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Magazine Breech Loading Gun.

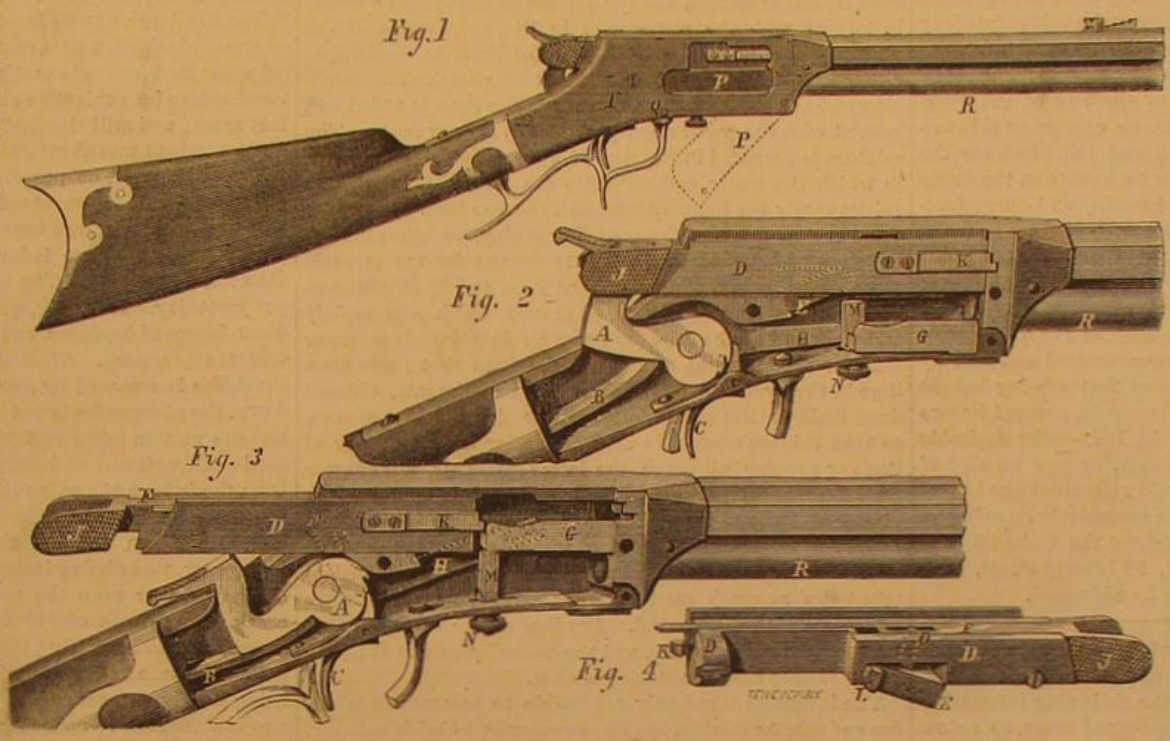
We this week place before our readers a firearm, designed more particularly for sportsmen and professional hunters, for which a number of important advantages are claimed.

Fig. 1, which shows the gun with the barrel broken away just beyond the back sight, gives an excellent representation of the symmetrical compact appearance of this arm, which is, as our heading implies, of the kind known as magazine arms.

Figs. 2 and 3 are enlarged views, showing in detail the mechanism of the lock and charging devices. Fig. 2 shows the parts as they are related to each other at the moment of discharge and subsequently thereto, until they are made to pass through the necessary movements for charging and discharging the piece. Fig. 3 shows the hammer at full cock, and the charging device, in the position it occupies at the moment of charging.

The lock consists of the hammer, A, the mainspring, B, and the trigger C. Its action will be sufficiently understood upon reference to the engravings without further description.

The charging and discharging device consists of a breech block, D, Figs. 2, 3, and 4, a recoil brace, E, a bar, F, for transmitting the shock of the hammer to the cartridge, and thus exploding the latter, a cartridge carrier, G, and a bell crank lever, H.



ROBINSON'S MAGAZINE BREECH LOADING RIFLE.

