder, Camden, Me. Antedated March 9, 1869.
87,752.—BED BOTTOM.—J. J. Baxter, Grand Rapids, Mich.
87,753.—HEEL CUTTER.—J. H. Bean, Marietta, Ohio.
87,754.—IMPLEMENT.—E. S. Bennett (assignor to himself and Justus Smith), New York city. Antedated Feb. 27, 1869.
87,755.—WATER-HOOK BOLT FOR HARNESS.—J. W. Bishop, New Haven, Conn.
87,756.—HAT HOLDER FOR PEWS AND SEATS.—J. M. Cain (assignor to George Cain), Lafayette, Wis.
87,757.—CURTAIN FIXTURE.—H. N. Chapman, Washington, D. C.
87,758.—DEFECATING SACCHARINE FLUIDS.—Wm. Clough, Cincinnati, Ohio. Antedated Feb. 27, 1869.
87,759.—REFINING AND DECOLORIZING SACCHARINE AND OTHER LIQUIDS.—William Clough, Cincinnati, Ohio. Antedated Feb. 27, 1869.
87,760.—BARREL HEAD.—J. A. Cook, Owego, N. Y.
87,761.—NUT LOCK.—J. R. Cribbs, Gardner, Ill.
87,762.—TREADLE FOR SEWING MACHINES.—H. G. Davis, New York city.
87,763.—FELTING MACHINE.—Rudolph Eickemeyer (assignor to J. T. Waring), Yonkers, N. Y.
87,764.—MACHINE FOR PREPARING AND FELTING TUFTED FABRICS.—Rudolph Eickemeyer (assignor to J. T. Waring), Yonkers, N. Y.
87,765.—SAFETY BARREL FOR WATCHES.—S. F. Estell, Richmond, Ind.
87,766.—GEAR CUTTER.—Charles Evotte, Paris, France.
87,767.—HANDLE FOR TABLE CUTLERY.—R. H. Fisher (assignor to Beaver Falls Cutlery Co.), Beaver Falls, Pa.
87,768.—CONSTRUCTION OF CHAIRS.—Robert Fitts, Jr., (assignor to the W. Heywood Chair Co.), Fitchburg, Mass.
87,769.—VELOCIPEDE.—F. B. Gardner and John Trageser, New York city.
87,770.—HARVESTER.—C. P. Gronberg, Aurora, Ill.
87,771.—COTTON GIN.—S. Z. Hall, Sing Sing, N. Y. Antedated March 3, 1869.
87,772.—STEAM GENERATOR.—J. G. Hamilton, Chicago, Ill.
87,773.—SHANK LASTER.—Fred'k Henderson, Marietta, Ohio.
87,774.—WRENCH.—H. W. Hewet, New York city. Antedated Feb. 27, 1869.
87,775.—WELL TUBE.—L. L. Himes, New Haven, Conn.
87,776.—MUCILAGE BRUSH.—M. W. House (assignor to himself and J. F. Forsyth), Cleveland, Ohio.
87,777.—CAR AXLE-BOX LUBRICATOR.—M. C. Hubbard (assignor to I. P. Wendell), Philadelphia, Pa., and said Wendell assigns one half his right to Thomas Sayles, Chicago, Ill.
87,778.—PUMP-ROD COUPLING.—H. T. Hunt, Titusville, Pa.
87,779.—PREPARING AND BLEACHING PAPER PULP.—W. C. Joy and John Campbell, Penn Yan, N. Y.
87,780.—BOLT-HEADING DIE.—Joseph Kaylor, Pittsburgh, Pa
87,781.—TICKET HOLDER.—C. H. Kimball, Chelsea, Mass.
87,782.—HORSE RAKE.—Joseph La Croix (assignor to himself and Edmond Richards), Chicopee, Mass.
87,783.—DEVICE FOR STEAM AND OTHER ENGINERY.—Peter Lear, Boston, Mass.
87,784.—REVERSIBLE DOOR LATCH.—Thomas Lyons, Hartford, assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
87,785.—DOOR HOLDER.—Emmons Manley, Marion, N. Y.
