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The Joslyn Tomes Breech Loading Rifle.

We are sure that experts who examine this gun will coincide with us in the opinion that few, if any, superior arms have been produced. Its simplicity, ease of manipulation, compactness, and finish, at once arrest attention. Upon close examination it will be seen that the parts are remarkably few, and that they are so arranged in their combination that all may be made extremely strong and durable. Every part is readily accessible for cleaning, and at the same time, when the parts are put together, they form a solid, substantial, and admirable piece of mechanism.

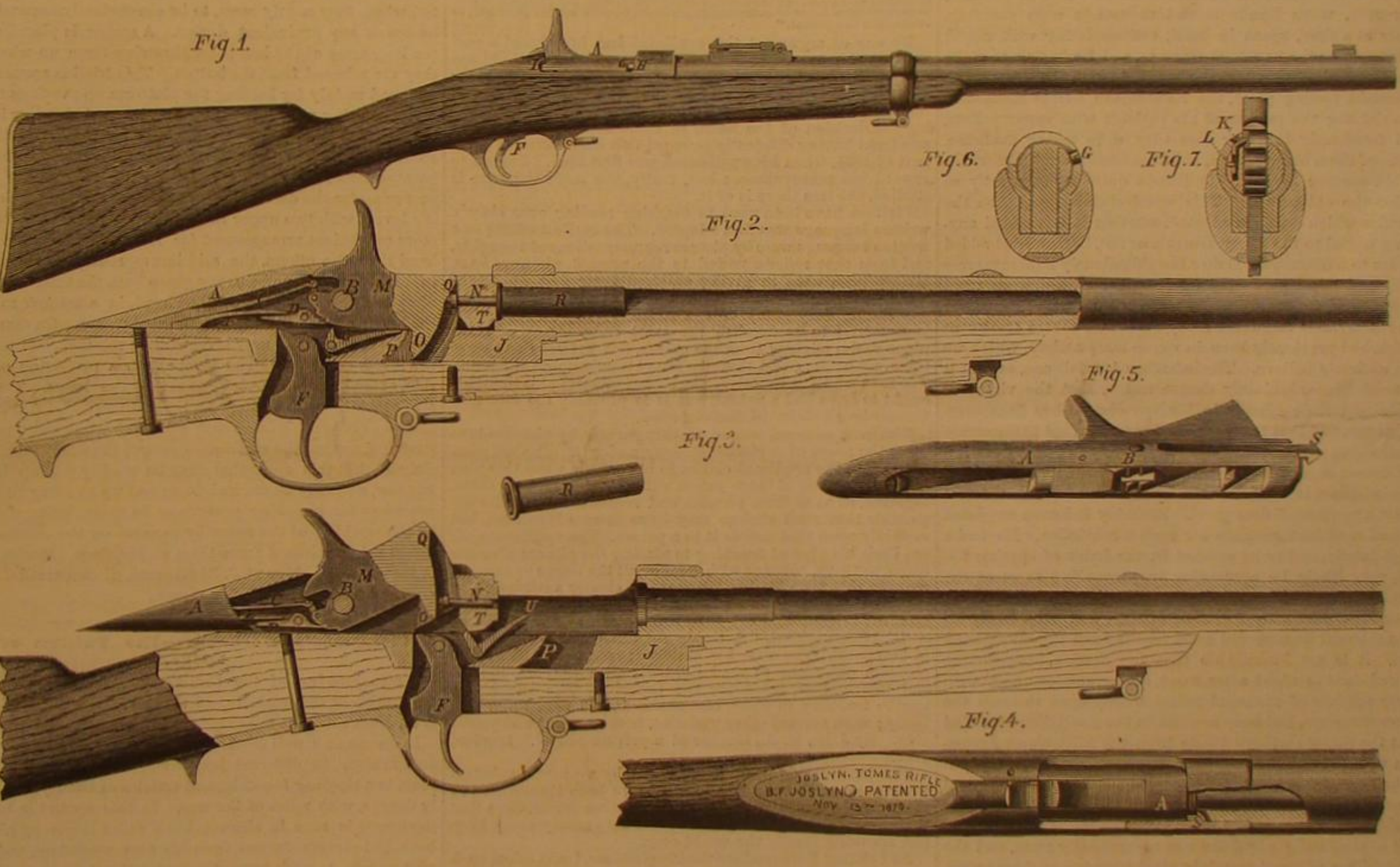
Fig. 1 is a perspective view of the gun. Fig. 2 is a sectional view, showing the position of the parts at the moment of firing, and as they remain till the breech is again opened to insert the cartridge. Fig. 3 is a sectional view showing the breech opened to receive the cartridge, and also showing the office of the sear, is sufficiently obvious without description.

This breech piece slides backward and forward in loading the gun, its motion being limited by the stop screw, G, Figs. 1 and 6, which, when the piece is closed, rests against the shoulder, H, Fig. 1, and when the piece is opened rests against the shoulder, I. By taking out the screw, G (only the work of a moment), the breech piece may be taken entirely out, as shown in Fig. 5, for cleaning, oiling, etc., and replaced as quickly as taken out.

The breech piece slides in a socket formed on the receiver, J, Figs. 2 and 3, which receiver is suitably fastened to the stock, and to the front end of which the rear end of the barrel is secured. If desired the receiver and socket may be made in one piece with the barrel.

When the breech piece is slid into the position shown in discharged in the manner described, they are extracted from the barrel by a spring catch or extractor, S, Figs. 4 and 5, which, when the breech piece is closed, engages the rim of the cartridge; and when the breech piece is drawn back, draws the spent cartridge back. When thus drawn back, the part, T, of the breech piece strikes upon the short arm of the bell crank lever, U, as shown in Fig. 3, and throwing up the long arm of the lever, throws out the spent case with considerable force.

The essential parts of the mechanism being thus described, we will now describe the manipulation, premising that only four movements are necessary to load and discharge the gun. First, the thumb seizes the comb of the hammer and draws it back to a little more than full cock, which releases the sliding breech piece; and, continuing the pull, draws back the breech piece to the position shown in Fig. 3.



THE JOSLYN TOMES BREECH LOADING RIFLE.

the cartridge as it appears when thrown out by the action of the ejector. Fig. 4 is a top view of the breech piece and a small portion of the barrel, the latter broken away to show the cartridge in position, and the way in which the extractor seizes the cartridge. Fig. 5 is a perspective view of the breech piece as it appears when taken out of the socket and held with its under side turned partly upward and outward toward the observer. Fig. 6 is a cross section through the stock and barrel, and through the stop screw, G, described below, illustrating the manner in which this screw is inserted. Fig. 7 is a cross section through the stock, receiver and breech piece, just behind the hammer, made to show the spring catch which holds the breech piece when the hammer is let down from full cock to half rest or full rest.

The chief points which distinguish this arm are as follows: The sliding breech piece carries the hammer, the mainspring, and sear, and sear spring; and the hammer performs the threefold office of striking the firing pin in exploding the cartridge, of locking the breech piece in place in discharging the gun, and acting as a medium for operating the breech piece.

The breech piece shown in Fig. 5, and lettered A, in Figs. 1, 2, 3, and 4, consists of a cylinder beveled at the rear to suit the conformation of the stock.

A vertical slot through this breech piece is formed for the reception of the hammer, which is attached to the breech piece by a strong pivot, B, Figs. 2, 3, and 5. This slot also contains the mainspring, C, and the retaining and releasing catch or sear, D, together with its spring, E. F is the trigger, the action of which upon the sear, D, in firing, as well as Figs. 1 and 2, it is held by the spring catch pin, shown in detail in Fig. 7, where L represents the spring carrying the catch pin, K. This pin holds the breech piece while the hammer is cocked, but is depressed by the back lash or slight motion of the hammer beyond the full cock so as to release the breech piece. This arrangement allows the hammer to be let down to half rest, or full rest, without releasing the breech piece, or discharging the gun, as the breech piece is only freed from the engagement of the spring catch when the hammer is drawn slightly past the full cock. This catch, however, does not hold the breech piece so firmly that it may not be readily drawn back by the hand.

When the hammer, M, descends to the position shown in Figs. 1 and 2, which it must do in order to strike the firing pin, N, and discharge the piece, the projection or hook, O, Figs. 1 and 2, formed on the nose of the hammer, enters the recess, P, in the receiver, J, and firmly locks the breech piece to the receiver.

The hammer projection or hook, O, enters the recess, P, at half cock, and thus the breech piece is locked before the slight projection, Q, strikes the firing pin, N, Figs. 2 and 3.

This firing pin passes through a hole in the front end of the breech piece, as shown, and by the action of the hammer is driven forcibly against the center of the base of the cartridge, R, as shown in Fig. 2.

The head of the firing pin plays in a cam groove formed in the front face of the hammer, and is thus held away from the cartridge at all times, except when the hammer has descended to nearly full rest.

The cartridges used are metallic, with center fire; and when Second, the cartridge is laid into the receiver.

Third, the breech piece is thrust back to the position shown in Figs. 1 and 2, which inserts the cartridge into the barrel.

Fourth, the trigger is pulled which discharges the piece in the manner above indicated.

The movements are all simple and rapidly accomplished, making this one of the most rapid firing arms we have seen as well as one of the most positive and certain in its action.

The first movement cocks the hammer, throws out the cartridge, and draws back the breech, the whole being accomplished as rapidly as the operator can move the thumb through the distance required.

To put in the cartridge, slide back the breech piece, and pull the trigger, including the first movement, takes about the time in which one may moderately count four. The piece may be easily fired twenty five times per minute.

The gun may be left at half cock, when it is desired not to fire the piece, by pulling the trigger and lowering the hammer. From this position it may be cocked and fired without drawing back the breech piece, as the spring pin, L, holds it sufficiently firm to allow the hammer to be cocked.

No premature discharge is possible; the breech piece is always locked before the hammer can touch the discharging pin.

This arm was patented November 15, 1870, by B. F. Joslyn, and, to distinguish it from his other firearms, is known as the Joslyn Tomes gun. Address, for further particulars, Tomes, Melvain & Co., manufacturers and importers, No. 6 Maiden Lane, New York.

Does the Internal Administration of Drugs ever Defeat Disease and Death?

Mr. E. P. Buffett, in the September number of *Lippincott's Magazine*, has a very readable essay entitled "Shall we throw Physic to the Dogs?" The reasons he gives why we should do so, are such, we think, as will prompt humane men to say we should from benevolent motives throw physic to something it will neither nauseate nor injure, and let the poor dogs, abused enough now, escape an additional burden. From the article in question, we quote the following extract:

One fact in the history of medicine might well stagger the faith of the most confident believer in the virtue of drugs. It is the coexistence of two systems of practice, professedly antagonistic, each denouncing the other as absolutely ineffective or positively harmful, yet both apparently flourishing, both having enthusiastic and intelligent advocates. At a time when human blood was flowing in streams both large and small, not from the sword, but the lancet—when men believed that their temporal salvation depended on being scarified, cupped, leeched, and venesected—an impudent Teuton, Hahnemann by name, broached the insane idea that patients could recover with less bloodshed, or even with none at all; and, strange to relate, they did so recover with unmutilated integuments, and, so far as human eyesight could determine, just as well unscarified as the reverse. At a time when no fact was better established in medicine than that in certain cases blisters must be applied to the shaven scalp and to the spine of the back, and to the calves of the legs, this same German said to his tender skinned followers, "do not blister," and they persisted in recovering without blisters, but in direct violation of the orthodox rules of practice. Moreover, when hundreds and thousands were standing, hours at a time, spoon in hand, contemplating with rueful countenances the nauseous contents, and hesitating to make the dreadful plunge which should deposit the dose in its uncertain resting place, the Hahnemann before mentioned was tickling the palates of his patients with sugar pellets, and facetiously insisting that they were taking medicine. Some of them believed him, and from some inexplicable cause would recover from their ailments quite as frequently as under the old *régime*. This wonderful burlesque on the practice which Solomon adopted, whether it has added anything useful to the Pharmacopœia or not, has at least added a horn to a dilemma. Either the ridiculously mild measures and small doses were useful and effective—which we must be pardoned for saying we do not for a moment believe—or the ridiculously large and filthy doses and severe treatment which had previously been in vogue were useless, which we just as firmly believe. The inference is a fair one, even if it has not been absolutely demonstrated, that the virtue of drugs and their efficacy in healing disease has been overestimated, and that recoveries had been ascribed to the action of medicine which were due to an entirely different cause.

Solomon says: "A merry heart doeth good like a medicine." The inference is unmistakable. The wise monarch thought that "a medicine" does good. Probably Solomon supposed he had sufficient grounds for such a conviction. He had a large family, and as he was not in the habit of sparing the rod, very likely he succeeding in persuading some of the juvenile members to swallow certain unpalatable doses which he thought necessary for their health; and very likely he then thought he observed good results from the administration. It is not improbable that the Jewish king, having retired for the night after some sultry summer day, with every window of the royal palace widely open to catch the faintest zephyr, had been aroused in the small hours to find that the chilly northern blasts from the hills about Jerusalem were driving in at the open casement, and that the infant Rehoboam, from his trundle bed, long before the matutinal hour, was vigorously crowing with spasmodic croup. No doubt then, as would be the case at the present day, the door bell of the family physician was energetically rung, and the future hope of Israel was duly plied with ipecac, hive syrup, blisters, and sinapisms. The boy surviving the treatment, the father then, as parents do now, would forever afterward triumphantly point to the white headed urchin as a living monument to prove both the skill of the family physician and the value of hive syrup and ipecac. Doubtless, under some inspiration of this kind, Solomon assumed that there could be no question that medicine does good.

We make no pretension to any greater wisdom than Solomon on general subjects, but we do think that if he were living at the present day he would very carefully reconsider the proverb we have quoted. He undoubtedly had a family physician who was a regular practitioner, who frowned upon all patent medicines, who had never learned the value of infinitesimals, and who treated his patients in the original heroic style. Solomon probably believed that the medicines prescribed by his physician were orthodox, and that all others were heathenish and abominable. How would it have puzzled the wise man to have found, as we do at the present day, that not only the regular system of practice is successful, but that many other systems entirely at variance with it appear to be equally so! How would it have astonished the king to learn that his wisest and wealthiest senators and prophets were using, with immense satisfaction and apparent success, Indian vegetable pills, and the water cure, and the movement cure, and the extract of buchu, in ailments of every character and variety! How his temper would have been ruffled if the queen of Sheba on her visit had pronounced his family physician a humbug and urged his dismissal, while she offered as a present, various minute bottles of infinitesimal pilules, with glowing descriptions of their charming effect upon herself and the ladies and children of her court! But Solomon, after carefully considering the facts, would probably have drawn the inference, from the great variety of medical treatment around him, either that everything which claims to be a medicine, no matter how unskillfully applied, is just as effectual as the carefully prescribed doses of the court physicians, or that all medicines are alike ineffective and do but little good. And the new thought might gradually have dawned upon his mind that Nature or some inherent agency would just as certainly, if not as speedily, have cured the infant Rehoboam, without the aid of the officinal emetic, cathartic, or sinapism.

JONATHAN DENNIS, JR'S. APPEAL.

It is seldom that a decision emanating from a Commissioner of Patents partakes of the humorous. But Commissioner Leggett's review of the case of Jonathan Dennis, Jr., in appeal, reported below, is an exception to this common rule. Mr. Dennis is a Quaker gentleman of considerable distinction around the Patent office, and he deserves much credit for the perseverance with which he has so long prosecuted his case in the face of adversity.

APPEAL FROM EXAMINERS IN CHIEF, APRIL 28, 1871.

In the matter of the application of Jonathan Dennis, Jr., for letters patent for Improved Lessons for Teaching Reading.

LEGGETT, Commissioner.

The applicant's claim is set out in the following words:

What I claim as my inventi n and improvement in the construction and arrangement of lessons for teaching reading, is placing a picture over or with some or all the nouns or names of things in the period or sentence to be taught, to aid or enable the learner to pronounce the word from the picture. I also claim in combination with a noun and picture in a reading sentence, repeating or duplicating the noun or name of the picture between the picture and its name, in the period or sentence, in the same or in different type.

The board of examiners-in-chief reject the application on the ground that "an improvement upon an old contrivance or device, in order to be the subject of sufficient importance to support a patent, must embody some originality and something substantial in the change, producing a more useful effect and opera ion. In the opinion of the board, what the applicant claims as his invention is not of sufficient importance, in view of this principle, to entitle him to a patent."

By way of argument the applicant has introduced a vast amount of printed and written matter, and an oral address of over two hours, covering almost the whole art of teaching; all of which I have patiently listened to and carefully read, hoping to find something that would warrant me in reversing the decision of the board of examiners-in-chief, for the applicant having diligently pursued this case, since the early part of 1864, when his application was first filed, I desired to reward his perseverance; but, really, the more the case is studied, the less there is of it.

Pictures have been used in teaching reading ever since a written language was first adopted. The earliest efforts at a written language were by picture representations of thoughts, and from that remote period to the present, pictures have always been used in giving children their first notions of written language. The plan adopted by the applicant is but one among very many of the schemes adopted from time immemorial to accomplish the same ends. Each of these plans varies slightly from the others, but between no two of them, probably, could there be found a patentable difference. The man who first conceived the idea of picturing his thoughts ought to have had a patent, but it is probably too late now for any broad claim in that direction.

The most common way of teaching words by pictures is to place the name of a picture directly under it. The only improvement the applicant claims to have made upon this plan is the connecting of these names with the pictures over them, together, so as to form phrases and sentences. It is barely possible that such change may have some advantages, but certainly none that entitle it to a patent. The applicant does not limit his plan of teaching to placing the picture over the name, but says, "over or with some or all the nouns or names," etc. In this form his improvement is clearly anticipated by many books and primers published all along for the last one hundred years or more. I have before me a primer published A. D., 1762, entitled, "A Guide for the Child and Youth." In two parts. The first for children: containing plain and pleasant directions to read English; with prayers, graces, and instructions, fitted for the capacity. The second for youth: teaching to write, cast accounts, and read more perfectly; with several other varieties, both pleasant and profitable. By J. H., M. A., teacher of a private school. London, 1762."

The lessons this book first taught, by a process substantially the same as the applicant's, have been transmitted in the New England Primer, and various other forms, from that time to this, and probably have gone into nearly every English speaking family the world over.

As I cannot here produce the illustrations, I will select such examples as will most readily recall to memory the pictures by which they are taught:

> "In *Adam's* fall
> We sinned all."
>
> This *book* attend
> Thy life to mend."
>
> "The *cat* doth play
> And after slay."
>
> "The *dog* doth bite
> A *thief* at night."
>
> "The idle *fool*
> Is whipped at school."
>
> "My *book* and *heart*
> Shall never part."
>
> "*Zaccheus* he
> Did climb the *tree*
> His Lord to see," &c., &c.

Here the words Adam, book, cat, dog, thief, fool, book and heart, Zaccheus and tree, are all so marked by the type in which they are printed as to refer to the picture which is found "with" each couplet. These pictures not only distinctly illustrate the works marked, but also fully suggest the thought intended to be expressed by the couplet, thereby accomplishing the whole object of applicant's device, and more too, and by a plan substantially the same.

This kind of instruction, for generations past, has constituted a part of nearly every nursery library; and at this late date, amid all our efforts to make knowledge free, to give the applicant a monopoly of this mode of teaching for the next seventeen years, and thereby either deprive the nursery maids of this agreeable mode of instructing the little ones committed to their charge, or take the risks of expensive suits and heavy penalties for infringement of a patent on the process, would be an outrage of which the Patent Office certainly ought not to be guilty. The decision of the board of examiners-in-chief is therefore affirmed.

Fire Escapes.

A pair of small cranes with bed or base pieces are adapted for resting across the window sill, and screwing thereto to hold the said cranes in the proper working position by means of the projections at the outer ends, and screws at the inner ends, the latter screwing through the bent ends of the base pieces against the sill under the rib or projection of the latter. These cranes are connected together for the purpose of steadying them by a bar, pivoted to one, and hooking on a stud pin on the other; also by a bar pivoted to one and detachably connected to the other by a bolt or pin; but the said bars may be connected in any suitable way to render them readily detachable, so that the apparatus may be readily put up or be taken down and packed for removal. These cranes have pulleys suspended from the upper ends in any suitable way for suspending a carriage by means of ropes. The ropes are attached to a ring connecting them with four chains, holding the platform by each corner; thence the said ropes pass up over the pulleys and down through tubes, the former being supported vertically on a frame, slightly above the platforms, and the latter on the platform below, in the same vertical lines with the others; from these latter the ropes extend to the ground, being long enough to reach the ground when the platform has been let down to it. These tubes are employed as a means of holding the ropes so that they may be readily clamped by friction apparatus for regulating the descent. In the lower tubes the ropes are clamped by crooked levers which project through holes in the tubes and press the ropes against the inner wall of the tubes; the levers being pivoted to the bottom of the platform, where they pass through it and extend along the upper side toward the center, where they nearly meet, to be conveniently secured by a button or any equivalent device. A spring is placed under the long arms of the levers for throwing them up whenever they are released from the button. This friction apparatus is designed mainly for holding the platform up previous to and while entering upon, but it may also be used alone or in connection with other friction apparatus for regulating the descent. The inventors prefer, however, to employ other apparatus alone, using this merely to hold the carriage while preparing for the descent. They therefore combine the clamping levers with two upper tubes in a similar manner, being a more convenient arrangement for regulating the descent by hand than the others, the said levers rising up along the tubes so that one person may grasp both the tube and lever of one side of the carriage in one hand, in a manner to force the levers against the ropes with great power. On commencing the descent the lower lever will be released, and the upper levers employed. The levers have a projection on one side, extending into the tube to act on the ropes. They are also provided with springs to throw them out. A piece of flannel or other substance that will not burn readily, may be stretched around the carriage to protect the occupants. It is claimed that this apparatus may be readily set up in any window, and may be worked down and up as many times as necessary for removing persons or baggage, being elevated by the working of the ropes by persons on the ground, the levers being released from them at the time. Messrs. John C. Hancock and Edward P. Richardson, of Somerville, Mass., are the inventors of this fire escape.