The outside plate, I, Fig. 1, is shown removed in Figs. 2 and 3, to exhibit the working parts. Considering the gun as just discharged in Fig. 2, it is charged by the following movements: The hammer is placed at half or full cock—the latter will save a subsequent movement in cocking the gun. The right hand thumb and finger then grasp the exploding bar at J, and draw it back as far as it will go, bringing the parts into the position shown in Fig. 3, and then instantly thrust it back again into the position shown in Fig. 2. These movements of the hand, two in number, will have thrown out the spent shell and placed a new one in the barrel, ready to fire, which is accomplished by one more movement—pulling the trigger if the hammer be placed at full cock, or two movements if half cocked—making the minimum number of movements in loading and firing three, and the maximum number four.

The movement of the hand in thus drawing back the exploding bar and thrusting it forward again, produces the following action in the moving parts: The recoil brace, E, which, in the position shown in Figs. 2 and 4, rests against a projection formed upon the breech piece, and engages with a shoulder upon the under side of the breech block, firmly holds the breech block from recoiling, and is attached to the exploding bar, F, by a short link, O, Fig. 1, shown partially in dotted outlines.

The first effect of drawing back the exploding bar is, through the link alluded to, to draw up the recoil brace into the recess on the under side of the breech block, so that its under surface accurately corresponds to the under surface of the breech block, and forms with it a continuous plane. The continued motion of the exploding bar now draws back the breech block itself, and with it the spent cartridge, which is seized by the grippers or extractors, K; and the lug, L, on the recoil brace, striking upon the upper arm of the bell crank lever, H, the other arm of which is pivoted to the cartridge carrier, G, throws the latter upward with the cartridge forced into it from the magazine, and forcing behind the spent cartridge a peculiarly formed projection on the carrier, not distinctly shown in the engraving, throws out the empty shell as the new one rises to replace it.

Reversing the movement of the hand of course reverses the action of the parts, thrusts the new cartridge into the barrel, braces the breech block, and throws down the carrier to receive another cartridge.

An attachment of this carrier renders it one of the most conspicuous features of the gun. A gage, M, Figs. 2 and 3, held by a thumb nut, N, adjusted in a slot formed in the bottom of the carrier, enables varying lengths of cartridges to be used, so that if the sportsman should find his original stock of the extra long Hammond cartridges—the ones preferred for this gun—exhausted, he may generally be able to obtain those of other kinds, which may be used with satisfaction.

The magazine, R, is supplied with cartridges by unscrewing the screw, Q, and dropping the pivoted plate, P, into the position shown by the dotted outline, Fig. 1. This opens the breech piece to permit the insertion of the cartridges.

It is claimed that this gun will use a longer cartridge than any other repeating arm, and hence, that it has greater range and penetration than any other gun of its class.

As will be seen, the adaptation of different lengths of cartridge is easy and rapid. It has no loose guard, a source of much annoyance in many repeating guns, and the form of the breech piece protects the working parts from water in moist weather.

Patented May 24, 1870. For further particulars address A. S. Babbitt & Co., Plattsburg, N. Y.