87,786.—TABLE CUTLERY.—Samuel Mason (assignor to Beaver Falls Cutlery Company), Beaver Falls, Pa.
78,787.—TABLE CUTLERY.—Samuel Mason and Edward Binns (assignors to Beaver Falls Cutlery Company), Beaver Falls, Pa.
77,788.—LAST.—A. W. Merritt, Scituate, Mass.
87,789.—STEAM-ENGINE PISTON PACKING.—T. R. Morgan, Pittsburgh, Pa.
87,790.—GRATE.—James Old, Pittsburgh, Pa.
87,791.—SKATE.—J. W. Post, Castile, N. Y. Antedated Feb. 27, 1869.
87,792.—APPARATUS FOR RECTIFYING AND DISTILLING SPIRITS AND OTHER VOLATILE LIQUIDS.—E. F. Prentiss and T. D. Prentiss, Philadelphia, Pa.
87,793.—PREPARATION FOR POLISHING METALLIC SURFACES.—C. M. Rowley, Chicago, Ill.
87,794.—DOOR BELL.—C. W. Saladee, Circleville, Ohio.
87,795.—GLASS MOLD.—J. C. Schaffer, Rochester, N. Y.
87,796.—AUGER BIT.—Henry L. Shailer, Deep River (Saybrook), Conn.
87,797.—FRUIT BASKET.—Daniel Sherwood and G. D. Dudley, Lowell, Mass.
87,798.—POULTRY COOP.—W. J. Sloan, Smith's Ferry, Pa.
87,799.—SKATE.—Phineas Smith, New York city. Antedated Feb. 27, 1869.
87,800.—SIGNAL LIGHT FOR STREET CARS.—John Stephenson, New York city.
87,801.—FLY TRAP.—J. E. Stone, Erving, Mass.
87,802.—MEDICAL COMPOUND.—Paul Oscar Robert Stroinski, Boston, Mass.
87,803.—MACHINE FOR VARNISHING FLOOR OILCLOTHS.—C. W. Strout, Hallowell, Me.
87,804.—PHOTOGRAPHIC ALBUM.—J. F. Tapley, Springfield, Mass.
87,805.—CASTING ROLLS.—R. C. Totten, Pittsburgh, Pa.
87,806.—FULLING MILL.—J. H. Waite (assignor to himself, Rodney Hunt, and D. B. Flint), Orange, Mass.
87,807.—HORSE HAY FORK.—C. E. Warner, Syracuse, N. Y. Antedated March 12, 1869.
87,808.—STOVEPIPE SHELF.—J. J. Watson and W. S. Pugh, Coatesville, Pa.
87,809.—COFFEE AND TEAPOT HANDLE.—William Westlake, Chicago, Ill.
87,810.—THREAD GUARD FOR SPOOLS IN SEWING MACHINES.—Geo. Wheelock, Washington, D. C.
87,811.—CORN SHELLER.—W. H. Whiterow and Wm. Detrick, New Albany, Ind. Antedated March 2, 1869.
87,812.—MANURE DRAG.—Daniel Wingenroth, Ephratah, Pa.
87,813.—STEAM-ENGINE VALVE GEAR.—Thomas Wosser, San Francisco, Cal.
87,814.—BREECH-LOADING FIREARM.—George T. Abbey, Chicago, Ill.
87,815.—ATTACHING CARRIAGE HUBS TO AXLES.—L. Adams, Amherst, Mass.
87,816.—BIT STOCK.—A. S. Alden, Chicopee, Mass.
87,817.—HARVESTER RAKE.—Ezra Ames, Austin, Minn.
87,818.—RAILWAY CAR AXLE.—John Armstrong, New Orleans, La.
87,819.—HARROW.—A. H. Ballagh, Westport, Mo.
87,820.—COMPOUND FOR DESTROYING WORMS ON PLANTS.—D. A. Bingaman, Jersey Shore, Pa., administrator of the estate of Joseph Bingaman, deceased.
87,821.—FOOD FOR DOMESTIC ANIMALS.—M. S. Bringier, Ascension parish, La.
87,822.—SKATE SHARPENER.—J. F. Cameron, Brooklyn, N.Y.
87,823.—CARRIAGE WHEEL.—J. Coney, South Boston, Mass.