A Clergyman's Workshop---The Pastime of the Lathe.

A correspondent of the *Commercial Advertiser*, gives this description of the workshop of the Rev. John Todd, of Pittsfield, Mass.:

In one room a well stocked library with rare books, ancient and modern, in different languages. In the centre of the room is a rippling fountain, and articles of beauty from kindly donors, with relics of the war. In this study the hand of the owner is seen in elegant book cases made by himself, beautiful picture frames from his own workshop, and little adornments turned from his own lathe to adorn a room where so many hours of brain work are expended.

Directly opposite is another room of entirely different character. Here is the veritable "*Congregationalist* lathe" procured from the proceeds of his contributions to that paper, and so most aptly named, while another lathe, of great value, elegant and beautiful, is greatly prized by the owner, who points out its various graces with the enthusiasm of a collector of gems. Here is a collection of saws and screws, and clamps and planes, and vices and gouges, and mandrels, and other tools, that would confuse any but a born mechanician, while shelves of acids and chemicals for polishing, with delicate anvils and tools of great variety, are kept in perfect order. One of the lathes' appliances performs two thousand revolutions in a minute, and is as delicate and graceful in its movements as the sweep of a bird through the air. If a tool is wanted for special use, the fertile brain of the Doctor invents it, and his skilled hand brings it out of the rudest elements.

He has a great variety of beautiful woods from different parts of the world, and a steam engine so *petite* and fairy like as to call forth commendations from the dullest looker on. Everything is arranged so systematically that the owner could put his hand on any one of over a thousand tools in the dark.

FERMENTED MILK.—On the steppes of Tartary, mare's milk is an ordinary beverage of the people; and a drink called "koumiss" is made therefrom by fermentation. A similar beverage has been produced in Germany from cow's milk, and showed, on analysis, that it contained alcohol, carbonic acid, lactic acid, with butter and caseine in a minutely divided state, as well as sugar and other residues of the milk. It is stated to resemble a mixture of cream and champagne, in flavor.

Iron versus Lead Pipes.

It would be difficult, at the present moment to decide, says the *Building News*, to which term of the adage "out of the frying pan into the fire" the iron and lead pipe may respectively belong, but there is no question there is not much choice left between them. Under certain circumstances and conditions, which vary with the locality, they are both to be feared as mediums for the conveyance of water as well as gas. Let us consider the case of iron pipes first, and investigate some of the objects urged against their use, as the whole subject is one of the most serious importance to the public at large. It is alleged that iron pipes are porous, allowing their contents to escape, or literally to permeate through the molecular interstices of the material; that, moreover, they leak considerably at the joints, speedily corrode and decay, especially when laid in damp ground, and are not suited for conveying certain descriptions, of water, which is to be utilised for potable and culinary purposes.

An obvious distinction must be made between the escape of gas by direct leakage and by permeation. The fact that absolute permeation does take place is incontestable; equally so with leakage. When iron pipes are fresh laid, with new joints, in a perfectly hermetically tight condition, so that no direct leakage can take place, the ground in the vicinity nevertheless becomes in a very short time completely saturated with gas. Again, where gas pipes have been laid near wells, the water has been found contaminated by the escape of their contents. But a still more remarkable circumstance has been observed at Croydon and elsewhere. When iron pipes, some containing gas and the others water, have been laid in contiguity, the gas has been found to escape from the one pipe, and permeate through the other until it mixed with the water in it. Extraordinary as this occurrence may appear, it is readily explained in accordance with the chemical theory of the subtle diffusion of gases. It is, in fact, a species of endosmose. The gas, having once escaped from its own confinement, impregnates the ground lying about the pipes, and thus we have the pipe containing the water surrounded by gas. It therefore occupies the position of a porous medium between two fluids of different densities, and by virtue of the chemical law already alluded to, they will tend to become intermixed, with a force inversely proportional to their respective specific gravities. The remedy for this is obviously to diminish the porosity of the pipe, which may be effected, either by the employment of another material, or by coating the iron externally or internally with some description of protective paint. If this measure were effectually carried out, and the pipes protected externally, a double end would be answered. The permeation would be arrested, and the corrosion and gradual destruction of the pipes materially retarded, if not altogether prevented. It is for this reason that some of the recently laid gas pipes have been well payed over on the outside with tar. A coating of tar is no doubt better than nothing, but it is not by any means the best preservative that might be used. There are numerous patent protecting and preserving paints, and it is probable that the true solution of the problem lies in the adoption of some one of these, or in the preparation of a special description for the purpose.

With regard to the chemical action of water upon iron pipes, so far as concerns the risk of endangering its potability, it may be almost disregarded unless the water be of an unusual degree of hardness.

Ever since the famous experiment at Hamburgh, every substance has been acknowledged to be more or less porous, the degree of porosity being inversely proportional to its specific gravity. The same ratio will also represent the permeability of the substance. The specific gravity of iron is 7·7, while that of lead is 11·35, or about half more than that of the former metal. The substitution of lead pipes for iron would thus at once prevent all leakage, except directly through imperfect joints, and the occurrence of this evil could be far more easily guarded against than in the case of iron. These advantages possessed by leaden pipes, to which must be added their greater durability, and freedom from corrosion, are counterbalanced by the manner in which lead is acted upon by water, which presents very unsatisfactory and even dangerous features. If a piece of clean lead be immersed in pure water, and afterwards exposed to the air, in a very short time a white, flaky, semi-crystalline powder is formed, which is soluble in water, and, similar to all preparations of this metal, is a rank poison. One merit belongs to this poisonous contamination, which is that it is easily detected. But as pure water in the chemical sense of the term never constitutes the supply provided for towns, we must take the case of ordinary rivers and spring water of a moderate degree of softness. In this instance the same operation takes place, but in a much less observable degree. Most waters of this description contain a small proportion of sulphates, which causes the deposition of an exceedingly tenuous film of sulphate of lead upon the inside of the pipe, and thus the further formation of the poisonous salt is at once checked. Thus it is that leaden pipes and leaden cisterns are used with impunity, or apparent impunity, in numerous instances for conveying and storing water. However true theoretically this chemical protective action may be, it would obviously be in the highest degree culpable to rely upon its efficacy, when the purity of the water supply of a town was the question at issue. The third case that presents itself for consideration is when water containing a large proportion of carbonic acid is passed through leaden pipes. Under these circumstances the formation of white lead would ensue, which is soluble in water containing carbonic acid.

The conclusion to be arrived at with respect to this important question is that the mechanical advantages of lead are outweighed by its chemical disadvantages. It is well known that very soft water acts most injuriously upon this metal. Besides, lead pipes could not possibly be substituted generally for iron ones, but only on a certain scale, and under certain conditions. It is clear that local boards and the sanitary authorities of towns are placed in a dilemma. They cannot poison the inhabitants on the one hand, neither can they, on the other, permit the enormous waste and contamination of water which continually occurs. Nevertheless, the course to pursue is clear enough. Whatever may be the mechanical difficulties to overcome, whatever may be the loss by defective joints or corroded pipes, they must all be endured in preference to adopting a remedy which entails a peril to the public health, which cannot be endured. It cannot be too prominently kept in view that no amount of filtration will purify water chemically contaminated. We throw out this suggestion because we have so frequently heard the expression, "Oh, I filter my water, therefore it is all right, wherever it comes from." Filtration removes mechanically suspended impurities, but not those held in chemical solution.

Who Wants to Enjoy Good Health and a Long Life? Practical Advice by a Practical Man.

To secure a clear, fresh skin, bright eye, active limbs, a quick brain, and a cheerful, pleasant temper, and if you would enjoy a long life, you should live about as follows:

BREAKFAST.

Oat meal porridge, with milk and sugar.
Or, Graham mush, with a little good syrup.
Or, cracked wheat, with milk and sugar.
Or, baked potatoes with bread and butter.
Or, beef steak or mutton chop, with baked potatoes and bread and butter.

If you are thin, and need fat, use the first three; if you are too fat, use the last named two.

Drink cold water, or a little weak coffee.

DINNER.

Beef or mutton, roasted or stewed, with any vegetables you may like (though tomatoes should be used very sparingly), good bread and butter, and close the meal with a glass of weak lemonade. Eat no dessert, unless it be a little fruit, and eat nothing more till the next morning.

There is no rule in regard to diet about which I am so fixed in my convictions, as that nothing should be eaten after dinner, and I think that the dinner should be taken early in the day; not later, if it can be so managed, than two o'clock. In regard to the precise hour for the dinner, I am not so clear, though for myself one o'clock is the best hour; but in reference to the omission of the third meal, I have, after long observation, no doubt whatever.

Hundreds of persons have come to me with indigestion in some of its many forms, and have experienced such relief in a single week from omitting the supper, that I have, for a number of years, depended upon this point in the diet as the best item in my prescriptions for indigestion. I have never met one person suffering from indigestion, who was not greatly relieved at once, by omitting the third meal.

Eat nothing between meals, not even an apple or peach. If you eat fruit, let it be with the breakfast and dinner.

Cooked fruit is best for persons of weak digestion. I have met hundreds of people who would digest a large beef steak without a pang, but who could not manage a single uncooked apple.

I think certain dietetic reformers have somewhat overrated the value of fruit.

Avoid cake, pie, all sweetmeats, nuts, raisins and candies.

Manage your stomach as above, and at the end of ten years you will look back upon these table habits as the source of great advantages and happiness.

For thirty years I have been a constant and careful observer (I have no hobbies about diet), and in the light of my own experience and these long observations, I assure you that the table habits I have advised, are vital to your health and happiness.

Pimples, blotches, yellow spots, nasal catarrh, biliousness, liver torpidity, constipation, sleepiness, dullness, low spirits, and many other common affections would generally disappear with the adoption of these rules.—*Dio Lewis, in "Our Girls."*

[We will add, for the satisfaction of our readers, that Dr. Lewis, who here intimates that he practices what he preaches, presents in his own person about as fine an example of genial good health and wide-awake-tiveness as one ever meets.—ED. SCI. AM.

Protecting Telegraph Lines from Lightning.

Much trouble has always been experienced from lightning on a section of telegraph line between Riverside and the Stock Yards, on the Chicago, Burlington and Quincy Railroad. Poles are frequently shivered to splinters, and much other damage done during the heavy storms which occur there during the summer. About a year and a half ago, Mr. F. H. Tubbs tried the experiment of attaching a lightning conductor to each pole of this section, consisting simply of a No. 7 iron wire, one end of which was secured underneath the iron ring at the top of the pole, and the other buried in the ground, the wire making one complete turn around the pole two or three feet below the top. This simple and inexpensive precaution has thus prevented any damage whatever from lightning on the section protected, although this is the second summer it has been use, while formerly not a summer passed without several poles being destroyed in this manner. *The Telegrapher.*

INTENSE craving for food of improper kinds and at unseasonable hours, can be prevented to a great extent by drinking water.

Rocks Polished by Sand.

Dr. Kneeland, at a meeting of the Boston Society of Natural History, exhibited several specimens of glass, marble and hard stones engraved, carved and grooved by the action of sand driven by a blast of air or steam. The surface being covered with perforated paper or a stencil plate, the parts exposed by the perforations are cut rapidly and accurately, while the covered parts are untouched—protected it is supposed, by the elasticity of the paper or metal. He drew attention to this industrial process as illustrating the advantage of diffusing, as a common branch of knowledge, information on the forces of nature, and in this instance on dynamical geology. This process, which promises to revolutionize one of the most extensive of the industrial arts, is simply carrying out what natural forces have been doing to the surface rocks of our continent for ages. Sands carried by strong and steady winds passing over rocks, often wear them smooth, or cover them with grooves and scratches, as noticed and figured by Mr. Blake in the granite rocks at St. Bernardino Pass, California. Quartz rocks were there found polished, the softer feldspar being cut away; where the latter had been protected by garnets, projections were left, tipped with the hard garnets, pointing like fingers in the direction of the wind.

On the surface of the great Colorado desert, the pebbles are finely polished by the drifting sand, or variously grooved, according to the hardness of their substance. Professor J. Wyman also mentions that glass windows on Cape Cod have holes worn in them by the drifting sands blown by the winds.

It is the tendency, Dr. Kneeland remarked in conclusion, of modern education to pay less attention to the dead languages and to ancient history as a means of culture, and more to the practical and living issues of the day, and especially to combine a knowledge of natural phenomena with the elementary instruction of the schoolroom. In this particular instance it is altogether probable that, if the grooving of rocks by the wind driven sands, long known by geologists and by them turned to no practical account, had been equally well known to our intelligent and skillful mechanics, the process would have been invented years ago, and by this time have attained a high degree of perfection. The same reasoning will apply to other departments of natural and physical science, and goes to show the wisdom of those educators who are endeavoring to diffuse a knowledge of scientific principles and phenomena among the people.

The Mont Cenis Tunnel.

Numerous disparaging rumors have of late been afloat respecting the Mont Cenis tunnel. It was said that the arch had fallen in for a length of 170 feet; it was affirmed that the heat in the tunnel was insupportable, and that engine drivers had been suffocated from the smoke of the locomotives. There has never been one stone displaced from the finished arch of the Alpine tunnel, the work of which is so solidly constructed that it is well nigh as durable as the rocks themselves. The only circumstance which served as a formation for these absurd reports was the falling in of eighteen or twenty feet of work, which happened in the last days of June, at the Bardonneche end, in consequence of the falling of some scaffolding broken by the explosion of a blasting charge. In this accident two workmen were killed and five were injured.

As yet, no experiments have been made with steam working through the tunnel, but all evidence goes to show that the locomotives will fulfil all the requirements, and will do the duty well. Good ventilation is well established, and if it should be found insufficient, the compressors so long employed in the work of excavation, and which have been now idle for so long a time, can be used at both ends. The heat is not excessive; before the completion of the work it did not exceed 82 or 84 degrees, and since the piercing was completed the temperature is so moderate that the workmen have no longer any necessity for working stripped to the waist, the through draught of air creating a decided ventilation in the tunnel.—*Engineering.*

Coating Metals with Nickel.

By the invention of Mr. E. D. Nagel, of Hamburgh, iron, steel, and other oxidizable metals are coated with an electro-deposit of nickel or cobalt, in the following manner: The inventor takes 400 parts by weight of pure sulphate of the protoxide of nickel by crystallization, with 200 parts by weight of pure ammonia, to form a double salt, which he then dissolves in 6,000 parts of distilled water, and adds thereto 1,200 parts of ammoniacal solution, of the specific gravity of 0·909. The electro-deposition is effected by an ordinary galvanic current by using a platinum positive pole, the solution being heated to about 1,000° Fahr. The strength of the galvanic current is regulated according to the number of objects to be coated. For coating with cobalt 138 parts by weight of pure sulphate of cobalt are combined with 69 parts of pure ammonia to form a double salt, which the inventor then dissolves in 1,100 parts of distilled water, and adds thereto 120 parts of ammoniacal solution of the specific gravity of 0·909. The electro-deposition is effected as with the nickel process.

SOME very interesting observations have been made on the properties of gun cotton. This substance, obtained with the ordinary process used by the manufacturers of collodion, is not soluble in alcohol; but, with the addition of a little camphor, it dissolves instantaneously. A beautiful artificial ivory is prepared by powdering gun cotton with camphor, and placing it under hydraulic pressure, covering it afterwards with a mixture of gun cotton and castor oil; by this process billiard balls have been produced, which have been declared by connoisseurs to be superior to those of real ivory.

THE FOG BOW AS SEEN FROM THE MATTERHORN.

Our engraving is a representation of one of the most interesting of meteorological phenomena, as seen from one of the highest and most inaccessible of the Alpine peaks, by Mr. Edward Whymper, the sole survivor of the four Englishmen who first succeeded in ascending to its summit. It may not be amiss, before introducing Mr. Whymper's description of this remarkable sight as published in a volume entitled "Scrambles amongst the Alps" in 1860-9, to give some account of the formation of fog bows in general.

Fog bows differ only from rainbows by the extreme minuteness of the spherules from which the reflection of light takes place. Fog is composed of minute globules of water floating in air. Vapor of water is transparent, and the air in the clearest days always holds more or less of it. When, however, the earth is moist and warm, and the air above it is colder and comparatively still, the vapor arising becomes partially condensed and forms fog. The same thing takes place over bodies of water from which vapor rises into a stratum of cooler air. Clouds in their formation are fogs floating at high altitudes. It frequently happens that moist warm currents of air, rising up along the sides of mountains till they meet strata of colder air, become chilled and the vapor they contain becomes condensed and forms a cloud about peaks. The term "cloud capped" has therefore been frequently applied to mountains.

In the Alpine range this occurrence frequently takes place, and as the sun shines through these fogs or clouds, the beautiful phenomenon of a fog bow is seen there perhaps as frequently as in any other part of the globe, although the sight is one which few ever have an opportunity to witness.

"We arrived at the snow upon the ridge descending towards Zermatt, and all peril was over. We frequently looked, but in vain, for traces of our unfortunate companions: we bent over the ridge and cried to them, but no sound

THE FOG BOW AS SEEN FROM THE MATTERHORN.

was returned. Convinced, at last, that they were neither within sight nor hearing, we ceased from our useless efforts, and, too cast down for speech, silently gathered up our things and the little effects of those who were lost, preparing to continue the descent. When, lo! a mighty arch appeared, rising above the Lyskamm, high into the sky. Pale, colorless, and noiseless, but perfectly sharp and defined, except where it was lost in the clouds, this unearthly apparition seemed like a vision from another world; and, almost appalled, we watched with amazement the gradual development of two vast crosses, one on each side. If the Taugwalders had not been the first to perceive it, I should have doubted my own senses. They thought it had some connection with the accident, and I, after a while, that it might bear some relation to ourselves. But our movements had no effect upon it. The spectral forms remained motionless. It was a fearful and wonderful sight; unique in my experience, and impressive beyond description, coming at such a moment."

"I paid very little attention to this remarkable phenomena, and was glad when it disappeared, as it distracted our attention. Under ordinary circumstances, I should have felt vexed afterwards at not having observed with greater precision an occurrence so rare and wonderful. I can add very little about it to that which is said above. The sun was directly at our backs; that is to say, the fog bow was opposite to the sun. The time was 6.30 p. m. The forms were at once slender and sharp; were neutral in tone; were developed gradually, and disappeared suddenly. The mists were light—that is, not dense—and were dissipated in the course of the evening. It has been suggested that the crosses are incorrectly figured (in the engraving), and that they were probably formed by the intersection of other circles or ellipses. I think this suggestion is very likely correct; but I have preferred to follow my original memorandum."

In Parry's "Narrative of an Attempt to Reach the North Pole" there is an account of a phenomenon analogous to this one, called by Parry a "fog bow." The Italian guides, who were descending on the other side of the Matterhorn that afternoon, saw the phenomenon, called the Brocken. As they came upon the shoulder of the mountain about the same hight as Mr. Whymper, which was 14,000 feet, the mist being very thick to the South, in Val Tournanche, but the atmosphere clear to the North, they found themselves surrounded by a circle of rainbow colors, in which their own shadows appeared of magnified size.

Our engraving is from the London *Illustrated News*.

Correspondence.

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

Construction of Boiler Furnaces.

To the Editor of the Scientific American:

In answer to one of your correspondents concerning the admission of air to the gases in boiler furnaces, I send you the accompanying diagrams.