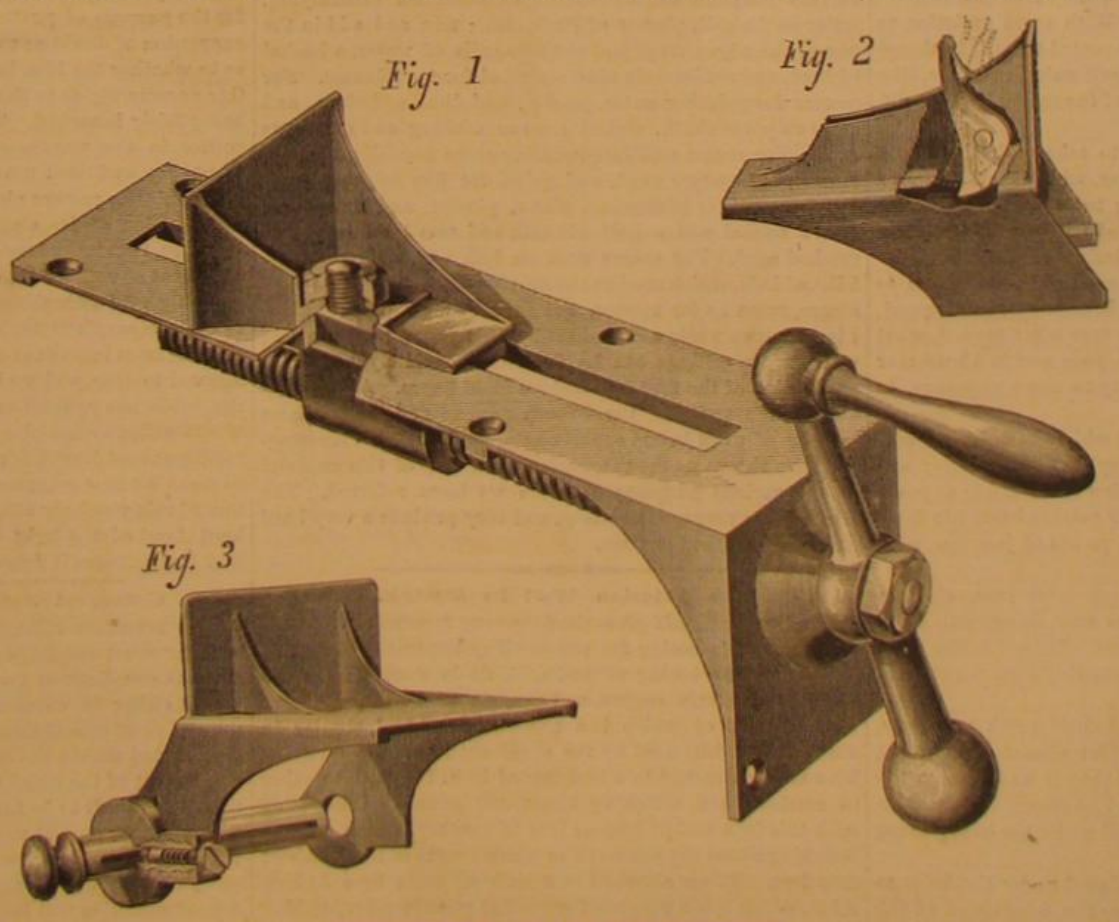
New Light for the Use of Photographers.

Photographers have long been seeking for an artificial light, so readily available that the success of their manipulations may not be wholly dependent on the sun, and subject to the caprice of the clouds. The last attempt to find the much needed substitute is by digesting zinc in the iodide of ethyl, a process which yields a liquid substance inflammable by the mere contact of the oxygen in the air. By passing pure hydrogen (or perhaps ordinary illuminating gas) through the fluid, the compound of zinc and ethyl will volatilize into the gas, and will yield, on combustion, a flame of extraordinary brilliancy and vivid whiteness of color.

It is said that the actinic effects of this light are inferior to those of combusted magnesium; but the steadiness of a flame from a gas will so far surpass any that can be obtained from a burning metal, even when the latter is of the highest purity chemically obtainable, that most photographers will doubtless give it the preference.

Improved Clamping Devices.

In the joining of wood, in the various wood working trades, the handiest and best mode of clamping the joints tightly and securely is a desideratum. The devices illustrated in this article are claimed to be the best for the purpose. It will be seen from the illustrations annexed that they are extremely simple, and their construction is such that they are strong, effective, and durable.



GOODCHILD'S CLAMPING DEVICES.

Fig. 1 is a perspective view of the clamp screw proper, with such portions broken away as will admit a view of its working parts. The cap casting, in which the working parts are held, is slotted as shown. It has cast on its under side cross ridges, which defend the clamp from any end movement off the clamp stick, and also relieves the ordinary wood screws, by which it is fastened, from strain. This casting is also strongly braced at its front by webs. The strain is taken by a collar on the inside face of the front of the casting, which collar is shrunk on when a machine handle is used, and run on and pinned for a vise handle; this will be readily understood.

The construction of the traveling nut and head block is clearly shown. It will be seen that the head block is cast so that two stout projecting portions run in the slot in the cap casting, before and behind the traveling nut, relieving the bolt part of said nut from all strain when the clamps are in use. The traveling nut is rebated so as to fit the slot in the cap casting, and engage with its under side, as shown. By these simple means the head block is obliged to keep a right line, which is necessary in straight work. The tail blocks of these clamps are meant to take the place of the ordinary wedge block, and other contrivances of wedges, etc., and furnish in their stead a substantial, reliable, easily operated, light, and handy device.