87,824.—WHEEL CULTIVATOR.—W. F. Coulter, G. Coulter, and J. A. Lanery, Hardinsburg, Ind.
87,825.—CORN PLANTER.—W. H. Cox, Virden, Ill.
87,826.—MACHINE FOR POLISHING NEEDLES.—C. O. Crosby, New Haven, Conn.
87,827.—VOLUTE SPRING.—M. R. Dand, Philadelphia, Pa.
87,828.—PUMP.—L. H. Davis, Newark, Del.
87,829.—FULL-LEAF EXTENSION TABLE.—J. Dourson, Columbus, Ohio.
87,830.—BRICK MOLD.—T. Ellis and W. A. Ellis, Philadelphia, Pa.
87,831.—HAND DUMPING CART.—Wm. Farmer, New York city.
87,832.—MOLDING SASH WEIGHTS.—W. Ferguson and James Anderson, New York city.
87,833.—SPINDLE WRENCH.—J. B. Fink, Freeport, Ill.
87,834.—LOCK FOR PIANOS, ETC.—E. F. French, New York city.
87,835.—ELECTRO-MAGNETIC ENGINE.—C. J. B. Gaume, New York city.
87,836.—WHIP MOUNTING.—J. R. Gillet, Westfield, Mass.
87,837.—LIQUID METER.—O. Gilmore, Raynham, Mass.
87,838.—BRICK KILN.—J. K. Good, Pequa township, Pa.
87,839.—DEVICE FOR OPERATING GATES.—David G. Goodall, Beloit, Wis.
87,840.—AIR TIGHT CAN.—W. J. Gordon, Philadelphia, Pa.
87,841.—MACHINE FOR MOLDING PAPER COLLARS.—S. S. Gray, Boston, Mass., assignor to American Molded Collar Company.
87,842.—GATE.—W. H. Griscom, Salem, N. J.
87,842.—TOWEL DRYER.—S. E. Grout, West Concord, Vt.
87,844.—DEVICE FOR PULLING HOP POLES.—O. B. Hale, Malone, N. Y.
87,845.—HARROW.—G. Heffner, Homer, Iowa.
87,846.—CAR HEATER AND VENTILATOR.—E. Himrod, Dunmore, Pa.
87,847.—WAGON BRAKE.—J. Hoke, Cordova, Ill.
87,848.—HARNESS CONNECTION FOR LOOMS.—John Taylor Holden, Elmwood, R. I.
87,849.—MOSQUITO NET.—J. B. Holmes, Philadelphia, Pa.
87,850.—PREPARING FARINACEOUS FOOD.—E. N. Horsford, Cambridge, Mass.
87,851.—MILK-COOLING APPARATUS.—I. Houghtling, Houghton, Mich.
87,852.—HUB BORING MACHINE.—F. Jonas, Freeport, Ill.
87,853.—MOSAIC FLOOR.—J. G. Kappes, New York city.
87,854.—BUTTON.—M. R. Kenyon, Providence, R. I.
87,855.—PLANTER AND SEEDING MACHINE.—S. S. Kimball (assignor to himself and J. F. Prescott), Laconia, N. H.
87,856.—HUSKING THIMBLE.—H. J. Kinsz, Greece, N. Y.
87,857.—LANTERN.—T. Langston, Brooklyn, N. Y.
87,858.—PROCESS OF EXTRACTING SACCHARINE JUICES FROM CANES.—H. S. Lewis, Chicago, Ill., assignor to himself and O. H. Tobey, New York city.
87,859.—SAIL CRINGLE.—C. Lucas, Brooklyn, N. Y.
87,860.—FEATHERING PADDLE WHEEL.—W. R. Manley (assignor to himself and W. H. Webb), New York city.
87,861.—FEATHERING PADDLE WHEEL.—W. R. Manley (assignor to himself and W. H. Webb), New York city.
87,862.—MACHINE FOR MAKING SE MLESS TUBING.—John McCloskey, New York city.
87,863.—RIVET TOOL.—Joel Miller, Swedesborough, N. J.
87,864.—BRIDLE BIT.—J. H. Minnich, Tuscarawas, Ohio.
87,865.—GRAPPLE FOR TUBES.—S. R. Mix and M. D. Wilder, La Porte, Ind.