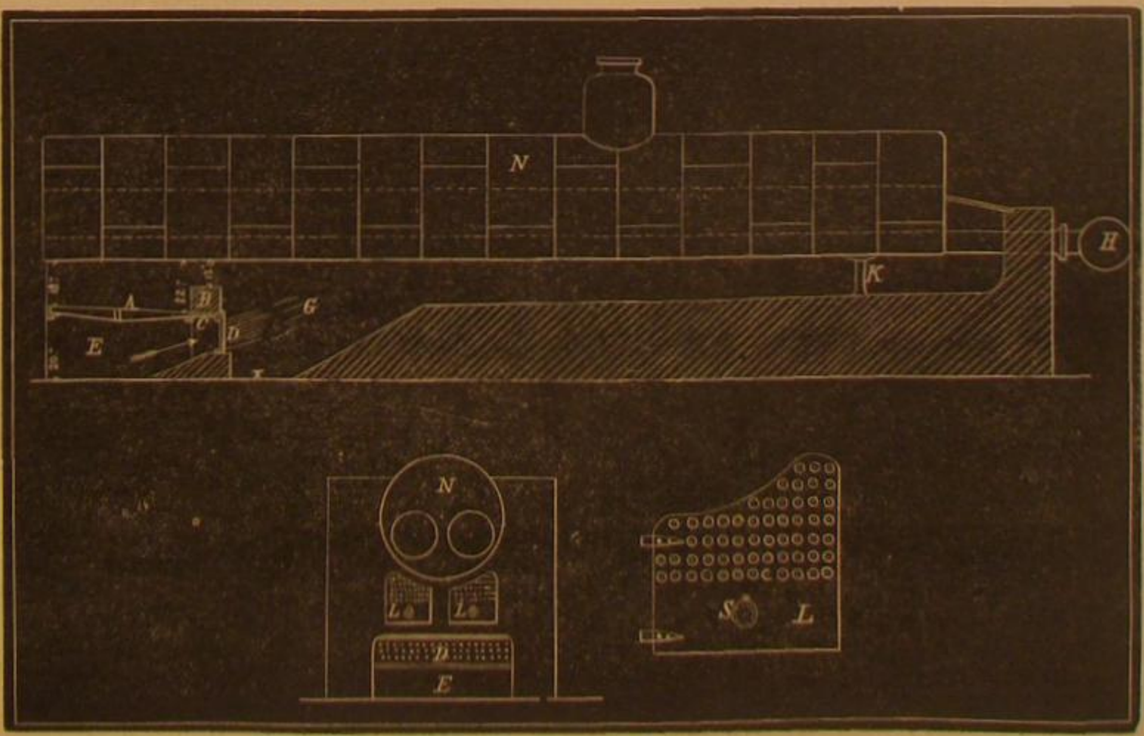
A is the grate bars, 19 inches below the boiler at the doors, and 22 inches at the bridge wall. B is the bridge wall, the top of which is to be 12 inches below the boiler, and built straight, not circled with the boiler. C is the iron plate, running across from wall to wall, on which the grates and bridge wall rest. The arrow shows the direction of the passage of the air under the grates to the combustion chamber, G. D is the perforated plate across from wall to wall, having 200 three eighths inch holes (an inch and a half from center to center). E is the ash pit, two feet opening and without doors. G is the combustion chamber, which should have a door in the side wall to remove the ashes. H is the mud drum and feed pipe. L is the doors, with lining only on the lower half, or below the holes; each door to have 50 three eighths inch holes, an inch and a half from center to center. S is the drop, covering the hole in the door through which the poker is inserted. N is the boiler, 48 inches in diameter, 28 feet in length, with two 16-inch flues. K is the stand pipe. Scale one sixth inch to the foot.

The theory is old, but the arrangement, of the different parts in detail, is the result of several years' experience in the burning of over a thousand bushels of coal per day.

This furnace is designed for bituminous coal; and where the boiler and grates are set in every particular as shown, there will be a saving (with good draft) of thirty per cent over the ordinary furnaces where air is not admitted.

If it were necessary or interesting, good practical reasons can be given for every feature of the construction; and I consider this double flue boiler the most economical for general use. WM. B. HAYDEN.

Columbus, Ohio.



CONSTRUCTION OF BOILER FURNACES.

Steam Boiler Explosions.

To the Editor of the Scientific American:

I believe it is a fixed principle in nature that the same causes will produce the same results, and different causes will produce different results. If I am correct in this belief, I wish to know why the boiler in the tug boat *Starbuck* was not blown into several pieces, and the little vessel shivered to atoms, since we are expected to believe that boilers only explode on account of being too weak to carry two or three pounds more pressure than our very discreet and most conscientious government inspectors say they should? According to the various accounts we have, it appears that after making due allowance for the difference in the diameters of the two boilers, the one the *Westfield* was fully twice as strong as the one on the *Starbuck;* but the *Starbuck* boiler required a pressure of fifty-two pounds to make a comparatively harmless burst; while the *Westfield* boiler made a first class explosion with a pressure of thirty-four pounds only! That is, if we are to believe in the report made by the Board of Government inspectors, who held fifteen sittings, or meetings, and examined fifty-two witnesses and experts, to arrive at this very sage conclusion. For in their report they say: "From the unanimous evidence, the boiler was well supplied with water at the time, and the fires were not more than ordinary. We think the pressure did not exceed more than three or four pounds above what was last seen by the engineer, who, in his testimony, stated that, about one and a half minutes before the explosion, the steam gage in the engine room indicated twenty-seven pounds." Will some one who does not believe that water can be surcharged with heat, and that boilers explode from this cause only, be kind enough to tell me why the boat *Starbuck* and her boiler, were not torn into thousands of pieces, considering the boiler was not half as strong, yet having about sixty-six per cent more pressure on than the *Westfield* boiler had when it exploded, according to the decision of so called experts? I think the *finale* of these two boilers gives us conclusive proof that boilers explode from an extraordinary power suddenly developed, by some means or other, and that, when they give way from a pressure merely exceeding their strength, gradually put on, they only burst open at their weakest part, and relieve themselves without being torn to pieces, no matter how high the pressure is. Several years since I had two plain cylinder boilers in use; they were old and worn out, I was obliged to carry eighty-five pounds pressure on them. One day, while the engine was running, one of them gave way on a line of rivets over the bridge wall. No other damage was done, and neither of the boilers moved one inch. I could cite a number of other cases of a similar character.

A large portion of the boilers now in use are extremely defective, and should be condemned, and if the boiler inspectors would do their duty, the owners would be compelled to stop using them. But so long as the majority of these gentlemen hold their office through favoritism and political influences, instead of sound merit, we need not be surprised that boilers like the one on the *Starbuck* shall be tested up to ninety-five pounds, and be licensed to carry sixty-five pounds.

The fact is, the present system of boiler inspection is rotten to the very core, and it should be changed. Let any one read over the various opinions given by the different experts, men of skill, men who have had great experience in boiler machinery and the management of boilers, and then read the report made by the Board of Examiners, and tell me if the question, "What caused the accident on the ferry boat *Westfield?*" has been answered. I think it has not. It was clearly shown that the boiler was defective when it first left the hands of the manufacturer, and it was made still worse by nine years ill usage, notwithstanding Mr. John K. Matthews had inspected it so recently, and "discharged his duty so conscientiously" that the honorable Board of Examiners had to make special mention of it.

I contend that the prime cause of the explosion is not even hinted at in this report, and I therefore think something should be done to settle the question of boiler explosions properly. It cannot be denied that all violent boiler explosions arise from the same cause; and I think it is a shame, reflecting severely on the intelligence of this age, that every man who has anything to do with steam boilers, has not been made to understand what that cause is. There are hundreds of well educated and scientific gentlemen who assume to have made themselves familiar with the natural laws which govern the generation of steam, the combining of heat and water, etc. And why have they not come before the public with the result of their experience and observations? Is it because they cannot believe in what they have seen, or can they not make reasonable deductions and draw proper conclusions from the various data they have gathered? Or are they fearful of being ridiculed for having promulgated an absurd theory? Well, be this as it may, the public generally is still in profound ignorance as to the true cause of boiler explosions; in proof of this assertion, I need only refer to the testimony and report I have already spoken of. I have met with many quite intelligent engineers who believed that water, when heated in a steam boiler, will boil the same as in an open kettle. Now, the amount of heat water will absorb, before ebullition takes place, depends on circumstances; for instance, on the top of a high mountain water will boil with so little heat, that one cannot cook an egg in it; in a vacuum it will boil with 98° of heat—a proper temperature for a bath. In the open air, on the ocean level, with an atmospheric pressure of 14·75 lbs., it will boil with 212°. I do not take into the account the latent heat, which amounts to 966°. Now if 14·75 lbs. pressure will cause water to absorb 114° of heat before ebullition can take place, is it unreasonable to suppose that a pressure of 42·75 lbs. would cause it to absorb 342°, that is, allowing the water to have the usual amount of air in it. But if the air shall have been expelled, as it certainly would be in boilers that are not fed continuously, then the amount of heat absorbed would be very much greater. But I will not ask to have this taken into account; I will only treat with undisputed facts. The boiler on the *Westfield*, previous to the explosion, had been allowed to stand a considerable length of time with all the outlets closed, and no water being fed in, consequently the water in the boiler was perfectly still, being held down with a pressure of 28+14·75 =42·75 lbs., and under these conditions would naturally absorb 342° of heat before ebullition could take place; and at the same time the heat in the steam space next to the safety valve would only be 247°, and this would have been the temperature throughout the whole boiler if it had been in action and the water kept moving; but it had not been in action for a considerable time, and, as shown above, the water absorbed 342° of heat before the safety valve began to play; *after* the valve operated a short time the pressure over the water was reduced enough to allow ebullition to take place, and then the 342° of heat suddenly became sensible power, and the safety valve, if it had been three times as large, could not have afforded any relief under these circumstances. We might as well expect the expansive force of powder to come through the vent of a cannon instead of being expended on the projectile and inner walls of the gun. According to Mr. Robert Creuzbaur's communication, published on page 117, current volume of the SCIENTIFIC AMERICAN, the steam space, as compared with the space occupied by the water in the *Westfield* boiler, was as 1 is to 4; and I therefore think it is safe to estimate that the temperature throughout that boiler, at the instant it exploded, was at least 315°, which would give a pressure of 80 lbs. And if we may be allowed to do a little guessing as to the relative strength of the *Starbuck* and *Westfield* boilers, I think this shows why the former required 52 lbs. to make a gentle burst.

D. A. MORRIS.

18 Platt street, New York.

P. S. We are now in receipt of telegrams giving a most graphic account of another wholesale slaughter of human beings, by the explosion of a boiler on the steamer *Ocean Wave*, after a short stop at a place near Mobile. Please note the fact that this boiler exploded under the same circumstances which attended the explosion of the *Westfield* boiler. There may be a few engineers, readers of the SCIENTIFIC AMERICAN, who would like to lend their assistance in keeping the prevailing sensation of this period fresh in the minds of the people. If so, let them attend to the following rules strictly:

It is immaterial whether your boiler is high or low pressure, whether it is a stationary, portable, locomotive or marine, boiler. To produce a first class explosion, which should send you where you belong at one lift, see that your boiler is free from all leaks. See that your safety valve is weighted so as to enable you to get up a pressure nearly equal to the strength of the boiler. Give the boiler a good supply of water, and have it in action long enough to get every thing hot; then see that you have only a moderate fire in your furnace. If the water is a few inches above the upper gage cock, all the better, for it is important to have a large body of water above the fire surface. Now shut off your pump, but continue running the engine about fifteen minutes, then shut down your throttle valve. If the fire is very slow, do not disturb anything for forty minutes or one hour; but if you have a tolerably good fire, you may bid farewell to your friends—if you have any—and lift the safety valve or open the throttle within half an hour. M.

"Explosive" Errors.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of August 19, page 119, is an article on boiler explosions, assuming as correct and endorsing two other papers on the same subject, also of August 19; all of which contend that water will not boil or evolve steam when the air is expelled, but will explode by additional heat; and a quotation is given from Miller's "Elements of Chemistry" that "water with the air expelled from it, has been heated to 360° Fahr. in an open glass vessel without boiling, but upon reaching that temperature expanded into steam, shivering the vessel to atoms." To which I reply: There is scarcely a household in the land, that has not water boiling in all kinds of open vessels, often to empty dryness. There are hundreds of stationary engines, where the fires are renewed every morning (the airless water in the boiler yet warm) after the night's rest from the preceding day's work; and innumerable other cases both on land and water, of boilers in the required condition for explosion, according to the above incredible statement, but as certainly exempt from the disaster.

The chimera of a "spheroidal state" assumes that heated water will, under certain conditions, resolve itself into minute globules, resisting conversion into steam, but continuing to receive heat up to a high point, when they will explode, and it would be disastrously so if these alleged globules should chance to "go off" in concert.

The same number of the SCIENTIFIC AMERICAN, page 113, contains a synopsis of a lecture delivered by Dr. Andrews at the Royal Institution, London, on the formation of steam and other gases, from which is the following: "The term spheroidal state when applied to water is apt to mislead; the water is not here in any particular state, when floating on a cushion (envelope) of vapor, over a red hot plate, but the phenomenon is due to other causes, and not to any new or peculiar state of the liquid itself." The equal expansion of portions of the boiler by differences of heat, undoubtedly tends to weaken the boiler; but in practice, and after long usage, say for years, no appreciable effect from this cause is entertained or discovered. In by far the greater number of cases, the fire is beneath the boiler, where the greatest expansion would occur: but in most marine boilers (as that of the *Westfield*), the upper part of the shell may be the hottest, although the lower flues, near the bottom, are first to receive the fire; and in the production of steam, an upward current, from the space over the flues, will cause a return circulation down the sides of the shell. I have used similar boilers, and know this to be the fact.

The sudden and violent emission of steam on raising the safety valve is a supposed cause of explosion, producing a rapid liberation of steam in the boiler by the lessened pressure, and of necessity presenting the singular result, of relieved pressure endangering an explosion. Scarcity of water or rather water on red hot flues, is a plausible cause of explosions; but steam cannot be evolved in large quantities, ry with a rapidity too great to escape detection by the safest valve, or the going of the engine. It requires 9 lbs. of red hot iron to convert one gallon of water into steam of atmospheric pressure, and considerable time to effect it. The terms "flashing" and "instantaneous" are inappropriate to the occasion. In connection with the above apprehended danger, or of its immediate cause, is the injection of water into the boiler, and the love of mystery assigns to cold water the greater danger. The formation of explosive gas appears to have been abandoned by general consent, and requires no remarks.

We see that explosions continue with increasing frequency, and published statements of causes and preventives in equal ratio. So long as we refuse to admit, and to act on the conviction, that explosions occur (in ninety-nine cases of a hundred), simply because the steam is too strong, or the boiler too weak, or hold to the fatal belief that "boilers will not burst with plenty of water," we cannot expect a decrease of the evil.

The foregoing remarks may be in too confident a tone for good taste, but may be justified to some extent at least, by an experience of forty years in designing, supervising, and using both marine, (river) and land engines and boilers, for low pressure, condensing, and high pressure engines, and a close attention to all the passing suggestive improvements, or changes of the day.

Pittsburgh, Pa. THOS. W. BAKEWELL.

Extraction of Gold from Tailings.

To the Editor of the Scientific American:

Recently there have been articles in your journal upon the extraction of gold from ores. It is a question in which, in its relation to Colorado ores, I have a large interest, and one as difficult to solve, as it is difficult to ascertain with substantial accuracy, actual results at any particular mine. I have devoted some of my time, apart from my regular business engagements, towards having experiments made with a view of getting at the facts, and all the facts I have gleaned I have given to the public, with a hope to get other series of tests from other parties, out of which to obtain confirmation of my own results; or, if a contradiction of these came, to learn, if possible, why others were more fortunate in their workings. But no one has yet, so far as I know, made any extended tests; and my own experiments have only drawn out criticisms to show that theoretically I ought to have done better by this or that course. I have, whenever any suggestion was made which could be adopted, tried it, but, in my judgment, the yield from the ores of Colorado, treated under stamps, does not equal half the value of the gold therein contained. My company, with this yield, are earning a margin over expenses, but what a waste! And could we save the waste, or four fifths of it, what a profit there would be!

There are other difficulties, such as the short sections of lode, owned by separate companies. My company at first owned four sections, in all about six hundred feet, but averaging one hundred and fifty feet each. We have secured now the other sections, until we have eleven hundred continuous feet, of course reducing the average of all working expenses.

The question is of importance to me, and to all individual mine owners; but is of far greater importance to the country at large, and deserves the attention you give it. Plate XXX. of the recent volume of "Mining Industry," will show you the sections of Burrough's lode, owned by my company (the First National), and on pages 537, 538, 539, 560, and 561, you will find details of my experiments, or some of them. I look for success through thorough concentration.

Boston, Mass. THOS. J. LEE.

The Paine Electro-motor.---Interesting Revelations by an Electrician.---Mr. Paine challenged to submit his alleged two horse power motor to a practical test, and a reward of $500 offered him in case the machine cannot be stopped by the main force of one man applied directly to the pulley.

"Much learning doth make thee mad."

To the Editor of the Scientific American:

Mr. Paine's exceedingly great knowledge has, I confess, placed me in an extremely ridiculous position, precisely that of the boy who was flogged because he was supposed to entertain a very poor opinion of his father. Mr. Paine swings round and round his motor, singing his own praise; lashes me because he supposes he knows what I think (or ought to think) is the source of power in his engine; gives the history of its "bed plate," but does not deny that it is a hollow structure, nor does he deny or disprove a single statement I have made relative to the appearance of his motor and its strange performances. He knows too well that his explanation of the increased speed of his motor, while laboring, is a theory the fathering of which ought to bring a blush to the cheek of even a novice; and armed, as he is, with his new fangled theory, and his vaunted thirty years' experience, he dares not tackle the fact that his motor has repeatedly declared that the difference between the power of three and four cells of batteries is infinity. Hence he passes these by with a sneer.

Mr. Paine's statement that "there is not more than six hundred feet of wire (No. 15) in circuit," is incorrect. There is, or was, in addition to this, a galvanometer coil of No. 20 wire. Now No. 20 wire offers a little more than four times as much resistance as No. 15; hence an auxiliary battery, especially if arranged to act on the magnets without having its current pass through the No. 20 wire, would add greatly to the power, and every electrician in the world knows this most positively.

The four patents and the two caveats mentioned by Mr. Paine are no evidence whatever of the merits of his motor. Divers other persons have also taken out patents for electromotors, all of which have been complete failures, as far as economy is concerned; and scores of patents have been granted for perpetual motions, not one of which ever breathed the first breath of life.

Nor does the submission of the Paine motor to "electrical scientists" help the case exceedingly, for one of them, to my positive knowledge, was not, until I taught him, aware of the simple fact in galvanism, that a large cell of battery will furnish a given current for a greater length of time than a small one, though this fact had, in substance, been published in ordinary text books on chemistry for at least twenty-five years. Truly "a little knowledge is a very dangerous thing" (for Wall street) though it is "a handy thing to have in the" shop.

Another evidence of the unsoundness of Mr. Paine's position is revealed in his article in the SCIENTIFIC AMERICAN of August 5th, wherein he attempts to annihilate Dr. Vander Weyde. In that article we read "the perturbations induced by breaking the circuit require seven seconds of time to come to rest. Now any attempt to repeat the lift on the group of 120 magnets in less time than seven seconds will result in failure, as the perturbations will interpose." When one compares this statement with the fact that his attempts to repeat the lift on its group of magnets forty-two times in seven seconds, he would really like to know which way Mr. Paine's big gun shoots.

But the weakest and most inconsistent move yet made in favor of this engine is the ludicrous attempt to carry it to market on Mr. Highton's one legged theory—a theory in direct opposition to Mr. Paine's practice. One uses a very short circuit, while the theory of the other demands an enormously long and large wire; hence the views of these two men should be compared only to show their antagonism.

In the seventh paragraph of Mr. Paine's article (SCIENTIFIC AMERICAN, August 26th) in speaking of the construction of an engine outside of his shop, he says, "but the proposal was emphatically rejected by the controlling board of our company." Further on he continues, "but the party referred to did secretly, without my knowledge or consent, proceed to construct an engine," etc. Now it happens that, about February last, I saw a certain article of agreement with Mr. Paine's name signed to it. This was for the formation of a Paine Electromotor Company, with a very handsome capital. According to this agreement, Mr. Paine was to assign to such company his invention and all future improvements he might make, but it did not obligate him to make any more. In this same compact Mr. Paine did most explicitly consent to the duplication of his motor to satisfy the parties of its genuineness. Even the kind, size, and number of cells of battery to be employed, and the manner in which the duplicate was to be tested, were distinctly specified. Further than this duplication, there was nothing whatever in this compact to indicate that the capital of this company was for the support of an "inoffensive experimenter" in "prosecuting a long series of experiments," when, according to his own showing, practical and economical electromotors might be constructed so as to "inure to the great benefit of mankind," stockholders included. That it has all along been Mr. Paine's intention to experiment as long as the pockets and patience of his company will hold out, I shall not attempt to refute; but I do know that the contract I have spoken of revealed nothing of the kind, for I copied every word of it.

Then followed the construction and fizzle of three engines as heretofore described. Two of them (one large and one small) were made in the telegraph manufactory of Charles T. and J. N. Chester, New York city, where at that time I was employed. I have it direct from Mr. Charles T. Chester that, after the failure of these engines, Mr. Cyrus W. Field was led into this enterprise. At Mr. Field's request, Mr. Chester called at his office, and there, by chance, met Mr. Paine. Then and there, in response to a question by Mr. Chester, Mr. Paine declared that he (Mr. Paine) would not abide by his agreement, and that the case might go to litigation. On this same occasion, Mr. Paine confessed to Mr. Chester that the small motor made by the latter gentleman was correct. Mr. Andrews, President of the Gold and Stock Telegraph Co., New York city, an interested party, and withal, of entire confidence in Mr. Paine, told me that Mr Paine had succeeded in making this small engine perform 1,800 revolutions per minute, whereas Mr. Chester and myself could obtain only 600 with six large cells of bichromate battery; yet this engine is one of the three of which this "inoffensive experimenter" positively declares his entire ignorance!

But why should Mr. Paine resort to writing, as a defence, when he professes to have the living proof in his shop? Is it because his pen is mightier than his motor? Now that two American patents have been secured since he exhibited his motor under lock and key, there can no longer be any secret in that particular engine, and its critical examination by any one cannot consistently be objected to; therefore I make the following proposition;

If Mr. Paine will, subject to the following conditions, run his motor with such power that I cannot check it, or hold it in check, by main force applied directly to its pulley, I will give him $500 for his trouble. The motor must have the same pulley that was on it last winter, or one as large; the wire in the magnets must be as large and as short as when I saw them; but four cells of battery shall be employed, and the current from them must pass through the same galvanometer coil of No. 20 wire, or its equivalent resistance; I must be permitted to critically examine the whole of the circuit outside of the motor; the motor must be removed from its bed plate in my presence, and, while removed, the trial must take place. I must also have the privilege of inviting the editor of the SCIENTIFIC AMERICAN and two or three others to witness the test. As soon as Mr. Paine may appoint a day for the trial, the above named money shall be placed in the hands of the editor of the SCIENTIFIC AMERICAN, with authority to hand it to Mr. Paine in case his motor overpowers me. And I now promise that, if defeated, I will frankly confess it through the columns of this paper.