These patents embrace two kinds of tail blocks, the pawl and rack block, and the pin block. Many would prefer

the former, as it is set almost instantly. Others would prefer the pin block, as in its use the top of the clamp stick is clear of metal. Either kind of tail block is effective and self-locking. The pawl and rack block, Fig. 2, operated by the thumb and finger, as shown in dotted lines, is disengaged from the rack; the spring shown always being in readiness to reset the pawl when the pressure is released. It will be seen that the arrangement of the pawl, spring, and fastening pin, is such that the pressure is taken entirely on the large, straight, bearing surface, directly at the front base of the block, relieving the spring and pin from strain. The pin block, Fig. 3, is also self-locking—the pin, in its use, requiring to be pulled out and pushed in only; there is no unscrewing and screwing up of nuts in changing its position. The pin will not draw entirely from the block, it being locked as it clears the stick; by this means it cannot be lost and is always ready. As it is pushed home it locks itself again, so that it will not fall back or slip. If the pin should be bent by long use, it will operate equally well. The pin cannot be twisted so as to throw the locking device out of the slot.

These two kinds of tail blocks were prepared to suit preference, as before stated, one only being used on the same stick. The clamp stick, three by three and a half inches (any length desired), is not furnished by the manufacturer.

The advantages of these devices are as follows: The screw is protected from injury and is out of the way of the workman. The traveling head block has no upward or side motion. The faces of both head block and tail block are the same, always allowing the work to be set square on the clamp stick. The tail blocks can be moved readily and conveniently. They are simple, light, and strong, being made mainly of malleable iron. A saving of time and temper is effected by their use, there being no slipping; they also leave better work; they can be furnished cheaply; they can be guaranteed to the purchaser. Considering the quantity of the old styles of clamps that are manufactured and sold by different parties throughout the United States (being bought in sets of three or four) these improvements, covered by two United States Patents—dated May 16, 1871—offer desirable investments in rights for single States, or any number of States combined. The patentee would rather sell one half of his rights, and join with the buyer in extensively introducing this simple, efficient machine throughout the United States.

The patentee is W. H. Goodchild, 98 Liberty street, New York, to whom communications may be addressed.

On the Transplanting of Large Trees.

Mr. O. C. Bullard, Superintendent of Prospect Park, Brooklyn, N. Y, at our request, sends us the following interesting particulars relative to the transplanting of trees, so extensively and successfully practiced by him in various parts of the grounds under his charge:

The planting of the Park has been under my charge from the first, and no part of my work has received more careful study than the subject referred to.

We have planted nearly 2,000 trees of from five inches to two feet diameter, with a very small percentage of loss.

Relying upon a few plain simple principles, healthy, vigorous trees, of almost any size, may be safely transplanted.

There are, of course, exceptions. With some varieties, as the hickory and other essentially tap rooted trees, it is almost useless to experiment. Those with soft succulent roots, like the sweet gum, sassafras, and some of the magnolias, are difficult to manage.

To insure success, it is important to take with the tree a mass of earth, proportionate to its size, which shall contain a large part of the fibrous or feeding roots uninjured. This accomplished, the tree may be moved without the necessity of materially damaging its form or losing its character.

The leafage should be reduced, somewhat in proportion to the necessary damage of roots. Much, however, will depend, in this matter, upon the vigor of the tree when moved, what the change is to be, whether from a poor soil to a better, or the reverse, from a sheltered locality to more exposure, or otherwise.

My system of pruning large trees which have been transplanted is (if the form is satisfactory) to thin out over and through the entire head, cutting as few large limbs as possible, and reducing the outline only by cutting back the leading twigs or small branches at their points of junction with the larger branches.

The trees with which we have been most successful are the maples, elms, lindens (American and European), hornbeams, some of the oaks, and birches. These for the most part have abundant fibrous roots reasonably near the stem of the tree.

We dig a liberal trench around a ball of earth and roots, varying in size from six to thirteen feet diameter, according to size of tree. The roots are smoothly cut as far from the tree as they can be safely retained. The trench is carried below the roots, and the excavation well under the ball, leaving only a small pedestal.