87,866.—TRUCK FOR PLOWS.—J. G. Moore, Kingston, Ohio.
87,867.—DOOR SPRING.—E. L. Morse, St. Louis, Mo.
87,868.—WATCHMAKERS' TOOL.—C. E. Murray, Lock Haven, Pa. Antedated March 12, 1869.
87,869.—GAITER BOOT.—Emile Nougaret, Newark, N. J.
87,870.—ATTACHING TUGS TO WHIFFLE TREES.—C. H. Nye, Elizabethport, N. J.
87,871.—STUMP EXTRACTOR.—B. Oliver and M. L. Oliver, Brooklyn, N. Y.
87,872.—HARROW.—G. W. Pense and C. E. Lykke, Franklin Grove, Ill.
87,873.—RAILWAY RAIL SPLICE.—Perry Prettyman, Paradise Spring Farm, Oregon.
87,874.—THRESHING MACHINE.—G. M. Rhoades, Hamilton, N. Y., and G. B. Hamlin, Willimantic, Conn.
87,875.—FRUIT BOX.—A. T. Robinson and J. Shepard, Bristol, Conn. Antedated March 12, 1869.
87,876.—FIRE TONGS.—D. R. Russell, Carrollton, Miss.
87,877.—SPINNING MACHINE.—A. L. Sayles, Pascoag, R. I., assignor to E. C. Cleveland and J. M. Bassett, Worcester, Mass.
87,878.—CELLAR FOR PRESERVING BEER.—R. Schmid, Chicago, Ill.
87,879.—MORTISING MACHINE.—H. Selick (assignor to Geo. S. Meyers), Lewiston, Pa.
87,880.—OIL BOX FOR CAR AXLES.—Jacob F. Sharp, Wilmington, Del.
87,881.—SHEET METAL ROOFING.—J. H. Shimmons (assignor to himself and S. R. Mayberry), Lawrence, Kansas.
87,882.—CAR COUPLING.—Thomas B. Smith and Acanthus Hinchman, Pleasant Hill, Mo.
87,883.—THRESHING MACHINE.—Wm. H. Smith, La Crosse, Wis.
87,884.—PORTABLE FIREPLACE.—Alvah J. Sprague, Springfield, Mo.
87,885.—COMBINED PLANTER AND CULTIVATOR.—W. C. Switzer, Nelsonville, Texas.
87,886.—STEAM HEATING APPARATUS.—William H. Towers, Boston, Mass.
87,887.—TOY GUN.—Edward Trask, Fitchburg, and Chas. T. Ford, Salem, Mass. Antedated March 5, 1869.
87,888.—STEAM ENGINE OSCILLATING VALVE.—A. Trew, Union City, Ind.
87,889.—FURNACE FOR MAKING IRON AND STEEL.—J. G. Trotter, Newark, N. J.
87,890.—APPARATUS FOR EVAPORATING SALT.—Andrew Van-Horn, Brooklyn, N. Y.
87,891.—CIRCULAR SAW.—Jacob Weible and Henry S. Robinson, Detroit, Mich.
87,892.—DITCHING PLOW.—Washington West, Pecksburg, Ind.
87,893.—RAILROAD CHAIR.—William Wickersham, Boston, Mass.
87,894.—METHOD OF PREPARING COON SKINS.—Chester Williams, Jr., Alba, Pa.
87,895.—BACKGAMMON BOARD.—N. Bangs Williams, New York city.
87,896.—HARNESS ROSETTE.—Levi C. Wilson, Albany, N. Y.
87,897.—SOLDERING IRON.—J. Dana Wyman, Fitchburg, Mass.
87,898.—LAMP BURNER.—Joseph Bell Alexander, Washington, D. C.
87,899.—THILL COUPLING.—William S. Appleget, Cranberry N. J.
87,900.—BRANCH JOINT FOR WROUGHT-IRON WATER PIPES.—Phinehas Ball, Worcester, Mass.
87,901.—POTATO DIGGER.—William Beaty, Pontiac, Mich.
87,902.—HORSE HAY FORK.—Wilson H. Berdan, York, Mich.
87,903.—VESSEL FOR MAKING COFFEE.—Alfred Berney, Jersey City, N. J.