Now, Mr. Paine, you cannot avoid placing either me or yourself in a truly ridiculous position. I pays my money, and you takes your choice. J. E. SMITH.

Easton, Pa., Sept., 1871.

Vitality and Strength.

To the Editor of the Scientific American:

Your correspondent, D. B., endeavors to make a point for Darwinism, on Mr. Howarth's supposed confusion of the terms "vitality" and "strength." Through his own use of equivocal terms, it is almost impossible to get any coherent argument from his letter. With much painstaking, however, I have succeeded in reaching the following conclusions, which I take to be the logical statement of his argument The term "stronger," as used by Darwin, does not mean animal strength, but vital power. Now, vital power is evidenced in two ways—by longevity and fertility. But longevity affects only the individual, while fertility affects the race. Hence, fertility is the fuller exponent of vital power. Fertility, however, is diminished by high flesh, high food, and civilization. But high flesh, high food, and civilization are promoters of individual longevity. Hence, vital power is most evidenced in the race possessing the least individual longevity. Therefore Darwin's axiom, "survival of the strongest," is fully proved. Q.E.D.

It is hardly necessary to say anything concerning this as an argument, but admitting that it were complete, it will be observed that the superstructure is erected upon the two predicates following:

1st. D B.'s assertion, "The vitality of an animal is assuredly diminished by the inability to perpetuate his race."

2d. "It is admittedly true that the most prolific people are the shortest lived."

Shall we grant these postulates? Assuredly not. Inability to perpetuate his race does not diminish vitality in the sense of longevity. The mule is unable to propagate, but is stronger, tougher, and notoriously longer lived, than his progenitor the horse. The ox, and even the gelding, and altered domestic animals of all kinds, are, of the two, longer lived than the fertile example.

Neither can it be admitted as true that "the most prolific people are the shortest lived." It is historically notorious that the earliest settlers of this country were far more prolific than their descendants, rearing generally large families of twelve and eighteen children, and yet they were healthier, more robust, and lived to greater age than men now do. The Irish are proverbially prolific; are they proverbially short lived? No one will believe it.

But as far as Darwinism is concerned, this is a mere side issue. It is evident in reading the "Origin of Species," that the learned author considers longevity and fertility as secondary points. Animal strength is the great power in natural selection, the strength to get and keep, being the controlling law. Formations of individuals, peculiarly favorable to this result, develope species, not from fertility, but power, strength, endurance; in the animal, monopolizing pasture, shelter, and convenience; in the man, comfort, wealth, and ease. But just here comes in the contrary law pointed out by Mr. Howarth; this condition, when attained, produces infertility, and the stinted or stunted animal or tree is found to be almost and universally more fruitful than the other. How do these other die out, and the new species come in? This question has yet to be answered by the advocates of that theory. D. B.'s method will not do it. R. W.

New Haven, Conn.

The Latest Phase of the Darwinian Controversy.

To the Editor of the Scientific American:

One important matter has been overlooked in the discussion to which you allude in your article entitled "Objections to Darwinism,' and that is, that the weakness of senility, or exhaustion, has been confounded with the lack of relative power in the struggle for existence. "Persistence of the stronger," is the rule when feebleness results from age—either in the species or individual—not generally otherwise. Savage races decay and die out before the white, when brought in contact with the same civilization, because they are more aged. The baby-nosed woolly negro—infantile in all his characteristics—survives and propagates; while the senile, lank-haired Indian, his prolific energy comparatively exhausted, as evidenced by his deficiency of loin, makes way for a younger race. Consequently he dies out before the backwoodsman, not, as it has been asserted, because the latter is a vegetable feeder, but because he is younger blooded.

The law seems to be:—Organic existence, individually and collectively, contains within itself a definite amount of vital energy, subject to exhaustion by various modes of expenditure and to possible extinction by antagonistic powers; and capable of assimilative reproduction through organic affinity.

Because, were the amount of vital energy infinite in definite bodies, no individual or species would ever reach the stage of vital exhaustion or senility; nor would they ever become extinct, save by catastrophism, which is contrary to the general past experience of life on the globe. Also the decadence of Greece and Rome, the ruins of antique civilizations in Asia and America, are proven by history to result from expenditure of vigor; while races surrounding them, who have never expended vigor in altering their modes of life, do not evince the same decay. China exhibits prolific permanence, because changeless and unprogressive. Luxury, mental wear and tear, intensifies the vital flame, and it burns out the quicker. Our own country furnishes proof. Very extraordinary men exhaust their posterity in their own individual work, the law holding in the case of the unit as the aggregate. The possibility of catastrophic extinction will not be disputed, nor a change through assimilation by cross breeding denied.

Of course, this law throws no light on the "origin of species," but it furnishes a higher common ground for the defendants. It explains the degeneration theory, Mr. Howarth's prolification of the weak, and the Darwinian objections.

WM. DENOVAN.

Philadelphia, Pa.

How to See under Water.

To the Editor of the Scientific American:

The Indians of North America do this by cutting a hole through the ice, and then covering or hanging a blanket, in such a manner as to darken or exclude the direct rays of the sun, when they are enabled to see into the water, and discover fish at any reasonable depth. Let any one who is anxious to prove this, place himself under the blanket, and he will be astonished when he beholds with what a brilliancy everything in the fluid world is lighted up. I once had occasion to examine the bottom of a mill pond, for which I constructed a float out of inch plank, sufficient to buoy me up; through the center of this float I cut a hole, and placed a blanket over it, when I was enabled to clearly discover objects on the bottom, and several lost tools were discovered and picked up. I am satisfied that, where water is sufficiently clear, this latter plan could be successfully used for searching for lost bodies and articles. I would now suggest that this experiment be tried on the sea; for I am satisfied that, with a craft like the Great Eastern, where an observatory could be placed at the bottom, with sufficient darkness, by the aid of glasses we could gaze down into the depths of the sea, the same as we can survey the starry heavens at midnight. A.

Watch Case Springs.

To the Editor of the Scientific American:

If T. M., of Homestead, Iowa, will try the best quality of finished steel case springs, which he can obtain of any first class material dealer in New York, he will find them much more economical than those he makes himself; and if he exercises the proper care in selecting them to fit, he will seldom have to put in a second one.

From a well assorted stock of a couple of gross, he would be able to select one in a very few minutes to suit almost any case.

And should he happen to have a case that he could not find a spring to fit, he could easily draw the temper of one nearly right, fit it, harden in oil, and temper by placing the spring in an old spoon (or anything more convenient), covering it with olive oil, and holding it over a lamp till the oil takes fire; then remove the spoon from the lamp and allow the oil to burn out. This will give the spring a reliable temper, whether it is a manufactured spring or one of his own make. L. G. GRADY.

Halifax, N. C.

Apparatus for Distilling Turpentine.

Mr. Adrian H. Van Bokkelen, of Wilmington, N. C., has invented an improvement in apparatus for distilling turpentine, of which the following is a description: A vessel or retort is supported by masonry above a fire box in which the crude turpentine is vaporized. The crude turpentine is introduced into the retort through a suitable aperture. A steam pipe from a steam generator discharges steam into the retort during the process of distilling. The vapors or products of distillation pass off through the neck of the still into a condensing chamber. This chamber is supported in a water tank. Water is pumped or discharged into the tank near its bottom, and rises so as to entirely surround the chamber. As the water is discharged into the bottom of the tank, or near the bottom, it will rise, and the heated water will flow over the top. A constant circulation is thus kept up and the heat absorbed from the vapors is carried off. In this manner a large portion of the vapor is condensed and passes from the condenser through a pipe into a coil or worm, but the lighter and more volatile products of the distillation pass off from the condenser through another pipe from near the top of the tank into the same worm. This worm is placed in a tank, into the bottom or lower portion of which cold water is discharged, surrounding the worm as it rises, and overflowing from the top, so that all the remaining vapor is condensed in the worm, and the liquid turpentine is discharged from its end through the side of the tank. The residue of the crude turpentine in the retort passes from the retort through a pipe into a receiving vessel. A steam pipe is coiled or made to pass back and forth on or near the bottom of the receiving vessel, by means of which the liquid resin is maintained at a high temperature until it is discharged from the vessel through a suitable pipe. The jet of steam which is passed into the retort through the pipe is discharged near the bottom, and beneath the crude turpentine. The effect of this discharge of steam into the retort is that the crude turpentine is vaporized or distilled at a much lower temperature than by the old process, the product of pure turpentine is increased, and the residue or resin passes off without being discolored by the high temperature hitherto employed in the distillation of turpentine. The result of the improvement is claimed to be an increased yield of pure turpentine, a superior quality of resin, and great economy in fuel, either of which advantages is of the utmost importance to the distiller of turpentine.

Veneering.

Mr. Sherrard B. Barnaby, whose views on glueing we gave last week, thus discourses upon the cognate subject of veneering.

The softest woods should be chosen for veneering upon—such as common cedar or yellow pine; perhaps the best of all for the purpose is "arrow board," twelve foot lengths of which can be had of perfectly straight grain, and without a knot; of course no one ever veneers over a knot. Hard wood can be veneered, boxwood with ivory, for instance; but wood that will warp and twist, such as nasty cross grained mahogany, must be avoided.

The veneer, and the wood on which it is to be laid, must both be carefully prepared, the former by taking out all marks of the saw on both sides with a fine toothing plane, the latter with a coarser toothing plane. If the veneer happen to be broken in doing this, it may be repaired at once with a bit of stiff paper glued upon it on the upper side. The veneer should be cut rather larger than the surface to be covered; if much twisted, it may be damped and placed under a board and weight over night. This saves much trouble; but veneers are so cheap, about 1d. a foot, that it is not worth while taking much trouble about refractory pieces. The wood to be veneered must now be sized with thin glue; the ordinary glue pot will supply this by dipping the brush first into the glue, then into the boiling water in the outer vessel. The size must be allowed to dry before the veneer is laid.

We will suppose now that the veneering process is about to commence. The glue in good condition, and boiling hot, the bench cleared, a basin of hot water with the veneering hammer and a sponge in it, a cloth or two, and everything in such position that one will not interfere with, or be in the way of another.

First, damp with hot water that side of the veneer which is not to be glued, then glue the other side. Second, glue over as quickly as possible the wood itself, previously toothed and sized. Third, bring the veneer rapidly to it, pressing it down with the outspread hands, and taking care that the edges of the veneer overlap a little all round. Fourth, grasp the veneering hammer close to the pane (shaking off the hot water from it) and the handle pointing away from you; wriggle it about, pressing down stoutly, and squeezing the glue from the center out at the edges. If it is a large piece of stuff which is to be veneered, the assistance of a hot flat iron from the kitchen will be wanted to make the glue liquid again after it has set; but don't let it dry the wood underneath it, or it will burn the glue and scorch the veneer, and ruin the work. Fifth, having got out all the glue possible, search the surface for blisters, which will at once be betrayed by the sound they give when tapped with the handle of the hammer; the hot iron, (or the inner vessel of the glue pot itself, which often answers the purpose) must be applied, and the process with the hammer repeated.

When the hammer is not in the hand, it should be in the hot water.

The whole may now be sponged over with hot water, and wiped as dry as can be. And observe throughout the above process never have any slop and wet about the work that you can avoid. Whenever you use the sponge, squeeze it well first. Damp and heat are wanted, not wet and heat. It is a good thing to have the sponge in the left hand nearly all the time, ready to take up any moisture or squeezed out glue from the front of the hammer.

So much for laying veneers with the hammer, which though a valuable tool for the amateur, is not much used in the best cabinet maker's shops; cauls are adopted instead. They are made of wood the shape and size of the surface to be veneered, or, better still, of rolled zinc plate, and being made very hot before a good blaze of shavings, they are clamped down on the work when the veneer is got into its place; they must be previously soaped, to prevent them sticking to the veneer. The whole is then left to dry together. The hammer is quite sufficient for most amateurs. I have laid veneers with it 5ft. long by 18in. wide, without assistance, and without leaving a blister. Cauls, however, are very necessary if a double curved has to be veneered, or a concave surface; they need not be used for a simple convex surface. By wetting well one side of the veneer it will curl up, and can easily be laid on such a surface; but it will be well to bind the whole round with some soft string to assist it in keeping down while drying.

Fire Proof Floors.

A new method of rendering floors fire proof is patented by James Dunseith, of the city of New York, who employs long flat bars of thin sheet metal, with a perpendicular flange turned on each edge. Other long thin bars, which are curved or arched, and riveted at or near their edges to the first named strips, are placed edgewise vertically, one between each two, the connection being so arranged that the tops of the arches do not rise quite as high as the tops of the first set of bars. Narrower strips are also arranged across and riveted to the lower flanges at suitable intervals apart, to serve as laths for holding the ceiling plastering to be applied to them, as well as to brace them laterally. Other similar strips are arranged across and riveted to the upper flanges, or wood pieces may be bolted on to receive and support the floor boards. The outside flanges are built into and rest in the wall. Other flanges may be applied, if desired, to the outside strip for letting into the wall. For a floor of great length the bars are lapped and riveted. The width may be regulated by the number of bars connected together. Diagonal braces may be employed if preferred. The width of the bars is varied to suit the circumstances of the case, but for ordinary floors the inventor proposes to make them from about ten to fourteen inches, and believes that, with bars of this width, stronger floors can be made with a given weight of material than can be made by any other arrangement. He sometimes prefers to brace the arched plates by angle wire bars bent over and riveted to them.

A New Apparatus for Manufacturing Gas.

A new apparatus for gas making has just been introduced by M. Rouille in Paris, by which gas can be produced economically, and with the simplest apparatus, in houses, manufactories, etc. The inventor has named this gas "Gas Autogène." It is formed of air and steam of essence of petroleum. The apparatus is not only very simple but occupies a very small space. An apparatus for the supply of 1,000 burners does not occupy more than a square yard, and for a less number, in proportion. The gas is said to give a much more brilliant light than ordinary gas, and to be much cheaper. In fact, it is stated that half a cubic yard of "gas autogène" gives as much light as a cubic yard of ordinary gas, and that it costs only three cents per cubic yard. An apparatus, with reservoir complete for fifty burners, is manufactured at the price of £24, and one ditto for 100 burners, for £40.

BLACK LUSTER COLOR.—Dr. Kielmeyer gives a recipe which is adapted for either paper, cloth, or porous wood. He states that it stands well, is very supple, and has no tendency to get sticky. To prepare it he boils together 8 pounds of glue, previously dissolved in 16 pounds of water; 1 pound potato starch, dissolved in $5\frac{1}{2}$ pounds of water: $5\frac{1}{2}$ pounds of campeachy, extract of 6° Baumé; 1 pound 2 ounces of green vitriol, and $8\frac{3}{4}$ pounds of brown glycerin. When thoroughly mixed, he removes the pot from the fire, and continues to stir until the liquid is cold. If the paint be desired thicker or thinner, the amount of starch and glue must be varied as well as the other materials, or the luster will suffer.

POST OFFICE STAMPS.—A correspondent, Mr. A. G. Woodward, induced by the illegibility and other imperfections of the post office dating stamps, suggests that the marks be embossed on the letters, or better still, be perforated by metal points. Stamping machines with perforating needles are already in use in many countries in Europe, chiefly for dating railway tickets. A little improvement in the cutting of the brass stamps, and in the inking cushions, would do much to remedy defective stamping.

A Piano without Strings.---A Novel Musical Invention.

For more than a hundred years innumerable attempts have been made to discover a substitute for the string in pianos. Without the discovery of such a substitute, all attempts to construct a steel instrument would only be partial successes. The essential points in a new sound medium for this purpose, without either of which it would be useless, being that it must furnish a compass of from six to seven octaves; that it may be operated upon by an ordinary pianoforte action; that it shall occupy no more room in the instrument (laterally) than the key board; that it may produce a tone at once pure, free from harmonics other than those necessary to produce the proper quality of tone or "tone clang," free from the disagreeable sound of the hammer on the sound board, and of the proper sonorous power: that the instrument constructed with such a sound medium may be simple in construction, not liable to get out of tune, to break, or deteriorate, nor occupy too much room, not be too heavy, and at the same time be cheap and durable; and that the sound medium may be mounted on an iron plate, and yet effect a communication with the sound board. All of these points the inventors claim for their new steel piano. If these claims be fully established, a struggle between the steel hook and the steel string will commence, with the chances in favor of the former. That this new instrument must prove a formidable rival to the piano, the inventors claim is evident from the fact that unless the piano was not known to be so defective, no attempts would ever have been made to discover a substitute for the string.

The peculiar, unpleasant tone of the stringed piano is caused by the shock of the hammer on the sound board, imparted through the action of the tightly drawn strings. If this noise, so unpleasant to a fine ear, especially in old instruments, could be separated from the the genuine tone of the string, the instrument would still be exceedingly weak in tone. In the instrument under consideration, this disagreeable noise is said to be obviated, as the metal plate only transmits musical vibrations, not noise.

The steel hook can also be used in combination with reeds,

Fig. 2

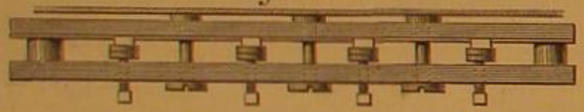


Fig. 3 *Fig. 4*

as it is the only sound medium of a full compass that will keep in tune with reeds. The power of the new instrument is said to be only limited by the quality and size of the steel hooks, the power of the action, the space within the instruments, and the quality of the sound board.

The only specimen of this instrument is to be seen at the piano and organ house of Mr. R. L. Atkins, No. 144 West Fourth street, Cincinnati, Ohio, which is also the address and and place of business of the inventors, Th. Atkins and Henry Drewer.

A short notice of the instrument was recently published in this paper, based upon an enthusiastic description of its capabilities published in a Cincinnati journal. We now place before our readers an engraving illustrating the prominent features of the invention, namely, the peculiar steel hooks used to generate the *tones*, and the manner of their arrangement in the body of the instrument to be acted upon by the hammers of an ordinary pianoforte action.

This last is shown in Fig. 1, the general appearance of the instrument being that of an ordinary upright or cottage piano.

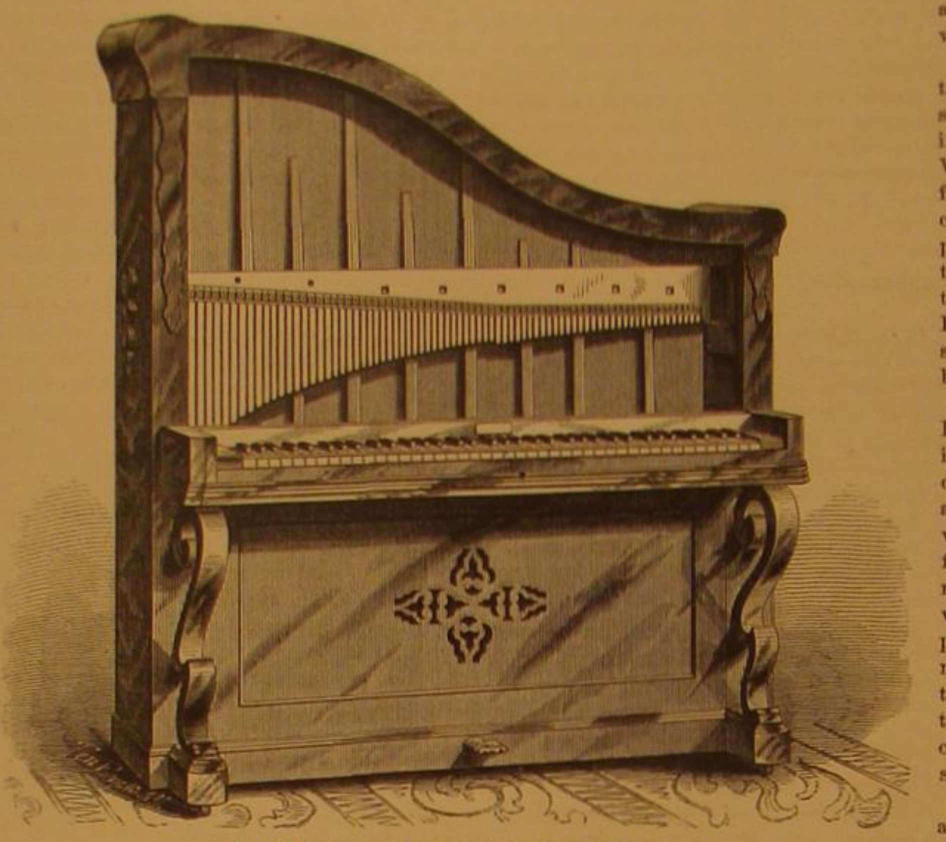
The hooks are attached to a metallic frame or bridge, which is fixed to a sound board, as clearly shown, the sound board being in this case vertical in position.

The mode of the attachment is shown in Fig. 2, and the forms of the hooks, which may be two pronged, three pronged, or four pronged, is represented in Figs. 3 and 4.

Whichever number of hooks is employed, the prongs must be tuned in octaves, the number of octaves depending upon the number of prongs.

The acoustic principle thus adopted is scientifically sound, and we are inclined to believe a good and powerful toned instrument could be made in this way. Not having, however, as yet had an opportunity of hearing the instrument, we cannot pronounce upon the quality of the tone as from knowledge, though the accounts that reach us are highly flattering to the success of the invention.