Timbers and chains are securely placed under the ball; to the latter, heavy tackles, attached to the windlasses of the tree truck, are fastened, and the tree is then raised in an upright position far enough to clear the ground in conveying it to the new home.

In planting, the excavation to receive the tree is dug much larger than the root ball, and deeper than its thickness. Good loam or soil is filled in to the required depth, and the tree lowered on this bed, the greatest care being taken to properly place and cover all exposed roots. Composted manure is mixed with the soil that does not come directly in contact with the roots.

Our trees make but little growth the two first years. New roots are forming and getting well hold of the rich food furnished them. The third year, and sometimes the second, they are among our most vigorous trees.

During the summer following planting, and, if necessary, the second summer, we mulch the trees liberally with fresh cut grass, and water if the season be dry.

I think the foregoing may give your readers a general idea of the possibility of transplanting large trees with comparative safety, and may be of some service as to the method.

Our trucks for moving trees were gotten up by the Park engineers, modified from time to time as we made our first experiments. I can hardly go into such an explanation of their construction as would be of any value.

O. C. BULLARD, Park Inspector Brooklyn Parks.

Selenitic Mortar.

For some months past, says *The Building News*, a series of careful and exhaustive experiments has been in progress at South Kensington, in order to test the value of a new kind of cement and mortar. This substance is the invention of Colonel Scott, R. E., and has been freely used in the construction of the French annexe. It has been named by Colonel Scott, selenitic mortar, and the process of production consists in mixing with the water, used in the preparation of the mortar, a small quantity of sulphate of lime, in the form of either plaster of Paris, gypsum, or green vitriol. These substances having been intimately mixed, the lime is added and ground with the water or sulphate into a creamy paste. The mixture is prepared in the pan of an ordinary mortar mill, in which the water and sulphate are first introduced, and subsequently the lime. After the lime has been ground for three or four minutes, the sand, burnt clay, or other ingredients are added, and the whole is ground for ten minutes more. By this invention, ordinary lime can be at once converted into a species of cement mortar which sets rapidly and well, and can be used for concrete, bricklayer's work, or stuff for plastering at a cheaper rate than that made from lime in the ordinary way. From his experiments, Colonel Scott finds the use of sulphuric acid to give the best results, so that this substance is used in preference to plaster of Paris or gypsum, although the latter materials will answer for all practical purposes. Sufficient acid is contained in plaster of Paris to effect the necessary chemical change, and to prevent the lime from slaking, which in effect is the secret of the whole process. The lime by this means, is enabled to take twice as much sand as when slaked, its fiery nature being brought under control. Any lime can be made selenitic by Colonel Scott's process, and the more hydraulic it is, the better are the results obtained with it.

The invention is not only applicable to cement manufacture and mortar mixing, but its use extends to brick making. A number of bricks have been made since the opening of the Exhibition, by Mr. Large's dry brick press in the pottery machinery annexe. These bricks are composed of one part lime to eight or ten parts sand or burnt clay, and they are found to be ready for use in about ten days after pressing, without being burned. It is found that these bricks do not swell as is ordinarily the case from the slaking tendency of lime when not made selenitic. The proportions adopted for various purposes are as follows:—Mortar for bricklaying, water half a pail, plaster of Paris, 4lb.; mix and add in the pan of the edge-runner two or three pails of water, a bushel of lime, and six bushels of sand; grind for ten minutes. For mortar for pointing water, plaster, and lime as before, and add two parts chalk, slaked lime or whiting and two parts sand. For coarse stuff for plastering same ingredients as for mortar, but coarser sand, and grind for five minutes only. For fine stuff for plastering, water, plaster, and lime as before, a bushel and a half of chalk and two bushels of fine mashed sand. For coarse stuff on lath add with the lime 5 lbs. of hair, which need not be previously beaten. For rough stucco, same as for mortar, but four bushels only of sand. Plastering on walls can be done by this process as two coat work, while ceilings can be floated immediately after the application of the first coat and set in 48 hours. An examination of the walls of the French annexe and some recent samples of work in the experimental yard at South Kensington have shown us the thorough adaptability of this material to the various purposes to which we have referred. The cements are very quick setting, and they produce a very hard and finely finished surface.

An Artesian Well in Boston.