87,904.—MILK STRAINER.—A. A. Bingham (assignor to himself and Geo. McNamee), Cooperstown, N. Y.
87,905.—ALARM LOCK.—Frank Brewster, Cleveland, Ohio.
87,906.—VENTILATOR FOR RAILROAD WATER CLOSETS.—F. H. Brown, Chicago, Ill.
87,907.—DOOR AND GATE LATCH.—Louis Brumbach, Reading, Pa.
87,908.—SAWING MACHINE.—John Casson, Parish of Sheffield, England.
87,909.—ICE-CREAM FREEZER.—J. R. Champlin, Laconia, N.H.
87,910.—SAW.—William Clemson, Middletown, N. Y.
87,911.—DEVICE FOR PROTECTING YOUNG PLANTS AGAINST WORMS.—J. W. Colburn, Rose, N. Y.
87,912.—PUMP.—Geo. Cowing, Seneca Falls, N. Y., assignor to himself, John P. Cowing, Philo Cowing, and Marshall Cowing.
87,913.—CARRIAGE WHEEL.—Charles Cummings, Providence, R. I.
87,914.—POTATO AND CORN CULTIVATOR.—John M. Davidson Pulaski, Pa.
87,915.—SCREW NOZZLE FOR CANS.—Fred. W. Devoe, New York city.
87,916.—HEEL STIFFENING.—Alfred B. Ely, Newton, Mass.
87,917.—STEAM BOILER FURNACE.—Wm. Ennis, Philadelphia Pa.
87,918.—GARBAGE BOX.—J W Evans and G. F. Godley, New York city.
87,919.—ROD OF CONNECTED HOOK-BLANKS FOR GAS-FITTERS' USE.—John Fellows and James W. Lyon, Brooklyn, N. Y.
87,920.—CORN SHELLER.—Philo Ferrier, Ypsilanti, Mich.
87,921.—WHIP-SOCKET AND REIN HOLDER COMBINED.—J. R. Finney, Youngstown, Ohio.
87,922.—GAS BURNER.—Conrad Franz, Cincinnati, Ohio.
87,923.—CULTIVATOR.—James C. French, Monmouth, Ill.
87,924.—MACHINE FOR CUTTING NAILS.—John C. Gould, Oxford, N. J.
87,925.—COOKING STOVE.—James Greer and Rufus I. King, Dayton, Ohio.
87,926.—CARRIAGE WHEEL.—David Grim, Pittsburgh, Pa.
87,927.—CARRIAGE JACK.—J. H. Hadley, Boston, Mass. Antedated March 12, 1869.
87,928.—ROTARY STEAM ENGINE.—S. H. Hamilton, Bushnell, Ill.
87,929.—LATHE FOR TURNING SPOOLS.—J. T. Hawkins (assignor to Holt, Hawkins & Co.), Annapolis, Md.
87,930.—MACHINE FOR DAMPING, ETC., CLOTH.—Wm. Hebdon, New York city.
87,931.—TRUNK LOCK.—Louis Hillebrand, Philadelphia, Pa.
87,932.—SUPPORTING BANDAGE.—Ernst F. Hoffman, New York city.
87,933.—CHAIR FOR BABIES.—Carl Holtz (assignor to himself and Chas. Magnus), New York city.
87,934.—FLOUR SACKER.—C. B. Horton, Sand Bank, N. Y.
87,935.—TRUCK FOR MOVING PIANOS.—John Hoyt (assignor to Chas. French), Davenport, Iowa.
87,936.—VELOCIPEDE.—N. W. Hubbard, New York city.
87,937.—MANUFACTURE OF VEGETABLE PARCHMENT.—E. P. Hudson, New York city.
87,938.—HEAD PAD FOR HORSES.—Daniel K. Humphrey Buffalo, N. Y.
87,939.—HAND TRUCK.—Henry C. Ingraham, Tecumseh, Mich.
87,940.—BRACE FOR BITS.—W. A. Ives, New Haven, Conn.
87,941.—MECHANICAL TYPOGRAPHER.—Chas. F. Johnson, Jr., Owego, N. Y.
87,942.—INNER SOLE FOR BOOTS.—Charles P. Johnson, Jamaica Plain, and Freeman K. Sibley, Auburndale, Mass.