The instrument was patented July 11, 1871, and of course has not yet had time to become generally known. For further information address the inventors as above.



A PIANO WITHOUT STRINGS.

Improved Water Filter.

This invention is a useful improvement in apparatus for filtering water, and is adapted to be used in wells, cisterns, and in connection with water pipes, whereby the water is drawn through filtering material in different compartments. Fig. 1 represents the filter complete, ready for attachment to water pipes. The water enters through the supply pipe, A, at B, and passes off through the discharge pipe, C, passing out at D. The supply pipe is connected with the discharge pipe by the pipe, E. F and G are stop cocks. H is a faucet. I is the cover of the filter, and is securely fastened down by bolts, and made water tight by using a rubber gasket. J is an air cock used for the escapement of the air while the filter is being filled with water.

As the water rises through the filtering chamber, K, Fig. 2, the sediment will principally lodge against the under side of the filtering material in said chamber; consequently, to cleanse the filter, it will only be necessary to reverse the flow of water through it; which is done by closing the stop cock, B, Fig. 1, and opening the stop cock, F, and the faucet, G; and if it be allowed to run for a few minutes into a pail or tub, the sediment, which has collected in the filter, will become entirely removed. By repeating this operation once every two or three months (according to the condition of the water) the filter can be kept clean for years without removing the filtering material.

Fig. 1

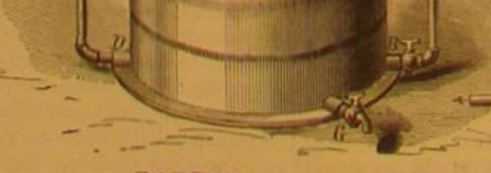


Fig. 2

PARROT & McCAULEY'S WATER FILTER.

Fig. 2 represents a vertical central section of the filter, showing its construction and internal arrangement. L is the filtering vessel, which is made of cast iron, cylindrical in form, two feet in hight, and one foot in diameter, with a central upright partition, M, running from the bottom to near the top. The two compartments, K and N, contain fine gravel, sand, and charcoal (as represented in the drawing), which rests on the perforated bottom, O. The water enters the receiving chamber, P, through the supply pipe, A, Fig. 1, ascends through the perforated bottom, O, into the compartment, K, passes over the partition, B, as indicated by the arrow, and descends through the compartment, N, into the pure water chamber, Q.

This filter is as well adapted to filtering the water of wells and cisterns, as that of city service pipes, and for that purpose, the walls of the chamber, P, are perforated, the pump pipe attached to the clear water chamber, Q, and the filter deposited on the bottom of the well or cistern.

It is designed to be used in an upright position, ordinarily; but it may be placed on its side, when it will filter the water within a few inches of the bottom of the well or cistern. Where a cistern is located near a cellar, the filter may be placed on the bottom of the cellar, and connected with the cistern by a pipe running through the cellar wall and cistern wall, near the bottom of the cistern, and the water may be pumped from the chamber, P, as before. These filters may be round or square, of cast iron, wood, or any other suitable material.

The advantages of this filter are obvious. It is claimed to be the only portable filter that is equally adapted to filtering the water of city supply, wells and cisterns, and that affords ample room for the use of charcoal and sand, which is an important feature, as the charcoal freely absorbs unhealthy gases, and thus removes all unpleasant taste and smell from water; and from its well known antiseptic power, neutralizes all injurious effects which might result from decaying animal or vegetable matter held in suspension or solution in the water. The sand in connection with the charcoal will remove, from the water, the sediment and discoloration.

Modern researches have shown that cholera, and other fearful diseases are often propagated by the use of contaminated waters. In a sanitary point of view, it is therefore of the utmost importance that water should be rendered as pure as possible from these contaminations before it enters the stomach. Charcoal not only acts mechanically to strain out impurities, but it is a powerful absorbent of gases. In many towns water becomes tainted by the presence of decaying animalculæ, which impart to it the odor of decaying fish. To such an extent does this occur that in some instances we have known the water to become absolutely unfit for even cooking vegetables, imparting its unwholesome flavor to the food. Thorough filtering through charcoal and sand would render such water fit for use, as the fetid gases, as well as the dead animalculæ, would be removed.

Worms and other insects usually found in water—as they cannot penetrate the filtering material through the fine perforations in bottom, O—will collect in the chamber, P, where they must remain until removed by opening faucet, H.

In houses where there are from 8 to 12 faucets in use, it usually costs from four to six dollars annually to keep them in repair, as they are ground out and rendered useless by the fine sand found in city water; most of which expense can, it is claimed, be saved by the use of this filter.

Patented, through the Scientific American Patent Agency, July 30, 1869. Address, for further particulars, Parrot & McCauley, Morristown, N. J. This filter is on exhibition at the American Institute Fair now being held in the city of New York, where orders will be taken, and State and county rights offered for sale.

Greenland.

The U. S. exploring steamer *Polaris*, Captain Hall, sailed from Discoe, Greenland, August 15th, bound for the North Pole. The season so far is an open one, and interesting discoveries, of great importance to many branches of science, are expected.

Greenland, though so intensely cold, and apparently so cheerless, is full of interest to the naturalist, and by no means without profit for the merchant. The outskirting land supports a luxuriant growth of from 300 to 400 species of plants, some of which ascend to the hight of 4,000 feet; many species of seals, and whales and fish, sport in the waters, which are also occupied by invertebrate animals and sea weeds; every rock swarms with water fowl, while land birds from the south visit the country as a nesting place; countless herds of reindeer browse in some of its valleys; the bark of the fox is to be heard even in the depth of winter; and the polar bear may be seen all the year round. The Danes, at their first visit, found a human population there of 30,000; and within their own possessions there is at present a healthy, intelligent, civilized race of hunters of not less than 10,000 souls.

The west coast of Greenland is slowly sinking beneath the sea. The remains of native houses are in one locality seen beneath the sea.

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VOL. XXV., NO. 12 . . . [NEW SERIES.] *Twenty-sixth Year.*

NEW YORK, SATURDAY, SEPTEMBER 16, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

THE NEW YORK IRON FOUNDERS GRIEVANCE—A SYSTEM OF SHAMELESS EXTORTION.

Our readers will recall an article published on page 34, present volume, containing an acccount of experiments performed by Mr. P. H. Jackson, of the foundery of J. L. Jackson & Bro., Twenty-eighth street and Second avenue, New York. The experiments were of themselves interesting, and the results of importance to engineers. In making place for them, we were not aware that there were axes to grind in this smooth surfaced statement of Mr. Jackson, or that the experiments were the preliminary to a system of shameless extortion, about to be inaugurated, and to which all the architectural founderymen in the city were to be subjected.

Briefly, the facts in the case appear to be, that at the last session of the New York Legislature, a bill was passed requiring that all iron beams, columns, lintels, or girders designed to span more than eight feet should be tested, by actual weight or pressure, under the direction and supervision of an Inspector of the Department of Buildings.

It now appears that not only does the renowned Tammany Ring own the Department of Buildings, but the Department of Buildings owns a Superintendent, one James M. McGregor, who owns Mr. P. H. Jackson, and has appointed the latter Inspector of Beams, Girders, etc.

By virtue of the power vested in him by the statute above referred to, Mr. Jackson now demands that all beams, girders, etc., shall be carted to his establishment in Twenty-eighth street, there to be tested at the trifling (?) cost of seventy cents per lineal foot, and then carted away again, the cartage, added to the charge for testing, making the test cost not less than one dollar, on the average, per lineal foot.

Now let any one, only partially acquainted with the extent to which iron is used in building in this city, just think for a moment what seventy cents per lineal foot implies to the building trade. There is no need for figures. The extortion will be apparent enough without them. Seventy cents a foot for testing beams, in New York city is almost as good a business as plastering the Court House, or carpeting it, or plumbing it.

The effects upon small founderies will be to drive them out of the business, as they cannot resist extortion like larger establishments. The only escape from Mr. Jackson's clutches is for foundery men to supply themselves with a machine, costing $3,000, and to test their own beams in the inspector's presence. But even this resort fails. We understand that those who have engaged in the business of testing beams, for themselves and others, have been unable to proceed, though they only charged fifty cents per foot. Mr. Jackson, whose presence is necessary to render such tests legal, finds it convenient not to be there at the time the tests are to be made, and so the testing process cannot go on, thus causing interruption in important building operations, and throwing workmen out of employ.

In short, it is now evident that, under the show of obtaining security in building, a law has been passed that places the architectural iron workers of this city at the mercy of a greedy, grasping ring of politicians, whose aim is to load every important interest with a burden of tribute.

Let Mr. Jackson and the men who stand behind him make hay while the sun shines. A storm is coming, the thunder of which was heard in the indignation meeting of citizens and oppressed tax payers, held at the Cooper Union on the 5th inst. This is no party question, and we feel it our duty in common with all good men to utter indignant protest against this and the other wholesale robberies that have disgraced and are disgracing the municipal rule of New York city.

NARROW GAGE NONSENSE.

Scarcely any engineering topic of the time has had more nonsense said and written about it than the subject of "Narrow Gage Railways." We have had it hashed and re-hashed, and served in season and out of season. The daily papers found out that the engineering papers were discussing it, and cooked it all over again, reproducing it in still less palatable shape than before. Much sound and little sense seems to be the result of all effort to make people believe there is essentially a great gain in the use of narrow gages.

Among this class of articles, however, we cannot rank one which appears in the *Railroad Gazette* of August 23rd, which clearly shows, in a tabulated statement, the fallacy of the faith which sustains the advocates of narrow gages. We shall present this statement in the present article, and call our readers' attention to it as worthy of the most careful study, before coming to any conclusion regarding the policy of adopting generally, or even partially, the narrow gage system; for it is purely a question of policy, as we have shown in previous articles.

We have also shown that the narrow gage system is not new, that it cannot by any possibility make the difference in first cost of railways claimed for it; and, although we admit that running expenses would be less than those of our present system of heavy rolling stock for passenger traffic and heavy loads of freight, we hold that to make such a comparison is foreign to the question at issue, which is between narrow and wide gages *per se*, not between narrow gages worked with light loads, light rolling stock, and low speed, and wide gages worked with heavy rolling stock, heavy loads and locomotives, and high speed.

Because a gage is what is called wide, it does not follow that cars and locomotives must be heavy, that loads which would crush down or break light rails need be carried, or that trains should move at a speed of forty miles an hour.

We have shown that, so far as permanent way is concerned, there would be no saving by narrow gage practice for a given amount of traffic, except perhaps a slight one in cost of ties, and in the ballasting, which will vary with the length of the cross ties.

The *Railroad Gazette* now not only agrees with us on these points, but shows clearly that the saving in rolling stock, constructed to do a given amount of traffic, will not be worth naming, and points out, as the "leading fallacy of the narrow gage reasoning," the nonsensical notion that cars and engines cannot be made as light for wide gages as for narrow, with the exception of axles, which will require about nine dollars more expense per car for the 4 feet 8½ inch gage than for the 3 feet gage.

In summing up the relative cost of items in construction, the paper referred to does not vouch for the full accuracy of the prices given, but as they are the same for both cases, the relation of cost is the same, whether the prices named are correct or not.

ESTIMATE OF COST PER MILE OF 3 FEET AND 4 FEET 8½ INCH GAGE RAILROADS.

	3 feet	4 feet 8½ in.
Land and land damage	$500	$500
Grading	3,500	3,710
47½ tuns of rails, 30 pounds per yard, at $70	3,325	3,325
494 rail splices	247	247
3,520 pounds spikes, at 4¼ cents	150	150
3,520 cross ties, 6 feet long, 5x6 inches, at 37½ cents	1,320	....
3,520 cross ties, 7 feet 8½ in. long, 5x6 in. at 37½ cents	....	1,584
1,000 cubic yards ballast, at 50 cents	500	....
1,300 cubic yards ballast, at 50 cents	....	650
Laying track	300	300
Sidings	300	325
Bridges	1,000	1,000
Masonry	500	500
Fencing	500	500
Freight on materials	150	165
Freight and passenger houses	600	600
Engine houses, repair shops, and water works	400	400
Miscellaneous buildings	100	100
Engineering, salaries and office expenses	1,000	1,000
	$14,392	$15,056

EQUIPMENT FOR, SAY, 25 MILES OF ROAD.

	3 feet	4 feet 8½ in.		
5 locomotives	$30,000	$30,000		
10 passenger cars	20,000	20,180		
4 mail and baggage cars	2,400	2,436		
100 freight cars	17,500	18,400		
	$69,900	$71,016		
Per mile	$2,796	$2,840	2,796	2,840
Total			$17,188	$17,896

It will be noticed that certain items here are put down as equal in cost; and it has been, and can be shown, that they will be the same in both cases, provided everything else—comfort, convenience, safely, etc.—is maintained on an equal footing.

The publication of this statement will do much towards the collapse of the narrow gage bubble. A large number of engineers and manufacturers have found it to their interest to advocate the system, but although the probabilities are that through their efforts a period of narrow gage railroading has been inaugurated, we do not believe that it promises long duration. The people will clamor for wide cars and comfort, and the gage will gradually be widened, while light stock will be used, so that light railways for light traffic, not narrow gages, will be the phase railroad engineering will assume in the future.

BOILER EXPLOSIONS.

The number of communications received by us upon this important subject would be very embarrassing, were there anything new in each of them imperatively demanding publication. Were such the case, we should find it necessary to alter the title of our publication, and style it the "Boiler Explosion Expositor," or something to that effect.

It is really surprising, how many theories exist on the subject of boiler explosions; but their longevity is perhaps still more surprising. Their vitality, in spite of the light thrown upon the dark places by modern scientific researches, is almost equal to that of the nine-lived cat.

Perhaps no particular theory has had more resurrections from apparent death, than the "gas theory." We have on several occasions shown the absurdity of it, and we know of no scientific publication that has not done likewise; but it rises, like Banquo's ghost, to torment the authors of its "taking off."

In the inquest of a coroner's jury of Kings County, N. Y., held to inquire into the causes of the *Westfield* explosion, which resulted in the decease of a number of citizens of Brooklyn, there was summoned, as an expert witness, Mr. B. M. Johnson, of Greenpoint, L. I., who swore that he thought the primary cause of the explosion was low water in the boiler, and the secondary cause, the generation of an explosive mixture of oxygen and hydrogen by contact of the water with the heated plates.

During the inquest we read the testimony of Mr. Johnson, as published in the Brooklyn dailies; but, regarding it, like many other pet theories that have been published in evidence in the inquests held in New York and Brooklyn, as scarcely worthy of notice, we refrained from alluding to it.

We are now in receipt of an essay of considerable length from Mr. Johnson himself, intended to sustain the opinions expressed by him in evidence, which we cannot spare the space to publish, but will give the argument, if indeed it can be properly so called, by which he endeavors to maintain his position.

To shorten our labors, we at once admit that red hot iron will decompose water, that in so doing the iron becomes oxidized and free hydrogen is evolved, and we might also grant, for the sake of argument, the assumption of Mr. Johnson that the crown sheet of the *Westfield's* boiler was partly uncovered, and had become red hot, so that water coming in contact with it would become decomposed, as above stated. Granting this, we do not grant, what Mr. Johnson further claims, that, under such circumstances, the following results would take place, namely, that only fifteen sixteenths of the oxygen would combine with the iron, leaving one sixteenth of the oxygen free to unite explosively with the free hydrogen.

In the first place, when chemical reactions of this kind take place, viz., the oxidization of metals, the substance which gives up its oxygen to the metal, only gives as much as the metal demands and can lock up in the oxide formed—not a particle more. If the metal demands fifteen sixteenths of the oxygen in a certain volume of water, the other sixteenth will remain combined with its one eighth by weight of hydrogen as water, or the vapor of water. Holding all the hydrogen it can combine with under such circumstances, it cannot unite with more. If uncombined with hydrogen, it is only because it has combined with something having stronger affinity for it than hydrogen, and from which hydrogen can no more wrench it than an ounce can equilibrate a pound in a chemist's balance.

There is one eighth hydrogen by weight to one of oxygen in any given weight of water. One sixteenth of one eighth of hydrogen is one one-hundred-and-twenty-eighth of the weight of the oxygen. Now, Mr. Johnson may mix one pound of oxygen with one hundred and twenty-eight of hydrogen, and fire away at us all day with it, if he likes. He could scarcely blow the cover off a pill box with such a mixture, much less explode a boiler. It is only when the mixture of these gases approaches more nearly the proportions in which they unite to form water that they combine with great violence; so that, supposing Mr. Johnson's theory of fractional combination of oxygen with iron to be true, his one sixteenth of all the oxygen will not account for the explosion of the *Westfield* boiler, nor any other boiler.

We are almost ashamed to have said so much upon this subject; but the fact that many are accepting the gas theory, "body and breeches," or writing to know what we think of it, is perhaps a sufficient excuse.

Now a word about the sudden generation of steam from overheated water. We seem to have been misunderstood in our recent article upon this subject. While we believe this may occur, does sometimes occur, and, at the time we wrote, did believe it occurred in the case of the *Westfield*—and while, in our opinion, it is and ought to be recognized as one of the ways in which an over pressure of steam is sometimes suddenly generated, we do not believe it is a very common cause of boiler explosions. We now distinctly say, that boilers burst by pressure greater than their strength, whether suddenly or gradually generated, and that, in general, they result from gradually accumulated pressure. There is, however, in our opinion, a risk in allowing still water to stand in a heated boiler without any vent for steam, while the temperature of the water is rising.

When fires are banked up for the night, the temperature will not be pushed so as to become a source of danger; but we would always, when steam is raised in the morning, allow a small vent. The opening required for this purpose need not be large, nor, perhaps, maintained very long; but it should remain long enough to set the body of water in the boiler to circulating freely.

On pages 106 and 119, Vol. XXI. of the SCIENTIFIC AMERICAN, we gave a review of experiments and researches by Dr. Tomlinson, upon the subject of boiling. These experiments showed plainly that the boiling point of water may be varied without altering the pressure upon its surface, and also that the use of pieces of coke or charcoal renders the generation of steam much more quiet and uniform than when produced in a vessel without such nuclei.

The inference is obvious. The explosive generation of steam does not occur in the presence of these substances, and water cannot be superheated when they are in a boiler, unless a corresponding gradual increase of pressure also takes place.

At the time of the publication of the articles alluded to, we pointed out the fact that the use of coke or charcoal in boilers would prevent the "kicking" of water and the sudden strains arising therefrom. So simple and easy a method would seem to be worthy of a general trial, which, so far as we are aware, it has not received.

ON CERTAIN HABITS CONSIDERED AS NECESSITIES OF MODERN CIVILIZATION.

The *Nation* in a recent issue discusses the subject of the use of stimulants of various kinds, treating these stimulants as necessities of modern civilization. The almost universal use of some kind of stimulant is the ground upon which it assumes the necessity of their use.

The Brooklyn *Union* also in a recent issue gives its readers an account of the extent to which opium is consumed in the City of Churches, which may be considered as somewhat astonishing. From seventy five to over one hundred dollars per annum is the cost of the opium consumption of single individuals devoted to this habit, from which the quantity they take may be estimated. It is difficult to estimate the aggregate quantity used for purposes of stimulus alone in this country or any section of it. The habit is easier to conceal than the drinking of alcoholic liquors, and statistics are hard to obtain. A country physician once remarked to us that if he could have the exclusive sale of the opium consumed in the single township where he resided, he could make his fortune without charging exaggerated prices.

So much for opium eating. If we now consider how much alcohol, tobacco, coffee, and tea are consumed, we shall have before us the chief articles in demand for artificial stimulation. There will upon reflection appear no need for evidence of the truth of the *Nation's* statement that stimulants are universally used. Is the inference of that able journal that they are necessities of civilization, and its suggestion that they be accepted as such, and the proper kinds of stimulants for different temperaments be studied, so that each individual may select intelligently and wisely, sound and safe advice to the public? We say, no.

As well might we call the wearing of narrow toed boots or chignons or corsets or any other fashionable folly a necessity, on the ground that such follies are universal. The universal craving for stimulants is purely a matter of habit—not of inherited habit, as a rule, although there may be instances of inherited appetite. We believe the world would be better off by far if opium, tobacco, alcohol, tea, and coffee were clean swept from the face of the earth.

But then what would ladies do when they wish to remain out of bed all night to parties and balls? And how would night editors be able to pen their pungent spicy items for morning readers? And how would doctors be able to sustain prolonged deprivations of sleep incident to their vocations? And how would Jones, after having robbed himself of sleep by late hours at his club, be able to eat his breakfast next morning without his accustomed gin cocktail to force his appetite? And Jones, you know, is good for nothing all day unless he takes a good breakfast.

Well, we must say to fashionable party goers, editors, doctors, and poor Jones, that if modern civilization entails necessities which make the wholesale use of stimulants a necessity, society had better make a new departure, and return to a more simple mode of living. Stimulants are like whips applied to overworked horses; they will get a little more work out of the poor brutes for the time being, but all work so obtained is dearly paid for in the end by shortened life and the misery of premature old age burdened by disease, and physical as well as mental pain, or perhaps in something worse.

If medicines of this kind are the necessities of modern civilization, it is as well perhaps to pause and at least make the inquiry whether an exchange of some of our present "*refinements*" (?) of living may not profitably be exchanged for health.

PHARMACY IN PRUSSIA.

Dr. Frederick Hoffmann has published, in the *American Journal of Pharmacy*, a valuable paper on the management of pharmaceutical affairs in Prussia, which ought to attract attention at the present time, when attempts are being made to regulate this branch of service in such a way as to secure the public against frauds and impositions. The education of an apothecary in Germany is conducted according to strict regulations.