The Boston *Herald* gives the following facts relating to the Gas Company's boring for water. The apparatus is similar to that used for boring oil wells. This is worked by a ten horse power steam engine, and consists of a heavy plunger, upon the end of which is a hardened steel tool, similar in shape to the drill used by the stone cutter at the quarries. This tool is attached to a long bar of iron, fastened together in sections, and weighing about 800 pounds. Connecting with this by a sort of loop or link is another section of iron weighing about the same. The whole length of iron is about fifty feet. This is attached to a walking beam by a 5½ inch cable, which has a weight of some 500 pounds more, making in all over two thousand pounds of dead weight, which by the motion of the walking beam falls 28 inches about 15 times per minute, the tool being turned by an attendant at each descent. This entire weight does not act as a force upon the tool at the bottom. Only the 800 pounds directly attached does this. When this broad chisel strikes against the hard ledge, nearly seven hundred feet away, the portion of iron above the link spoken of yields its pressure and descends some three inches independently. On its return this weight of half a tun strikes against the top of the link, knocking the tool or drill out from its bed, and suffering it to rise for another stroke. This is necessary, as a steady pull would not release the tool, as it sticks in the pulverized stone at the bottom. This drill does not cut the full size, five inches, but after it has cut as far as it is practicable to work it without a charge, another tool is put down. This is a sort of rimmer with blunt edges, round with exception of a little cavity on the sides, and not wedge like, as is the first. This crushes down the rock, leaving a cylinder just five inches in diameter. No tubing is needed down here, the solid rock being self-supporting. Besides, if tubing were run at so great a depth, the friction would become so great that the tools could not be worked with any degree of efficiency.

While working through the black slate, occasional layers of white quartz, very hard, have been encountered. These strata have about an inch thickness, as nearly as can be judged. At a depth of 520 feet two layers of pure black clay, about an inch thick and a foot apart, were found. When five hundred feet were reached, a thin layer of honeycombed quartz was found, looking as though it had been washed by the permeation of water, and since this the water has been somewhat salt leading to the belief that at some former period there has been a direct connection with tide water, which is now nearly or partially stopped by the filling in of clay or sand. When the depth of 600 feet had been drilled, and no supply of water obtained, a new contract was made at an increased price per foot (not yet exactly determined, however, or if determined, to be subject to change by circumstances), of 600 feet more; and still the drilling goes on, until evening the depth attained was about 900 feet, 600 of which have been in the solid ledge. The progress at present is about four feet per day. Small fragments of the rock, from the size of a pea that of a goose egg, are brought to the surface occasionally, showing that the slate is broken into somewhat beyond the diameter of the well. The writer has a small specimen taken out yesterday. It is dark, quite even in color, and of a medium degree of hardness, and this is throughout the whole extent of this quarry. After drilling for ten or twelve hours the *débris* is removed by means of a sand pump, which is let down, the plunger be forced in by the immense weight above and the suction being sufficient to draw the tube full of the sand and fragments of rock, and as soon as the pump lifts from the bottom the valve closes and it is drawn to the top by steam.

In case of an accident the machinery is ample for any emergency, there being instruments to cut off or seize the end of the rope or even the tools themselves. The rope did break at the depth of 170 feet, and but little difficulty was experienced in recovering this and also the tools. There is little to be seen in the operation, the machinery above ground being simply a steam engine and a huge walking beam, with a rope attached. If water is reached, its fountain may not be elevated enough to force the water to the surface, and in that case, should the supply be ample, a lifting pump will be employed.

Extinguishing Fires by Carbonic Acid.

We published on July 8, under this heading, an article commenting on the fact that a law had been passed by the Legislature authorizing a company to lay pipes underground to convey carbonic acid to all parts of the city of New York, for the purpose of putting out fires; and concluded with the expression of doubt as to the genuineness of the scheme, and as to whether the idea had ever been seriously entertained. Our uncertainty as to the project is now ended, the company being fairly launched. The mechanical and chemical difficulties in the way, were mentioned in the article above alluded to, and need not be recapitulated here, as the affair will doubtless receive plenty of criticism as to its feasibility and derision of its claims and professions. We imagine, however, that its promoters will not be much hurt either by argument or satire. The city authorities of New York will probably vote a considerable sum of money as a subscription to the company's stock, and then, the object being gained, and the most important result achieved, the matter will be allowed to drop, and we hope this end will be obtained before the public has suffered much annoyance from the tearing up of sidewalks, or has placed much money in the venture. The inhabitants of New York have little money and less patience to spare for new schemes of any sort just now; and the directors of this visionary affair would have done wisely had they kept it out of the light of day till trade improves and the new Court House is forgotten.