87,943.—SLEIGH.—C. P. Kimball, Portland, Me.
87,944.—FLOOD GATE.—Abraham L. King, Farmersville, Ohio.
87,945.—ANIMAL TRAP.—George W. Kintz, Rochester, N. Y.
87,946.—SURGICAL INSTRUMENT FOR CONVEYING MEDICATED POWDERS, AND DEPOSITING THEM ON INTERIOR CAVITIES.—Adolphe Marie Albin Laforgue, Caen, France.
87,947.—SEED SOWER.—James L. Linderman, Rockford, Ill.
87,948.—BED BOTTOM.—R. O. Lowrey, Salem, N. Y.
87,949.—THRESHING MACHINE.—Jacob Lutz, John A. Eberly, and Henry Becker, East Cocalico township, Pa.
87,950.—LITHOGRAPHIC PRINTING PRESS.—Auguste Hippolyte Marinoni, Paris, France, assignor to Richard M. Hoe.
87,951.—CULTIVATOR.—T. J. Marinus, Independence, Iowa.
87,952.—CARPET-CLEANING MACHINE.—William McArthur, Philadelphia, Pa.
87,853.—DEVICE FOR LOCKING NUTS.—Harvey McCown, Enon Valley, Pa.
87,954.—TWINE CUTTER.—S. F. McGowan, New York city.
87,955.—MACHINE FOR MAKING CIGARS.—John McKee and Thomas W. Fletcher, New York city.
87,956.—SAW SET.—John Merrill, Freeport, Me.
87,957.—LAMP BRACKET.—Charles H. Miller, Buffalo, N. Y. Antedated November 25, 1868.
87,958.—DOOR PLATE AND ALARM.—Charles H. Miller, Buffalo, N. Y. Antedated March 2, 1869.
87,959.—LIQUID METER.—John Minor, Peoria, Milton W. Nesmith and George W. Nesmith, Metamora, Ill.
87,960.—SAP SPILE.—Paige Morrison, Starksborough, Vt.
87,961.—MEAT CUTTER.—Gardner Mosman, Boston, Mass. Antedated March 4, 1869.
87,962.—SODA FOUNTAIN.—David Neff, Henry county, Ind.
87,963.—HARVESTER RAKE.—Aaron Palmer and Charles W. Palmer, Brockport, N. Y.
87,964.—MACHINE FOR MAKING CORDAGE.—Isaac E. Palmer, Hackensack, N. J.
87,965.—PREPARATION OF COCOA.—Peter Pearson, Leeds, Great Britain.
87,966.—DUMPING CAR.—Alois Peteler, New Brighton, N. Y.
87,967.—PENCIL SHARPENER.—Charles C. Plaisted, Hartford, Conn.
87,968.—COMPOSITION FOR WELDING IRON AND STEEL.—J. B. Rand, Concord, N. H.
87,969.—STOVE DOOR HANDLE.—William F. Redding, Saratoga Springs, N. Y.
87,970.—DEVICE FOR FEEDING CATTLE DURING TRANSPORTATION.—William Reid, Granton, Scotland.
87,971.—STILL.—George W. Robson, Cincinnati, Ohio, and Melvin T. Hughes, Paris, Ky.
87,972.—GAS PLIER.—Herrmann Richter, New York city.
87,973.—SADDLE LOOP FOR HARNESS.—James M. Roe (assignor to himself and J. R. Torrey), Worcester, Mass.
87,974.—RECESSING TOOL.—Joshua Rose, New York city.
87,975.—CLEANING COTTON AND OTHER SEEDS.—Thomas Rowe, New York city.
87,976.—PORTABLE FENCE.—A. H. Scott, Concord, N. C.
87,977.—HORSE RAKE.—J. H. Shireman, York, Pa.
87,978.—ATOMIZING APPARATUS.—A. M. Shurtleff, Boston, Mass.
87,979.—HORSE HAY FORK.—Emanuel Huoncker, Bethel, Pa.
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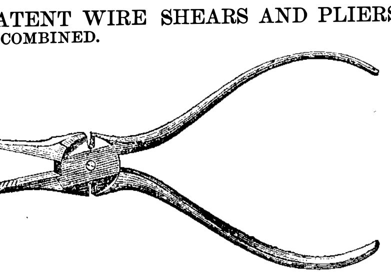