The applicant receives the requisite permission from the district physician and district apothecary, after presenting satisfactory testimonials of considerable proficiency in his studies and of good moral character; a thorough preliminary education is absolutely necessary for entrance upon this career.

The apprenticeship is fixed for three years, during which time the master is bound to instruct his apprentices, theoretically as well as practically, in pharmacy and its collateral sciences, and to furnish the requisite apparatus for this purpose. Sufficient time must be allowed to the young men, aside from their daily work in the office and laboratory, to prosecute their studies, and in summer to undertake botanical excursions for the purpose of collecting an herbarium. They have to keep a journal of all preparations made by them, and to enter therein a short description of the theory and practice of the operations. After the termination of three years, the candidate is rigidly examined by a competent commission, and then may be safely entrusted with the functions of an assistant. As such he shares the responsibility of his employer for the proper conduct of the office, except where he merely carries out the orders of his superior. After an additional term of service of three years as an assistant, the student may enter the University course of studies, lasting at least one year, and he can then come up for his final State examination, which is the severest ordeal of all. This examination consists in a series of practical written and verbal questions, covering the whole field of pharmaceutical acquirements, and extending over several months. It includes the preparation of medicines, the execution of qualitative and quantitative analysis, and the examination of poisons, and the verbal examination covers the science of botany, pharmacognosy, general, analytical, and pharmaceutical chemistry, toxicology, and pharmaceutical laws. The final test, which is verbal and public, and to which not more than four candidates are admitted at one time, is passed before the entire board. The candidate who survives this ordeal receives a certificate of qualification from the Ministry of Medical affairs, and the apothecary's oath is administered to him on the occasion of his entrance upon the practical details of his office. The pharmaceutist engages to exercise the duties of his calling in accordance with the laws and regulations, with fidelity and conscientiousness and to the best of his ability.

Grants and concessions to apothecaries are made dependent upon actual necessity; in the cities the number is one to seven for 10,000 inhabitants, and in the country one to twelve for 15,000 inhabitants. In the course of time the grants become very valuable, so that the leading apothecaries are wealthy men. The German apothecaries confine themselves to a purely medicinal business, that is, to the compounding of prescriptions and the sale of medicines. The sale of toilet and fancy articles has been introduced in a few large towns, but although tolerated is looked upon with disfavor by the government, and as entirely *infra dig.* by the regular members of the profession.

It will be seen from the above that pharmaceutical matters are conducted upon very different principles in Germany from what they are in this country; and although it may not be feasible to copy all of the foreign regulations, there are certainly some of them which could be imitated by us with advantage.

Our legislature should provide for the education of pharmaceutists, and then insist upon a diploma as a condition to obtaining a licence to dispense drugs. A political commission appointed to examine apothecaries after they are well established in business is the wrong end at which to commence the reform. It is better to shut the lion out altogether than to attempt to turn him out after he has got in. We commend Dr. Hoffmann's pamphlet to the attention of our legislators.

THE INTRODUCTION OF INDIA RUBBER SHOES.

Perhaps never was the fact that large industries often grow out of small beginnings better illustrated than in the introduction of india rubber shoes.

In a recent conversation with a well known wealthy and distinguished citizen of New York, he casually remarked that he was the first man that ever wore a pair of india rubber shoes in this country. Our curiosity being excited by this statement, he gratified us by a narration so interesting and instructive that we herewith give it in substance to our readers.

Previous to 1821, india rubber had been imported only as curiosities, in the form of crocodiles and turtles, and other reptiles, and also small bottles used for erasing pencil marks. In that year an intelligent sea captain brought home from a voyage a pair of what appeared to be models of shoes made of solid pure india rubber. They were only five or six inches in length, were closed at the top, and of the natural creamy color of the inspissated juice of the caoutchouc tree.

The shoes were given to the gentleman above referred to, then a lad, possessing the inquisitiveness natural to the intelligent youthful specimens of the genus *homo*.

As usual, this lad had a jackknife among the treasures of tops, kitestrings, and other incongruities with which boys' pockets are generally stuffed, and possessed that universally strong boyish impulse, to use his knife upon any new material presented to his notice. This, coupled with a desire to see the inside of these queer little shoes, prompted him to cut them open upon the instep.

The openings disclosed two clay lasts, which were easily broken up and removed by the knife.

The thickness of the rubber was found to be at least three quarters of an inch.

How to get these miniature shoes upon his feet was the problem this lad now undertook to solve. They would not stretch enough to "go on," notwithstanding the well known ingenuity with which boys of his age contrive to get through small holes in fences, to clamber up precipices impossible to adults, and to accomplish feats astonishing to all who forget they ever were boys themselves.

Whether it was suggested from something he had read, or whether in random experiment, our never-to-be-conquered youth conceived the idea of softening the rubber by boiling water and stretching the refractory shoes upon lasts as large as his feet. This done, the shoes were perfected except in color.

The natural resort of schoolboys, in such an emergency, ink, was tried, but, to his chagrin, it washed off as soon as the shoes were wet. It is probable the boy had read something of blackening rubber by smoke; but if he had not, it is certainly singular that he should have hit upon the very method which has been used so long for this purpose. He saturated the shoes with carbon deposit by hanging them in a chimney. Then triumphantly donning his new acquisition, he marched out into the streets, through puddle and pool, the envy and admired of all the boys who saw him.

And it came to pass that, this thing being brought to the notice of the sea captain who presented the shoes to the lad, he had the sagacity to import more of the shoes on his next voyage, which, finding ready sale, the regular trade in rubber shoes commenced, and in 1823 it was an established business.

This trade gradually brought into public notice the vast supplies of caoutchouc existing in various parts of the world, and led to the experiments of Goodyear and others, which have developed the manufacture of an endless variety of rubber articles into one of the most important industries of the age.

THE LABOR PROBLEM—CLASS ORATION FOR 1871 AT YALE.

The Class Oration delivered on Presentation Day at Yale, July 11, 1871, is a production of far more than the usual merit. The graduate who delivered it, Orville Justus Bliss, of Chicago, Ill., is evidently a man of brilliant promise. It is rare that in such a production so much thought is displayed.

The subject of the oration was "The Educated Man in American Society." After making a general inquiry into what constitutes society, and glancing at its imperfections, the assertion is broadly made, that, "disguise it as we may, society at large has not yet been taught a genuine respect for labor." The subject of the relations of labor to capital is then taken up. "Labor parties," it is forcibly said, "may not prove that eight hours a day ought to be a legal day's work, but they do prove that something is rotten in American society." And here the orator makes the strong point of his address, viz., that political economy having failed to relieve the burdens of the laboring classes, society has adopted the charity system. He says:

> At the risk of a glittering generality, I pronounce this the age of poor-houses. Hospitals for the sailor, asylums for the inebriate, and retreats for the spinster, spring up in a night, and open their doors to the unfortunate. Never was society so thoroughly nursed as it is today. Now no one would disparage these enterprises. They honor the head as much as they do the heart of their authors. But they do not meet this great social problem of poverty, and they never will. For they are not philosophical. The best gift you could bestow on a cripple would be to set him on his feet; and if some disease is crippling society, crutches will never make it walk straight. Will it develop into life and vigor the self-reliance of an able bodied man to feed him like a child with his daily bread? The truth is, there must appear in society some miracle worker, personal or impersonal, which shall bid these crippled, halting, and helpless thousands rise up and walk.
>
> If, then, our institutions cannot be trusted, if political economy has proved itself futile, and if charity, however broad in its reach or multiplied in its form, can work no permanent cure, to what shall we turn? Must we abandon the question in despair? Must we accept as a fact the existence in America of an isolated class? While England is manfully fighting her way to justice in the face of tradition and law, shall we ignobly surrender this very fortress of human rights? I do not believe it. That same political economy for which so much is claimed, teaches that man with his muscle alone is able to produce more than he can consume. And if he can do this unaided, where is the boasted beneficence of invention, if it is to carry only physical and moral poverty in its path? Given a community of ten persons, with one hundred bushels of corn, and they ought to enjoy greater material prosperity, than the same number of persons with fifty bushels; and does any one doubt that we can produce the one hundred bushels with our labor saving appliances, where we could produce fifty without them? If, then, it has been demonstrated that destitution is not a necessity among a savage and untutored race, is it inevitable here, where art has doubled and trebled nature? Does not the contemplation of these facts force us back to the truth with which we started, namely, that society fails to *distribute* fairly its labors and its rewards?
>
> Mr. Phillips would reduce the amount of production, and thus bring capital to terms. There could not be a greater fallacy. The bane of society is not that the rich live in palaces, but that the poor live in huts. Rather, if it were possible, increase production ten, twenty, yea a hundred fold, until the rich are fairly surfeited and gorged with luxury, and when they can neither eat, drink, nor waste any more, some will overflow and find its way into the hovels of the poor. But that is a chimera. Once more we are compelled to ask: What shall be done with the labor problem? I began the study of this subject with no preconceived notions, and utterly uncertain as to the conclusion which would be reached. But truth compels me to sum up the answer in a word, old indeed, and monotonous in sound, but gathering a fresh meaning from this new connection. It is the word education. We must educate two classes, the poor and the not poor, which you will admit to be a pretty exhaustive subdivision of American society.
>
> We must educate the laborer, first, for his own work. If knowledge is power, much more so is skill. In this respect a lesson may be learned from France. For example, drawing is taught in our schools merely as an accomplishment, and in most instances a very imaginary accomplishment at that; in France, on the contrary, it is an art, and when the French peasant boy leaves the school for the workshop, he is able to sketch the machine before which he stands. Hence a certain independence; and independence breeds self-respect. The workman should be taught not only how to work, but also how to manage. Of all the blessings which the genius man has bestowed upon labor, I believe that co-operation is greatest and best, for this reason: It makes the employé his own employer, and thus capital and labor cease to quarrel. It is destined to throttle monopoly, and to be the lever upon which the working class will raise itself to power. But hitherto it has been almost useless to them, because they have no competent managers. Our duty is, by industrial schools, by institutes of technology, by free commercial colleges, or by some other means, to put them in possession of those acquirements which will meet this demand. Educate the workman thoroughly in his own sphere alone, and half the charity houses in the land will be compelled to pull down their signs.
>
> But, secondly, we must bestow upon them that broader in-

telligence which will fit them for a position in society. Give a Yankee boy five years in a district school, and he is ready to do anything—trade, shovel, or lecture. His self-confidence may be absurd; but it contains a great secret, nevertheless. The misfortune of the foreigners who fill our workshops and perform our drudgery, is that they are able to do but one kind of work.

The remedy for these evils is then stated to be, education; education—which breeds independence by making men their own employers. This sounds a little indefinite, but we think it will not be found so when considered as it ought to be. It is through education that mankind will at length come to reject the wages system as bad for both employer and employee; through it, that the truth will yet be learned that wounds and scars received in honest work are as honorable as those obtained in battle. It is through this great moral renovator that we shall ultimately be led to know that he who has done all he could for the society in which he lives, is entitled, when superannuated, to be held as something better than a mere pauper, whether his "*all*" has been much or little. It is through education that the masses will be taught to array themselves against large and greedy monopolies, and overthrow them, as all things which oppress the many to pamper a few must ultimately be overthrown. It is through education that the world will advance to the adjustment of its inconsistencies and incongruities. But what kind of education? Not that of books alone, but by the experience, of centuries to come, of suffering, of fierce combat, of famine, of the gradual growth of the consciousness of power in the down-trodden, and of the futility of persistence on the part of those who oppress them. The time is coming, perhaps sooner than any of us think, when they who do the work of the world shall rule in council, and divide unto themselves the fruits of their toil.

It is vain to shut our eyes to the plain fact that the labor question is pre-eminently the question that now most presses for solution. Who will be the prophet that shall lead us out of the wilderness?

[For the Scientific American.]

OCCASIONAL NOTES.

BY G. E. H.

Amsterdam, August 13, 1871.

ENGINEERING SIGHTS IN HOLLAND.

We found Brussels discussing two questions of interest to the readers of the SCIENTIFIC AMERICAN; the one that of connecting herself more directly with the sea by an immense ship canal, which shall make her a maritime port by bringing the largest cargoes directly to her warehouses; and the other, the danger to be anticipated should the New York Museum, that is to be, become a strong competitor for her paintings and her statuary. "America," the daily papers bitterly exclaim, "possesses, nor can produce, nothing of art, and must depend on Brussels for supply, while they will bring us in exchange, only some cotton and miserable petroleum, more dangerous than gunpowder." Sad news this to our future Bierstadts and Powers. The loss of attraction to the pockets of American tourists, has possibly some bearing on her temper.

Motley's able "Rise of the Dutch Republic" had first turned our thoughts, and now our feet toward

"The land that rides at anchor, and is moored
In which they do not live—but go aboard."

So, leaving the accustomed track—of the Rhine in its middle course—we arrived at Antwerp, only to be disappointed in finding little of engineering interest, save in the new system of fortification, which is being completed with all the appliances of present military science and skill, at a cost of over $12,000,000. The Arsenal and Pyrotechnic school are quite busy in manufacturing artillery appliances and ordnance stores, reminding one of Woolwich on a small scale. In the now remaining docks, there is nothing out of the ordinary course, but there can be no doubt that previous to 1814, and for that period, the docks and basins completed by Napoleon were astonishing.

After viewing the architectural and artistic beauties of Antwerp, to reach Rotterdam one takes the rail to Moerdyk, and steamer thence to Rotterdam; but it is expected that in a year, the three grand railway bridges now building will afford uninterrupted railway communication with North Holland. The first of these works is now nearly completed at Moerdyk, and consists of fourteen iron girder spans, each of 328 English feet, with a swing span at the southern extremity, very elegantly arranged. At the point where it crosses, the Hollands Diep is 8,200 feet wide. Each span, complete in itself, is constructed on an island at the northern extremity, floated into place upon two immense pontoons at high water, and allowed to rest upon its respective piers by the subsidence of the tide. Ten of the girders are at present in position, and two complete on the shore. The majority of the piers rest on cylinders sunk, by atmospheric pressure, 70 feet below low water; the others are founded on piling and concrete. The absence of the resident engineer prevented us from obtaining such details as would have been interesting, and upon our arrival at the Hague, we found that the Government reports upon this and the Rotterdam bridges out of print.

The second bridge we passed at Dordt. This is also of iron, but of small elevation above water level, and consists of two spans of 287 feet, two of 211 feet, and two swing bridges, each 88 feet in length. At Rotterdam none of the superstructure has been placed in position, though all the piers, except that which is second from the northern shore of the Nieuwe Maas, are complete. They have all been constructed similarly to the piers of the bridge at St. Louis, Mo., the iron caissons being supplied with compressed air by eight pumps, driven by two large portable engines. The compact and convenient arrangement of the air and discharging locks is noticeable. The caisson to low water mark is laid in Dutch bricks, and finished in Norway granite. This will have five spans in all, two of 295 feet, one of 88 feet, and a swinging bridge, 176 feet in length, for masted vessels. A viaduct, nearly a mile in length, will carry the railway into the heart of Rotterdam. These later examples of engineering science contrast oddly enough with the old canals intersecting the Dutch cities, their innumerable draw bridges, and the quaint customs of the inhabitants, to which the hundreds of windmills form a suitable background. Rotterdam and Amsterdam being both built entirely on piles driven 70 feet into the morass underlying, may be said to be the most wonderful cities in existence; and, in fact, when we consider that nearly three quarters of entire Holland has been reclaimed, little by little, from the Rhine or the sea, and is only now held from the irruption by the constant attention of the "water staat," or Government hydraulic engineers, we can hardly wonder that the Dutch have obtained a character for perseverance far above all other nations.

From the Hague to Leyden, and thence by private conveyance to Katwyk, 5½ miles to the North Sea, to visit the gigantic "sluice gates" built by Conard, in 1809, for Louis Bonaparte, then King of Holland. This artificial exit of the Rhine to the ocean consists of a triple set of sluices of two, four, and seven pair of gates respectively. The immense dykes at the seashore are founded upon piles driven in loose sand, and faced with heavy limestone masonry. When, at ebb tide, the gates are opened, the accumulated Rhine water passes at the rate of 100,000 cubic feet per second. It was our good fortune to be present at the ebb, and (by the judicious expenditure of a guilder) shown all the details.

The extension of the railway from Haarlem to Amsterdam was only accomplished by building the earthwork upon alternate beds of fascines and rubble, held together by stakes and wattles, as the marshy soil of Holland has obliged the majority of her public works to be constructed; but, to offset this expense, cuttings and grades are seldom required.

A visit to the Leeghwater engine near Warmoud, which was one of the first pumping engines erected to drain the Haarlemmer Meer, should not be omitted. We found the engine undergoing some repairs, but the old Cornwall affair readily lifts eleven five feet pumps at each stroke, discharging over 60 tuns of water. This engine, together with one at Half-weg, and another near the Spaame, converted the Haarlem Lake into 45,230 acres of arable land in four years, the average depth being 12 feet below the canal level. This immense Polder now maintains between seven and eight thousand persons, two thousand horses, six thousand cattle, and nine thousand sheep and pigs, at a cost of only 60 cents per acre per annum for pumping engines and repairing dykes. The dykes have a foundation of 120 to 150 feet in width, and are generally a combination of earth, sand, and clay, frequently thatched with a wicker of twigs staked to the surface. The base is often faced with masonry or piling. When we reflect that by a judicious system of dyking and drainage, not only are useless swamps transformed into valuable lands, but that the health of the near inhabitants, endangered by proximity to pestilential morasses, which poison their surroundings, is protected, it is certain that the hydraulic works of Holland deserve special study by our rising engineers. In our next, we will speak of the great ship canals of Holland.

SCIENTIFIC INTELLIGENCE.

MR. RUTHERFURD'S RULED PLATE.

Mr. Lewis M. Rutherfurd, of New York, has succeeded in accomplishing a feat that has hitherto been the monopoly of M. Nobert, of Germany, namely, the successful ruling of a glass plate, that is technically called "a grating." The chief difficulty in preparing these gratings consists in ruling the lines with adequate accuracy, it having been found that an error of $\frac{1}{250000}$ is sufficient to render them inapplicable for purposes of scientific research. The lines on the plate should be about $\frac{1}{1000}$ of an inch apart, and extend over a surface about two inches square.

The lines are ruled with a diamond, absolutely parallel to each other, and, by means of such a plate, a diffraction spectrum is produced without the use of prisms, and the spectrum is a very pure one. Parallel rays are allowed to fall on this grating, and a number of spectra are produced on each side of the glass plate, any one of which may be viewed by a telescope of low power placed in the right position. By means of Mr. Rutherfurd's grating, eight spectra can be seen, and the effect is equal to that produced by a battery of prisms. The spectrum is exceedingly faint, but in scientific research it presents the great advantage that any spectrum obtained in this way will bear direct comparison with one obtained with another plate.

Glass and bisulphide of carbon prisms modify the action of light, as the material of which the prism is composed acts specially on different rays of light. The spectrum produced by the glass grating is very unlike the one with which the public are familiar, for in it the yellow rays are in the middle the spectrum instead of near one end.

It is to be hoped that Mr. Rutherfurd will permit his ruling apparatus to be used in the preparation of gratings, for scientific research and for adaptation to instruments to be used in technology. A spectroscope made of these glass plates may open up a field of research not attainable by the ordinary prisms.

WASHING PHOTOGRAPHIC PRINTS.

Anthony's *Photographic Bulletin* gives an account of a new process, for washing out all of the hyposulphite of soda from prints, that is worthy of notice. Mr. H. J. Newton, of New York, accomplishes this object by decomposing the last traces of hyposulphite by means of the acetate of lead. A solution of the pure crystalline acetate of lead is made of the strength of one grain to the ounce of water. This is the strength for use; it may be made stronger for stock. After the prints have been well washed in three or four changes of water, they are to be placed in the lead solution, when the remaining hyposulphite is immediately decomposed, forming sulphate of lead and acetate of soda. After remaining a few minutes, the prints are removed, and finally washed in three changes of water. The sulphate of lead, being insoluble, will not be likely to adhere to the print, but care should be taken to have no excess of the acetate of lead left in the paper, as that would, if anything, be worse than traces of hyposulphite. The fading of photographic prints is chiefly due to the difficulty in washing out the hyposulphite, which, in course of time, destroys the picture. This method of Mr. Newton appears to thoroughly overcome the difficulty.

DECOMPOSING PHOSPHATES WITH SEA WATER.

Native phosphates are insoluble so as to be all but worthless as fertilizers. They require to be ground and treated with sulphuric acid to convert them into superphosphate, in which state the mineral becomes soluble and capable of being assimilated by the plant. Mr. Commins, of South Carolina, proposes to circumvent this tedious and expensive process by calcining the nodular phosphates of that region in a reverberatory furnace, and, while the mass is still hot, allowing sea water to trickle down upon it, by which it is claimed that the stone is not only disintegrated but rendered soluble.

What there is in sea water beyond the small percentage of salt to give it a preference over any other water, does not appear; and there is room for doubt as to the effect of steam and water in rendering a mineral phosphate soluble. If the process can be accomplished in this simple way it will be a great improvement on the use of sulphuric acid, which is attended with so many disadvantages. It may be that the water and heat act to thoroughly disintegrate and comminute the mineral, so as to render its assimilation by the plant possible: and the longer it remains in the soil, the more thoroughly would it be likely to be decomposed. So, too, if bones were ground and treated in a similar way it is possible that they could be applied as a manure at once, dispensing with the use of sulphuric acid.