Universal Joint for Shaft Coupling.

This invention relates to a new and improved universal joint for shaft couplings; and it consists in the employment for such couplings of two coiled springs connecting the two shafts either in connection with the jointed forked ends thereof, or of collars thereon or not, one of said coils being smaller and within the other, and coiled in the opposite direction to that of the outer one, and in such relation to the section of the shaft to be turned that the resistance of said shaft will tend to uncoil it and expand it against the outer coil, which is to be arranged to be twisted smaller by the resistance, whereby the tendency of one to be changed from its normal condition will be neutralized by the other; and all the advantages offered by the flexibility of coiled springs for universal joints will be utilized without any of the objections that prevent the practical success of the single coiled spring which, when the resistance takes place, will either coil up the spring more, or uncoil it, according to which way the coil is arranged relatively to the direction in which the shaft turns, and then fly backward or forward when the resistance ceases. Greene V. Black, of Jacksonville, Ill., is the inventor.

PAINTERS should seldom wash their hands in turpentine, as the practice, if persisted in, will lead to the most serious results, even to the loss of power in the wrist joints.

Disinfectants.

Dr. Moreau Morris, of New York city, recently read an admirable paper on the "Sanitary Care of Contagious Diseases," from which we gather the following:

"Contagious or infectious diseases have certain laws of inception, growth, and propagation. The elements of which they are composed are as yet unknown, but their methods of progression and diffusion are better understood. We know that they have a beginning, and can, in many instances, anticipate and prevent the initiative; if once fairly established, we can control if not destroy them. By the aid of chemical science we have learned how to arrest, destroy, and transmute into innocuous compounds, the germs that propagate disease. The appliances for removing the causes of disease are varied according to the nature of the evil; if there are filthy streets, or accumulation of decomposing matters in cellars, privies, or houses, cleansing and disinfection, or arrest of decomposition, are the means employed. If there is a confined, vitiated atmosphere, openings are made, letting in sunlight and air. In a word, the most important means for securing health and preventing diseases are fresh air and pure water."

In the practical application of disinfectants, they are classed into two groups:

1. Disinfectants which arrest fermentation, such as carbolic acid; sulphate of zinc and iron; sesquichloride of iron.

2 Disinfectants which effect chemical decomposition: chloride of lime; sesquichloride of iron; chlorine; lime; sulphurous acid.

"The disinfectants that arrest fermentation are either employed separately or mixed with some of the same class, depending upon the circumstances in each case. The better qualities of carbolic acid are used for fumigating rooms, disinfecting bedding and clothing; but for basements, cellars, and privies, a 70 per cent acid is all that is required.

"For the disinfection of damp cellars and yards, a concentrated solution of protosulphate of iron, mixed with a low grade of carbolic acid, is employed; and for privies, a solution of sesquichloride of iron of 1·30 specific gravity is used, mixed with 10 per cent of carbolic acid and water. Sulphate of zinc is also found useful in solution with water, or in combination with carbolic acid, for infected clothing and bedding. The formula employed are as follows:

Sulphate of zinc, 8 ounces; water, 3 gallons. Or, sulphate of zinc, 8 ounces; carbolic acid, 1 ounce; water, 3 gallons.

"The latter has been found effectual in arresting or destroying the infection upon bedding and clothing in scarlet fever and small pox, and probably will be found efficient in other contagious fevers.

Disinfectants that effect chemical decomposition:—"The fermentation of filth and vegetable germs are destroyed by chloride of lime, and it ought to be liberally employed. Its use in relapsing fever proved invaluable, as likewise with other malignant fevers depending upon filth and foul atmosphere. It is used either in a dry form sprinkled upon the floors, or in solution upon the floors and wood work of infected rooms. In damp places, to avoid the hygroscopic properties of the lime, carbonate of soda is added. In the cleansing and disinfection of houses and apartments infested with relapsing fever, chlorine gas has been extensively used, and with the best results."