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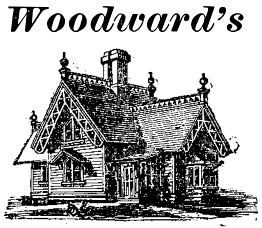

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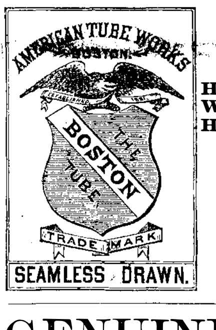

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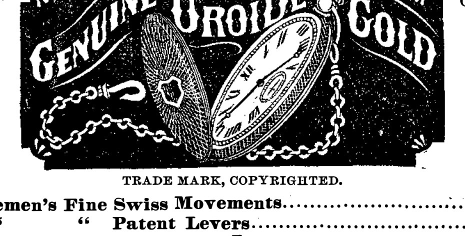

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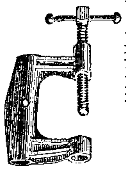

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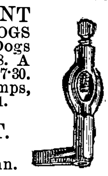

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(Works at Worcester, Mass.) 98 Liberty st., New York
4 tf

WARD'S PATENT SPOKE MACHINES. The Best in Use. State, County, and Town Rights for sale. Also, Machines manufactured by WILLIAM B. LEWIS & CO., at Naugatuck, Conn. Send for circular.
10 16*

PAPER BAG Machines For Sale. Address
4 26* B. S. BINNEY, 64 Kilby st., Boston.

PARKER'S POWER PRESSES.

THESE PRESSES are what are universally known as the "Fowler Press," improved, and *are without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. We have just received

A GOLD MEDAL

From the New Hampshire Art and Mechanics' Association, it being the FIRST PREMIUM awarded on Presses, and was given us over

STILES' POWER PRESS.

☞ Notice is hereby given that ALL PRESSES having an Eccentric Disk on the Crank Shaft, are direct infringements of our Patent, April 13, 1858, reissued Feb. 9th, 1869, and all parties are hereby cautioned against buying or using said Presses without our permission.

PARKER BROTHERS,
West Meriden, Conn. 11 26*

Stiles' Patent Power Press,

MANUFACTURED AT MIDDLETOWN, Conn., and conceded by all to be the best Punching Press ever devised. We have not yet found it necessary to purchase

A GOLD MEDAL

To make it sell; but we have found it necessary to bring suit for infringement, and we hereby give

NOTICE

That last fall we commenced suit against PARKER BROTHERS, of Meriden, Conn., for infringement of our Patent; that, SINCE SAID SUIT WAS COMMENCED, said Parker Brothers have hunted up and purchased an old patent, granted in 1858, for rolling taper blanks. This they have procured to be reissued (Feb. 9, 1869,) in the VAIN HOPE of defeating our rights. Trial will be had in April, when our Counsel assures us, our patent will be triumphantly sustained. Meantime all parties are hereby cautioned against purchasing or using the Parker Press, having an eccentric disk on the crank shaft for the purpose of adjusting the punch.

N. C. STILES,
13 2 Middletown, Conn.