It is claimed that the constituents of the sea water, notably the lime, potash, magnesia, and soda salts, add materially to the fertilizer treated in the new way; this is no doubt true, only it would be vastly cheaper to procure these salts from the residues of the Stassfurt mines rather than obtain them by the evaporation of large quantities of sea water. The Stassfurt mines can furnish all the crude potash and magnesia salts that may be required, and it is probable, as further developments are made, that the Louisiana salt beds may reveal deposits of a similar character.

The whole subject is of importance, in view of the want of fertilizers for the impoverished lands in many parts of our country.

American Institute Fair.

The annual exhibition of the American Institute was formally inaugurated on Thursday the 7th by the usual ceremonies of music, a prayer, a poem, and an address by E. G. Squier.

This constitutes the nominal opening, but chaos reigns throughout the building at the time of going to press, and it looks as if it would be some time yet before the machinery department is in running order, or articles classified and placed in position to render the exhibition attractive.

When the Fair is in good working order, we shall take occasion to notice such machines and articles as are novel and meritorious.

LOUISIANA STATE FAIR—BOILER AND ENGINE WANTED. —The announcement of the fifth Grand State Fair of the Mechanics' and Agricultural Association of Louisiana, commencing November 18, 1871, appears in our advertising columns, with an advertisement stating the desire of the Association to purchase an engine and boiler to be used at this and succeeding fairs. This advertisement should elicit the attention of manufacturers, who will find it to their interest to have their engines so thoroughly advertised, as would be the case when placed in so conspicuous a position as in this annually crowded exhibition.

THE INDUSTRIAL ASSOCIATION OF GEORGIA announces its first annual exposition to be held at Savannah on November 21 and following days. The list of premiums comprises rewards for excellence in all industrial, agricultural, artistic and domestic pursuits. Mr. H. D. Capers is the secretary of the association.

THE THIRD ANNUAL MISSISSIPPI STATE Fair will take place at Jackson, during the week commencing on Monday October 23d. The prize list is long, and competition is invited in a judiciously varied list of objects and pursuits. Mr. J. L. Power is the secretary of the fair his address is Jackson, Miss.

DR. THOS. SCHNEBLY, surgeon-dentist, a man of literary and scientific attainments, an editor, and the inventor of several useful improvements, died recently at Hackensack, N. J., aged sixty-nine. He was the patentee of several excellent inventions relating to harvesters, grain weighing machines, horse rakes, etc.

J. H. HALLENBECK suggests for photographers the use of thin sheet rubber instead of yellow glass for the sensitizing rooms. Light admitted through this rubber will not act on the sensitive plates.

Examples for the Ladies.

Anna G. P. Inskeep, of Urbana, Ohio, says she and her two sisters have earned their entire livelihood for 7 years with a Wheeler and Wilson Machine without any repairs, although it has often been loaned to friends, and played with by many children.

"Of late years advertising has assumed a very important phase—in fact, has become a science in business, and no one has done more, or as much, to make it so, as Geo. P. Rowell & Co. of New York. Their prompt and systematic mode of transacting their business has gained the confidence of all large advertisers, and has raised them in a few years from one of the smallest to the leading advertising house in the world.—*Maple Leaves.*

Burnett's Cocoaine promotes the growth of the Hair. Free from irritating matter.

Improved Universal Wringer.

The latest improved Universal Wringer has movable metal clamps and thumb screws for fastening to any sized tub; a folding shelf or apron, for carrying the clothes over the edge of the tub or machine; compound wooden spring-bars, to equalize the pressure of the rolls; a patent stop, to prevent the rolls from letting the cogs out of gear;—in short, everything which ingenuity can invent, has been pressed into service, to make The Universal a complete Wringing Machine.—*Moore's Rural New Yorker, Sept. 9, 1867.*

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Presses, Dies, and all Can Tools—Ferracute Works, Bridgeton, N. J.

Wanted—One Brown & Sharp's or Pratt & Whitney's Screw Machine. Manhattan Brass and Man'f'g Co., 27th street and 1st avenue.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

The Greenleaf Grate Bar saves fuel, and lasts much longer than the ordinary bar. Address Greenleaf Machine Works, Indianapolis, Ind.

Diamond Carbon, of all sizes and shapes furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Refined Paraffine Wax, any kind and quantity. C. C. Beggs & Co., Pittsburgh, Pa.

The Eccentric Elliptic Geared Power Presses save power, time labor, and save Punches and Dies. For Circulars, address Ivens & Brooke Trenton, N. J.

Vinegar—how made—of Cider, Wine, or Sorgo, in 10 hours. F. Sage, Cromwell, Conn.

Copper and Brass Seamless Tubes (from 3-8 to 5 in. outside diameter). Merchant & Co., 507 Market st., Philadelphia.

Patent English Roofing Felt, ready coat, thick, durable, and cheap. Merchant & Co., 507 Market street, Philadelphia.

See advertisement of Wilkinson's Combination Pocket Tool.

Send to E. & A. Betts, Wilmington, Del., for list of nice Machinists' Tools, on hand, and making.

For best Lubricating Oil, Chard & Howe, 134 Maiden Lane, N.Y.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List o Waltham Watches. All prices reduced since February 1st.

Self-testing Steam Gauge.—The accuracy of this gauge can be tested without removing it from its connection with the boiler. Send circular. E. H. Ashcroft, Boston, Mass.

Ashcroft's Low Water Detector. Thousands in use. Price, $15. Can be applied for less than $1. Send for Circular. E. H. Ashcroft, Boston, Mass.

Lord's Boiler Powder is only 15 cts. per pound by the bbl., and guaranteed to remove any scale that forms in steam boilers. Our Circular with terms and references, will satisfy all. Geo. W. Lord, 107 W. Girard ave., Philadelphia, Pa.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth st., Brooklyn, manufacture Presses and Dies. Send for Catalogue

Improved Mode of Graining Wood with Metallic Plates, patent July 5th, 1870, by J. J. Callow, Cleveland, O. Sample plate sent for $3.

Superior Belting—The best Philadelphia Oak Tanned Leather Belting is manufactured by C. W. Arny, 301 Cherry Street, Philadelphia.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Bailey's Star Hydrant, best and cheapest in the world. All plumbers send for a circular to G. C. Bailey & Co., Pittsburgh, Pa.

Wanted—To invest $500 to $5,000 in a good paying Manufacturing or Mercantile Business. Address Box 574, Pittsburgh, Pa.

Copper and Brass Seamless Tubes (from 3-8 to 5 in. outside diameter. Merchant & Co., 507 Market st., Philadelphia.

Patent for sale, or Partner wanted with capital to introduce the same. Please address Philip Marquard, 408 Swan st., Buffalo, N. Y.

Wanted, a good salesman to take charge of a new branch machinery store we are about opening—one who is familiar with Wood-working Machinery, and can furnish good references. Address J. A. Fay & Co., Cincinnati, Ohio.

$4.00. Stephens' Patent Combination Rule, Level, Square, Plumb, Bevel, Slope Level, etc. See advertisement in another column.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Answers to Correspondents.

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 must be by volume and page.

CONE PULLEYS.—D. L. B., in your issue of Aug. 26, explains cone pulleys; allow me to simplify his method. Let him make his driving cone, say 12, 13, and 14 inches, then put it up in the place desired. If the size of the smaller cone to be driven is 1 inch, get a casting for said cone, so that it will finish 1, 2, and 3 inches. Then turn the smaller pulley to the size of 1 inch, and place the same in the lathe where it is to be used. Put a gross line around from the driving cone to the lower one, and tie it taut; then shift to the next pulley, and with one or two trials he can turn it to correspond with the first, by means of the line; so on with the third. The line also will give the length of belt. Any machinist will find this a simple, easy, and perfect way of making cone pulleys. It is D. L. B.'s theory simplified, and put where any practical workman can easily understand it.—F. H. M., of Mass. [This is a good practical method, as we know by experience. The calculation of sizes mathematically, is for all cases difficult, and the method given by F. H. M. is accurate enough for most purposes. With these remarks we shall drop the subject of cone pulleys for the present.—EDS.

RIGHT ANGLED TRIANGLE.—Briefly, let the three sides be H, B, P. Let the cosines of the angles opposite B and P be severally b and p. It can be shown that

$$P + B = b + p$$

is true for all right angled triangles; and this suffices to solve the problem; we modify the equation thus:

$$P = (B \times b) + p$$

which is, indeed, a "solution." Multiply the known side by the cosine of the opposite angle, and divide by the cosine of the angle opposite the side sought. This will solve so much of the problem as relates to the two sides B, P, one of which is known. Having both B and P, find the square root of the sum of their squares for the value of the side, H.—J. L., of N. Y.

DIMENSIONS OF RIGHT ANGLED TRIANGLE.—C. E. C., query No. 4, Sep. 2, asks: "Given the three angles and the length of the base, to find the length of the hypothenuse, or the perpendicular, of a right angled triangle." As the angles are given, the solution is in the use of natural sines, that is, sines, cosines, tangents, cotangents, etc. See Davies' "Legendre, Plane Trigonometry," page 28, where will be seen six principles applicable to the solution of right angled triangles in any case required. Rule No. 3 applies to C. E. C.: "Perpendicular is equal to base by tangent of angle at base." To find hypothenuse, rule No. 1: "Perpendicular equals hypothenuse by sine of angle at base;" or, according to proportion, transposing the factors and using logarithms, we have log. of hypothenuse equals log. of perpendicular (plus ten) minus log. sin. C. The hypothenuse is easily found without the use of trigonometry, as follows: Multiply the square of the base by the square of the perpendicular, extract the square root of the result, and it is the hypothenuse of a right angled triangle.—N. F. P., of ——

RIGHT ANGLED TRIANGLE.—If C. E. C. (Sep. 2) has a table of logarithms, he can find his hypothenuse by the following rule: Sine o vertical angle is to base as the radius is to hypothenuse. If not, let him lay down his base line from any rule, and construct the adjacent angles; then the intersection of the two other sides will mark the third angle, and he can measure either side by the same rule.—T. E. N. E., of Mass.

ROLLING BODIES.—Of three balls: one of gold, one of iron, and a third of some lighter material than iron, to be perfect globes, of equal diameters, and coated over with paint, or otherwise, so that they shall be exactly alike, to all external appearance, and all of the same weight—the gold one being quite hollow, the iron one less hollow, and the lighter material solid or but a little hollow—the question is how to tell which is the gold and which the iron, without defacing the surface. The answer given is that the use of an inclined plane will decide; for the gold ball, having all the weight at or near its circumference, will roll the most rapidly down the incline, and the iron one next, and the lighter material slowest. Many people possessed of considerable scientific knowledge believe this answer to be correct. Is it correct or erroneous?—S. H. B., o Pa. Answer: Incorrect. The balls will roll down in equal times.

JAPANNING ZINC.—In reply to your correspondent, M. D., query No. 9, in your paper of August 5th, I do not think he can get any japan which will adhere to zinc, whether stoved or not. The only article which I know of that will permanently adhere to zinc, is Webster's Patent Zinc Metal Paint. This is not the oxide of zinc, but the spelter itself reduced into a friable form by a patent mechanical process. I have seen a piece of sheet zinc coated with this preparation, and after being exposed to the atmosphere for more than two years, was as firmly attached to the zinc as possibly could be.—J. McH., of Birmingham, England.

RETURN PIPE OF STEAM HEATER.—A. S. wishes to know why the return pipe is connected to the boiler below the water line. In my opinion that is the correct and scientific principle. The operation seems to be as follows: When steam generates, its specific gravity being so much less than that of water, it seeks its outlet from the upper end of the boiler through the steam pipe to the radiators, where it condenses, and returns by the return pipe to the lower end of the boiler; this establishes a complete circulation. A. S. can return by the same pipe (steam pipe), but at the expense of fuel, from the fact that the live steam comes in contact with the condensed steam, and lowers its temperature before reaching the radiators. The best way is to place a check valve in the return pipe, just above the boiler; then, as the condensed steam collects (say eighteen or twenty inches above), the valve will open and let it in, and so on, opening and closing as the steam condenses.—J. A. Mc.

WATERPROOF CLOTH.—A. L. S., of Ga.—To render cloth waterproof, immerse in a mixture of the solutions of sulphate of alumina and acetate of lead, using about five parts of the first named salt to six parts of the latter, by weight.

J. A. Mc.—Your theory of circulation in steam heating apparatus is correct.

C. S., of Ontario.—The price of the SCIENTIFIC AMERICAN, postpaid to Canada, is $3·25.

O. W. C., of Mo.—The gum used on postage stamps and envelopes is gum dextrin.

R. H. A., of Md.—We cannot give the address desired.

M. H. B., of Mass.—It is impossible to tell what is the defect in your pump, without any knowledge of the circumstances under which you are trying to make it work.

J. E. M., of Pa.—There are plenty of authorities that have investigated the flow of steam through orifices. Get Box's "Practical Treatise on Heat," which contains full information, tables, and formulæ.

DIMENSIONS OF A RIGHT ANGLED TRIANGLE.—C. E. C. (Sep. 2) will find, if he studies the 47th proposition of the first book of Euclid's "Elements," that the length of the hypothenuse, and of the perpendicular, will vary with the proportions of the two smaller angles. The squares of the two sides containing the right angle will be proportioned to each other inversely as the two angles are. Thus, if A B C be the triangle, A B being the hypothenuse, the square of the line, A C, will be to the square of the line, B C, as the angle A B C is to the angle B A C. C. E. C. has only to apply the proposition to any given data to find what he wants to know.—D. B., of N. Y.

BED SPRINGS.—*Does E. S. B. use copper springs, or are they iron slightly coppered? If of iron, immersion in solution of sulphate of copper will restore the covering which has been burned off. They must be first thoroughly cleaned.*—M. P., of Conn.

CONDENSATION OF STEAM IN LONG PIPES.—Y. S. (Sep. 2) should know that the rate of condensation will vary with the diameter of the pipe, and thickness of the metal of which it is made. No rule can be given, as an answer to his query.—D. B., of N. Y.

ROLLING THIN METAL.—Current volume No. 9, page 138, query 8.—Gold can be so worked that 200,000 sheets will be but one inch in thickness; silver and platina can be worked considerably thinner than 4,800 sheets to one inch; this process is done by beating between goldbeater's skin. "If it can be done by rolling?" as the question asks, I do not know, but suppose it could, provided the metal is protected from touching the rollers directly.—A. K., of N. Y.

KILLING TREES.—Current volume No. 9, page 138, query 12. If S. H. L. will take a concentrated solution of sulphate of iron and apply it to a tree by making a cut with an ax in the same, and pouring some of the solution in it, he will see a wonderful effect. I saw this receipt about six years ago in Germany, in some book, and believing in its efficacy, I undertook a trial. I made a solution of the above mentioned salt, dipped a knife in it, and cut off the half of a leaf of a rare house plant. To my regret, the whole plant died, which was a rather costly experiment. The cost of the material is very low.—A. K., of N. Y.

WRITING ON CHINA.—In answer to query of R. T.: Take liquid silicate of soda, of 1·5, incorporate with red lead, to give it a bright color. Write with a small brush, and set the pottery in the heated oven of a stove for 48 hours. Do not put on too thick.—P. M., of N. Y.

GRINDING CLAY.—Let D. H. S., Jr., crush his clay between two rollers of cast iron. Grind afterward in pug mill.—P. M., of N. Y.

FOUNTAIN.—G. M. G. should use two ¾ inch supply pipes, and ½ inch pipe (all of lead), and use the double acting ram; as it has two valves, it gives a steady even pressure of the water. He will not need a reservoir, as he has all the pressure that can be had on the water.—*C. H.* of N. H.

W. F. W., of N. Y.—An American patent is invalid if granted for a process or device identical with that which has been in practice in Europe for twenty-five years, as you state. Such a patent cannot be sustained in the courts.

J. R. D., of Miss.—We know of no way by which your imperfectly burned bricks can be converted into good bricks.

HAIR DYE STAINS.—In answer to L. D., query 12, page 154, nitrate of silver, or hair dye stains can be removed by a solution of ten grains of cyanide of potassium, and five grains of iodine to one ounce of water; or a solution of 8 parts of perchloride of mercury and muriate of ammonia in 125 parts of water.—T. J. D., of Pa.

QUEEN BEES.—In answer to J. E. R., as to the death of queen bees, in No. 7, current volume of the SCIENTIFIC AMERICAN, I have to say that when bees throw off their first swarms, they generally raise up a number of queens to take the old one's place. These leave with the swarm and as only one queen is permitted to stay in a hive, the others are killed and thrown out on the lighting board.—J. M. C., of Ill.

PLATED WARE.—If "Plater," query 18, September 2, will make a paste of whiting and alcohol, apply it to his plated ware, and allow it to dry, rubbing it with a brush if rough, or with a soft rag if smooth, he will have no more trouble in cleaning plated goods.—S. D. S., of N. Y.

FIBRIN FROM BLOOD.—S. G. D. (Sep. 2) can obtain fibrin of tolerable purity by whisking the blood with a bundle of twigs. The fibrin coagulates in elastic strings, of an opaque white color. It should be washed in water, and can then be pressed into a doughy substance. It dries to a horny texture, and becomes yellow in color.—*D. B.*, of N. Y.

GAS FOR BALLOONS.—T. J. W. is informed that fifteen cubic feet of hydrogen will raise a weight of one pound; but more of the carbureted hydrogen of the gas works will be required, and the quantity will increase with the various impurities in the gas.—D. B., of N. Y.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSIONS.—A. A. W.—B. M. J.—S. F. R.
CANAL NAVIGATION.—D. P.—S. D. C.
CIRCULATION IN BOILER.—P. R.
CONSUMING SMOKE.—P. S.
DARWINISM.—J. E. S.
DESCRIPTION OF THE UNIVERSE.—J. S.
FORMATION OF THE WORLD.—S. C. C. C.
GRAVITY A PROPERTY OF MATTER.—W. L. W.
LOW PRESSURE ENGINES.—T. B. W.
PRESSURE OF FLUIDS.—C. H. P.
REFLEX INFLUENCE OF MACHINES.—D. S.
SAFETY VALVES.—O. R.
ANSWERS TO CORRESPONDENTS.—A. D.—D. & R.—H. S. W.—T. S. B.
QUERIES.—A. D.—A. E. M.—A. J.—C. H. L.—J. A. G.—W. L. C.

Inventions Patented in England by Americans.

August 15 to August 18, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

AUXILIARY SPRING.—H. Lull, Hoboken, N. J.
BALE TIE.—S. Brett, New York city.
CLEANSING FIBER.—W. Adamson, Philadelphia, Pa.
GAS LIGHTER.—F. Bean, Somerville, Mass.
LABELLING MACHINE.—E. Tyrrell, Brooklyn, N. Y.
LOOM.—A. Nimmo, T. Moran, V. Stausse, G. W. Ensinger, Philadelphia, Pa.
PHOTOGRAPHIC PLATE.—H. M. Hedden, C. A. Hill, Worcester, Mass.
PREPARING GRAIN FOR FOOD.—R. B. Fitts, Philadelphia, Pa.
SIGNAL.—T. S. Hall, West Meriden, Conn, and A. L. Van Blarcom, Summit, N. J.
STEAMING CLOTH, ETC.—L. M. Heery, Hinsdale, Mass.
TANNING.—W. A. Hacker, Lynn, Mass.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—BLOW PIPE LAMP.—Can any of the readers of the SCIENTIFIC AMERICAN tell me if it is safe to convert common lamp oil (petroleum) into gas on a small scale for blowpipe use? Having had the experience that alcohol is too expensive, I tried to find a substitute for it. The receptacle for oil should be cylindrical, three inches in diameter, and about the same hight, being heated by a lamp under it, fed with the same oil. Would the oil explode if heated so as to give gas, which would, under some circumstances, be above its boiling point? I think this a question of general interest, especially for watchmakers and goldsmiths, who have to use hard solder.—A. K.

2.—MALLEABLE CASTINGS.—What process is the best and cheapest to finish malleable iron castings? How is japanning done?—N. F. P.

3.—STEPS FOR WATER WHEELS.—Will some of the readers of your valuable paper please tell me what kind of wood makes the best step for water wheel? also the best form to turn the same?—S. H. B.

4.—DEODORIZING BISULPHIDE OF CARBON.—Will you please inform me in your "Answers" if there is any method of deodorizing bisulphide of carbon? I think I have seen an article on the subject in the SCIENTIFIC AMERICAN or some other scientific paper.—H. L. B.

5.—TRANSFERRING DRAWING TO GLASS.—Will some of your kind subscribers inform me of the process of transferring pictures on to glass to imitate stained glass? There are prepared prints and boards for the purpose.—C. S. M.

6.—PEASLEY'S CEMENT.—Can any of the readers of your valuable paper inform me how to make the celebrated "Peasley's cement?" I once read the recipe in a weekly journal, but have forgotten it.—I. G. H.

7.—PARLOR MATCHES.—Will one of your numerous correspondents please inform me how to put the red tops on parlor matches, what are the ingredients, in what proportion should they be used, and how to prepare them?—J. W.

8.—RELATIVE POWER ON THE SIDES OF PISTONS.—I wish to know if a steam engine works with as much power on the backward stroke as on the forward stroke? As the piston rod occupies some space on one side of the piston and none on the other, there will be that much more surface for the steam to act on.—J. H. C.

9.—ROSEWOOD GRAINING IN ASPHALTUM.—Is there any method for preparing asphaltum so that fine graining can be done by spreading it over a red base and then graining in it as in paint? Asphaltum, although exceedingly beautiful for imitating rosewood naturally, runs, spreads, or flows together again, so that it will not retain the graining. We have remedied this defect by putting in linseed oil, boiled, prepared, or dryers which have it for a base (retaining its dark color by adding lampblack), but it dries so slowly when mixed with oil that it is not practicable. Yet we have seen such graining. We have not been able to obtain any book which could give us the needed information. Such information would be thankfully received by about all the cabinet makers in the United States, for it is in general use, but on account of the above defects the great body of them are limited in its use exclusively to the cheapest imitations of rosewood.—A. T. & S.

10.—HEATING SURFACE OF BOILERS.—Will some reader give me a simple, practical rule for estimating the heating surface of steam boilers, both tubular and two flued?—A. H. G.

11.—CISTERN WATER.—Can I find out, through the SCIENTIFIC AMERICAN, how to obviate dirty and bad smelling water, which is kept in a large and well cemented cistern, having just been cleaned, and with good ventilation?—H. W. U.

12.—HEATING FURNACE.—Could you tell me how to arrange a smith's fire to heat my springs (putting in a dozen at a time), so as not to put them directly in the coal, as it is inconvenient for rapid work?—N. S. H.

13.—PREVENTION OF SCALE.—I have seen it stated that if borax be introduced into hard water it will become soft; and the idea came into my mind that it might be useful to introduce it into steam boilers to prevent scale; but I do not know the effect it might have on the boiler, or the quantity to the gallon, or how often to introduce it. Would it be preferable to put it into the cold water in a tub and lead the exhaust steam into it, and heat the water with the borax in it before pumping it into the boiler?—D. McI.

14.—CAPACITY OF BOILERS.—Will some of your correspondents answer the following question? There is a boiler forty-four inches in diameter, twenty-six feet long, with five twelve inch flues, that furnishes steam for an engine, fourteen inch cylinder, twenty-four inch stroke. How many plain cylinder boilers will it take to furnish steam sufficient for the above engine, of the following dimensions: two feet diameter, twenty-six feet long? If some one will answer the above, I will be obliged, as we do not agree about it here, and propose to refer it to your paper.—M. L. S.

15.—QUARTER TWIST BELT.—Can I run a quarter twist belt on my swinging cross cut saw, nine feet between shafts, driving pulley twenty-four inches diameter, and driven six inches, six inch faces? The driver is placed in lower story, the saw on floor of second floor; the saw has twenty-two inches throw from standing point; speed, 1,000 per minute.—A. M.

16.—BLEACHING STAINED BONE.—How can I bleach or clean articles of bone which have become dingy, soiled, and yellow, without removing the polish, or, if that must be done, how can I repolish them?—S. L. C.

17.—HINDRANCE TO THE FLOW OF WATER THROUGH PIPE.—I laid a three quarter inch iron pipe about 130 feet, from a spring to a watering trough, about a year ago. The water is moderately hard, and there is a descent of five or six feet in the pipe; at the lower end, a three eighth inch iron pipe is used to raise the water from the elbow, about three and a half feet to the trough. The descent in the main pipe is even—no depressions—and the small pipe is bent over to form a goose neck at the top. At first the water ran full and strong, but after a short time slackened and almost stopped. Upon removing the upright pipe, the water starts from the main pipe freely again, and after a few seconds large bubbles of air or gas begin to pass off rapidly, continuing for about eight or ten minutes, when it ceases, and the water runs steadily again from the upright pipe for from six to ten days, when it becomes weak and slacks up to almost nothing; and upon removing the upright, the bubbling process is repeated, and has been so at the usual intervals, ever since. Now there has been much speculation and argument among a few persons as to the cause of this strange proceeding. Is it air or gas? Why does it not pass out at the upper end of the main pipe, instead of accumulating and checking the flow? Why does it bubble so long? The pipe certainly is emptied of the accumulated water in less than one minute. Would the oxidation of the iron produce any such effect, by the combination with the hydrogen in the water, or form any kind of gas, and in such enormous quantity?—J. R. B.

18.—PUNCHED AND DRILLED GIRDERS.—As I have heard various opinions as to punched and drilled girders for bridges, I should be glad if any of your numerous readers would give the exact percentage of advantage of drilled girders over punched, and the difference in cost per ton.—B. F. M., of Australia.

19.—SAFETY VALVE.—Will you permit me to ask the following question? If the steamboat *Westfield's* steam gage indicated twenty-seven pounds of steam when the engineer last saw it, her fires being in good order, generating steam at the rate of twenty-five revolutions per minute of her engine, boiler exploding from five to fifteen minutes after engineer had seen the steam gage, how much pressure of steam had the *Westfield's* boiler when she exploded? If her safety valve was of sufficient capacity, and not fastened down, how came she to have twenty-seven pounds of steam?—W. H. S.

Recent American and Foreign Patents.

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

DIGITORIUM.—Myer Marks, of London, England, assignor to William A Pond, of New York city.—This invention has for its object to produce an instrument whereby the fingers and wrists of persons learning to play the pianoforte or organ can be trained, and the muscles used in playing strengthened. Five keys are pivoted within a box, and arranged alongside of each other like piano keys. Each key is held up by a spring of greater or lesser strength, so as to be more or less difficult to depress. The person practicing on the keys will train the fingers to the gentle touch required on actual instruments. A slide is fitted into a groove in the under side of the case, so that it can be drawn in or out at will, and supports, at its front end, in front of the keys, a wrist support, which is applied by a screw, to be vertically adjustable. The wrist can thus be sustained at suitable hight and suitable distance from the keys. To the sides of the case are affixed plates with their corners so rounded that the thumbs and forefingers can be spread thereon, one plate being for the right, the other for the left hand. To the back of the case is affixed another plate, wedge shaped, so as to serve for spreading two adjoining fingers.

CLOD FENDER.—George L. Perry, of Berlin, Wis.—This invention furnishes an improved corn shield, so constructed as to effectually protect the corn from being covered or injured by the dirt or clods thrown toward it by the plow, and so that it may be conveniently raised or lowered, or adjusted at a greater or lesser angle with its bar, or adjusted for attachment to either side of the plow. It is a simple and useful device well calculated to accomplish the end sought.

CARPET STRETCHER.—James H. De Poe, of Boonton, N. J., assignor to himself and Richard Manse l, of same place.—This carpet stretcher consists in a long straight stock adapted for applying to the floor at the angle between it and the base board by the lower end, which terminates in a pointed metal piece with a fixed jaw projecting from the side opposite the base board, and a swinging jaw above it, between which the carpet is griped by the jamming of the upper jaw upon the lower one when the upper end of the stock is pushed toward the wall. It is so arranged that when the carpet is placed upon one jaw, and the instrument is ready to be set in action, it will close upon the carpet by the action of gravity, and the friction, when the instrument is moved toward the wall, will cause it to gripe and hold the carpet firmly to stretch it.

PROPELLING CANAL AND OTHER VESSELS.—John Jochum, of Brooklyn, N. Y.—This invention consists in an improvement upon that class of propellers which acts against air instead of water. An ordinary screw propeller wheel is arranged in an elevated position on the deck, to be turned by the motive power in the same manner as when acting upon the water, but, of course, to be run very much faster for obtaining the required impelling force. It is contemplated to employ any suitable arrangement of wind wheels instead of screws, as may be found best for the purpose. By preference, a hood or case will be placed over the wheel to prevent lateral displacement of the air, also to protect it and the attendant from injury. The particular location of the wheel or arrangement of it or the driving mechanism is not material.

WRINGER ROLLERS.—Joseph Whitehead, of Trenton, N. J.—This invention consists in a novel mode of combining the rubber with the shaft by means of plates connected with the flanges or disks and arranged parallel with the shaft, preferably two in number, and arranged on opposite sides. The plates are intended to have the india rubber so built around them as to prevent the possibility of its turning, shifting, or working loose on the shaft. This is accomplished by first winding the india rubber, it being suitably arranged in a sheet on the shaft as thick as the distance of the plates from the shaft. Then the plates are on the rubber, said plates being enclosed in a canvas cover coated with india rubber, or otherwise arranged to cause the india rubber to adhere to them when vulcanized. Then the disks, secure to both the shaft and the plates, and the spaces, are filled out between the plates flush with the outer surfaces by pieces of india rubber laid in, and then winding on the sheet until the full size is attained; after which the whole is heated in the ordinary way of causing the layers of india rubber to unite in a mass, thereby incorporating the plates so that the india rubber cannot turn or shift.

HAND GARDEN PLOW.—William D. Smith, of Homerville, Georgia.—The shank of the plow is inserted in a handle, and secured by a key in the ordinary manner. The lower part of the shank is divided into two branches of unequal length. The shorter branch is curved to the right and downward and to its end is attached or upon it is formed a blade. The other or longer branch is curved outward, upward, and downward, and upon its lower end is formed or to it is attached a blade. The blades are made thin, narrow, curved, and with sharply inclined forward edges, with a sharp point. Guard, plate or fender, made thin, flat, and broad, is formed upon or attached to the end of a rod, which passes horizontally through a hole in the shank, at or near its branching point, and is secured in place by a hand nut. This construction enables the fender or guard to be turned down when cultivating small plants, turned up when cultivating larger plants, and to be readily detached when required. The handle is about six feet long, so that it may be grasped nearer to or further from the plows, according to the hight of the operator.

WASH BOILER.—Nathaniel Parks and George A. Hynds, of Rome, N. Y.—This invention relates to several improvements on the style of wash boilers containing vertical pipes, wherein the steam created in the lower part of the boiler ascends to be discharged laterally into and through the clothes to be washed. The present invention consists in the application to such boiler of a fresh water chamber, wherein a supply of fresh water is kept and heated, to be let on after the water in the boiler has become dirty. The invention also consists in a new manner of fastening and arranging the vertical steam pipes, and in the use of a removable false cover.

ELECTROMAGNETIC BURGLAR ALARM.—George E. Cock and John H. Guest, of New York city.—This invention relates to several improvements in the sounding and setting apparatus of a burglar alarm; and consists, first, in the arrangement of an adjustable spring, whereby the movements of the vibrating armature are regulated; also, in the application to windows of a balanced metallic circuit closer, which will serve to establish a current as soon as the sash is moved or its panes are meddled with. Finally, the invention consists in the introduction of a peculiar set of springs between the sash and window frame for closing the circuit as soon as the sash is elevated. We should be glad to give our readers some idea of the details of this ingenious invention, but the nature of these details precludes the possibility of so doing.

NAIL MACHINE.—Henry Reese, Baltimore, Md.—This invention relates to the manufacture of horse shoe or other wrought nails, by the process of rolling the end of a heated cylindrical rod between opposite and exactly similar faces moving with the same velocity in contrary directions, said faces being inclined so as to gradually approach each other as the rolling progresses and being so shaped that the cylindrical rod may be rolled and drawn into a pointed blank, round in cross section, said blank then being pressed into the proper shape between dies operated by a toggle or other equivalent arrangement.

TREADLE POWER.—Two cranks are used having friction rollers upon their wrists. The cranks are set opposite, so that when one is at the lowest point of its revolution, the other is at the highest. Two treadles are used, which are pivoted at one end, and rest upon the friction rollers at a convenient distance from the other end. On the under side of these treadles are inclines, so adjusted, that, when the treadles are depressed alternately, they force the cranks by the dead point. William Reed, of Allentown, Pa., is the inventor.

WATER WHEELS AND GATES.—P. H. Wait, of Sandy Hill, N. Y.—This invention, the details of which are such as to preclude minute description here, renders the casting of the parts easier, as the rims and buckets may be molded together. The inclination of the buckets is preferably in the relation of the hypothenuse of a triangle whose base is five and whose perpendicular five. By this and certain improvements in chutes, etc., it is claimed that a more effective application of the water to the wheel is secured. A feature of the gate is, that, should any obstruction reach through it to be caught in the wheel, the gate will revolve with the wheel, and thus avoid breaking. There are several other good points to this wheel which will be duly appreciated upon its introduction to the public.

DENTAL DRILL.—The invention of Chandler Poor, of Dubuque, Iowa, relating to dental drills, provides an improved method of transmitting the power of a foot wheel to such drills in filling and preparing teeth for plugging. The power is transmitted, by a cord belt through a universally jointed standard, to a spindle at the top of the standard. This spindle is connected with the drill mandrel by means of a piece of catgut. The drill mandrel runs in a hollow cylindrical hand support, having a bell shaped opening in the rear where the catgut enters, thus allowing the drill to be presented in any required position to the tooth operated upon.

AUTOMATIC WIRE STRETCHER FOR FENCES.—This device, invented by Ebenezer Burnet Stephens, of Brownville, Nebraska, consists in a vertical bar, to which the ends of the wires are attached. This bar is drawn back so as to stretch the wires uniformly, through the agency of a weighted lever and a wire rope, said rope passing over a pulley in a fixed support, and branching to connect with each end of the vertical bar.

SIDE HILL PLOW.—This is a combination of well known devices designed to constitute a reversible plow that shall work equally well upon inclined or level land, and at the same time be easily reversed and firmly held while at work. The combinations are cheap, strong, and simple, and we judge well adapted to the purpose specified. Charles B. Pettengill, of Hebron, Maine, is the inventor.

WASHING MACHINE.—T. A. Massie, of Plattsburg, Mo.—In this machine the clothes are passed over an obliquely ribbed board, and squeezed against a vertical grate by suitable squeezers, the clothes being forced back and turned over on reversing the movement by teeth attached to an oscillating head, said teeth being passed between the vertical bars of the grate. The whole is inclosed in a suitable tub or case, and the mechanism is operated by an oscillating hand lever.

SAW GUMMER.—William Reed, of Allentown, Pa.—The stock or frame of the machine is bolted or otherwise secured to a bench or other support. The forward part of the stock is cut away to form a table, in which is placed the die plate that supports the part of the saw plate upon which the punch is operating. The punch works in a vertical hole in the forward part of the stock. The top of the stock is recessed transversely to receive pins or lugs formed upon or attached to the sides of the upper end of the punch to receive the hooks or eyes of a link that passes through a hole in the inner part of the lever near its end. The forward side of the top of the stock is slotted, to receive and serve as a guide to the lever. Upon the under side of the inner end of the lever is formed a cam, that rests upon the top of the punch, and, as the outer or free end of the lever is forced downward, forces the punch through the saw plate. The inner end of the lever is rounded off or has a cam formed upon it which works in a groove in the forward side of the rear part of the top of the stock, and thus serves as a fulcrum to the lever when operated to raise the punch. A link, the lower end of which rests in a recess in the base of the stock, and the upper end of which rests in a notch or recess in the upper edge of the inner end of the lever, serves as a fulcrum in operating the lever to force the punch through the saw plate. By this construction, as the outer end of the lever moves downward the fulcrum moves forward, so that when the punch comes in contact with the saw plate the short arm of the lever may be very short, causing the punch to operate with very great power.

WASHING MACHINE.—An endless chain of ribbed segments is passed over two rollers, fixed in a suitable frame, and under a ribbed roller also suitably fixed in the same frame, springs being employed to force up the chain of segments against the ribbed roller. The apparatus is fastened in an ordinary washing tub, and the clothes are passed from the suds repeatedly between the chain of segments and the ribbed roller until cleansed. Calvin J. Weld, of Brattleborough, Vt., is the inventor.

INFANT'S CHAIR.—John Hayes, of Philadelphia, Pa.—This improvement consists in forming a chair with detachable rockers and casters, so that the chair may be used with or without rockers, and also providing it with a seat made of two leaves, having a half circle cut from each, so that when closed they form an opening for the reception of the child's body when the chair is used as a walking chair for infants learning to walk.

VARIABLE CUT-OFF FOR STEAM ENGINES.—William B. Cross, of Sacramento, Cal.—This is an improvement upon an invention for which letters patent were granted to Mr. Cross, Jan. 24, 1871. The present improvement greatly simplifies the apparatus. The valves are actuated by levers pivoted at one end, which pass through slots in the valve stems. Upon the tops of the levers and in the slots of the valve stems slide blocks, which by a screw adjustment are made to vary the point of cut off. The levers are actuated by a double toe or cam on a rock shaft worked by the eccentric.

NAIL MACHINE FEEDER.—The study of this patent renders clear that it is an important improvement, but it would be futile to attempt a description of its details in the present notice. We call the attention of nail manufacturers to it as well worthy their consideration. The device is automatic, but though automatic feeders for nail machines are not new, this invention comprises improvements covered by five claims, the number of claims allowed showing its distinctive character from that of other machines which have preceded it. James Ferguson and John Turner, Bridgewater, Mass. are the inventors.

GRIST MILL.—Ephraim H. Austin, Scott's Hill, Tenn.—This invention relates to sundry improvements in grist mills, said improvements having for their object to thoroughly separate grain, prior to grinding, from all kinds of foreign matter that may be mixed with it, to regulate the passing of grain from the hopper to the stones, and to facilitate its passage through the stones.

APPARATUS FOR FORCING FLUIDS.—Thomas W. Malone, Mason City, West Va.—This invention has for its object the production of an upward flow of the contents of wells, whether of the salt, oil, artesian, or ordinary species, or of cisterns, or of gas tanks, or of coal pits or shafts, by means of a forced current of air.

HARVESTER DROPPER.—Orrel M. Harrison, of Glasgow, Mo.—The inventor disclaims any novelty in the general idea of operating the dropper automatically by a weighted lever, being well aware that the principle of producing an automatic action by a weight or spring is very old in the mechanic arts. His object is only to secure protection on the particular means employed to produce this action effectually, and to embody a new mode of applying this well known principle to harvester droppers. The invention consists in a weighted lever, pivoted to a rod entering a notch upon the under side of a brace, and passing over the reel box in front of the reel post, thus forming a tilting apparatus, which drops the bundles of uniform weight.

COTTON PRESS.—James Templeton, Florence, Ga.—This invention has for its object to enable the follower of a cotton press to be moved at the beginning of the pressing operation, when the material is loose, faster than it can be moved in that portion of the operation when the material becomes more solid; and it consists in a windlass mounted in a sliding bar that is placed in a guideway located in the foundation of the press, by which means said windlass, which is connected by a rope with the follower lever, may be drawn away from the press box to a certain extent, and by this movement partially lower the follower before the windlass is actually rotated.

CORK CUTTING MACHINE.—George Purves, of New York city.—This invention consists in an improved arrangement of apparatus whereby cylindrical or tapered corks may be rapidly cut by two operations of the cutter upon each cork, said operations being performed by a right and left movement of the cutter along the cork while being revolved, the object being to obviate the tearing of the corks so much as they do when finished at one cut. The machine seems a valuable improvement upon the cork cutting machines now in use, and will, we judge, be generally adopted.

Bedstead.—Thomas B. Baldwin, of Marshall, Texas.—This mode of suspending beds will be especially useful in stores and offices where it is desirable to economize room, and it will also be desirable in many dwellings. The rame of the bedstead, which, for the class of bedsteads to which the improvement more particularly applies—being light, so that they may be readily handled—may be joined together rigidly at the corners, but the bottom should be detachable. Chains, one at each corner, for suspending it from the ceiling by flat or other springs, are attached thereto, or the chains may be connected to staples, as preferred. The chains are connected to the bedstead, preferably, by long links, in which the hooks of a hoisting frame may be engaged so as to press the bed clothes down snugly on the bed bottom to keep them in place. Said frame may also be attached to the chains above the bed when the latter is down for use, to suspend a mosquito net. The suspending rope is attached to the frame at the center, and passes over a pulley hanging from the ceiling; thence to the pulley off at one side and down one of the walls of the room to any convenient fastening. The chains are connected some distance above the bed by ela tic cords, for drawing them inward to rest on the bed when twisted, and thereby prevent their hanging over the sides. As a general thing, these beds will be preferred without legs; but, in case any should prefer to have legs, they can be attached so as to be folded up or taken off when the bed is raised. The short vertical rods bear against the ceiling, when the bed is elevated, to prevent it from tilting or swinging. They may have India rubber tips to prevent injury to the ceiling. The bottom of the bed is, on account of being exposed to view, finished ornamentally.

Wheel Pit, for Spoking Carriage Wheels.—James Collins, of Cr aw fordsville, Ind.—The claims cover a guide staff, constructed and operating in connection with standards, a pin, and the end of the hub, and also an adjustible supporting and gage pin, with nuts, lever, and spring, constructed and operating with the adjustable guide staff, and the outer ends of the spokes. The method of applying these devices not only holds the hub and spokes securely, but gages the dish of the wheel accurately.

Cultivator Teeth.—Lewis Daley, of Minaville, N. Y.—This invention relates to improvements in cultivator teeth; and it consists in a wrought iron stock, with a steel edge and part of the upper wearing surface, and a wrought metal shank. These teeth are claimed to be superior to the solid steel points, because they may be sharpened from time to time, as they become dull, by hammering the edges down thin; or when the steel is entirely worn out they may be resteeled, while the all steel tooth is worthless after wearing to a certain extent. They are also superior to cast or wrought metal teeth for the same reason.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING SEPTEMBER 5, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
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REISSUES.

4,541.—Lamp Burner.—H. W. Hayden, Waterbury, Conn.—Patent No. 106,363, dated August 16, 1870.
4,542.—Lock.—J. C. Hintz, Jr., Cincinnati, Ohio.—Patent No. 108,481, dated October 18, 1870.
4,543.—Water Tank.—J. Morton, Sedalia, Mo.—Patent No. 63,418, dated April 2, 1867.
4,554.—Wash Boiler.—C. N. Tyler, Buffalo, N. Y.—Patent No. 84,918, dated December 15, 1868.

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