The sanitary officers have also found sulphurous acid a valuable agent for the fumigation of infected rooms and clothing. It arrests fermentation, and acts as a deoxidizer. It is used specially in the disinfection of the contagion of small pox, scarlet and yellow fever, and in skilled hands seems to control effectually.

The Metropolitan Disinfecting Fluid is highly commended by Dr. Morris, as a preparation which has been employed during the past three years for purposes of privy disinfection, and was the result of a thorough scientific experimentation by the officers of the Metropolitan Board of Health.

"Sesquichloride of iron is prepared by dissolving the hydrated sesquioxide of iron (bogore) in muriatic acid; to this is added 10 per cent of carbolic acid. This forms the fluid in a concentrated form, and is largely diluted with water at the time of using. Its preparation requires chemical knowledge, and involves time; but it is kept for sale at two places in the city, and is thus always available. All night scavengers are compelled by the Board of Health of New York to use it. Its effects are compound. The iron checks fermentation, and the chlorine acts as an oxidizing agent. Its carbolic acid also aids in arresting decomposition and fermentation, and the whole combination, therefore, by its chemical action, decomposes the sulphuretted hydrogen. Hydrated chloride of aluminum has recently been brought to notice as a disinfectant, but not having yet given it a fair trial, no definite statement of its properties can be given."

What our Hand Gear is, and where it comes from.

From among the many myths and shams of this fictitious age, the Boston *Commercial Bulletin* selects kid gloves, on which to dilate as follows:

It would be quite impossible to find kid enough to supply the demand for gloves; so recourse is had to sheep skin, and it is asserted, by several of our largest small ware folks, that not 10 per cent of the gloves sold for kid are the legitimate article. The pelts of sucking lambs and colts are the principal materials used. Rat skins are never used for gloves; they are too small, and cannot be dressed soft and durable. Rat skins are tanned for covering to jewelry boxes. A genuine kid glove is thin, fine grained, delicate and soft, yet very strong. A sheep glove is coarser grained, thick and stout, and if shaved to a thinness to represent a kid, it is flimsy and rotten.

Paris is the headquarters of the kid and colt skin glove. The kid skins are collected in all parts of the world, while the colt skins come from Tartary, where the flesh of suckling colts is a staple article of food. The tanning, dressing, and cutting out of the gloves, are done in Paris, and they are sent out into the country to be sewed. The great bulk of the Paris gloves has always been sewed in the districts of Alsace and Lorraine; and now that Germany has acquired this territory, Paris, to retain her glove trade, will be compelled to very generally adopt the sewing machine. By an ingenious application, skillful operators can afford to sew gloves 30 per cent cheaper with machine than by hand. The sheep skin gloves come principally from Naples and Vienna. About 300,000 dozen pair from the former place are sold yearly in Boston, and about 200,000 dozen pair from the latter city reach this market. This class of glove is very largely worn by preference by many, as being about one third the price of a kid article; the wearer can afford with better economy to wear a new pair of sheep skin gloves each day, and thus present a cleaner, unsoiled glove, than in purchasing kid continually, and replacing them when soiled.

The dressing of skins for gloves is somewhat ingenious. Lime for removing the hair cannot be used, as is done in preparing skins for boot leather; but it is done by soaking them in water and Indian meal, and afterward treading the skins in a rough trough until all the meal is well out of the hide, when the hair peals off easily.

The skins are then skived or thinned down, and the inner side laid upon a large flat stone, and the dye or color applied with a brush to the outer side. The skin is then dried slowly, when it is ready to be cut into gloves. This latter process is done by laying a skin over a steel frame, the upper edges being sharpened, in the shape of two open hands, and striking the skin with a padded club. The strips between the fingers are cut from the edges of skins. They are then tied in packages of a dozen pairs, and, with printed instructions accompanying each pair, are sent out to be made. For ladies' wear, they are made in ten sizes, from 5⅝ to 8 inches, which, also, is an index of their number. This is the size of the hand they are to fit, measuring around the knuckle joints. Gloves are put up in packages of a dozen, each a different color. Manufacturers are often at a disadvantage in waiting for some one color to complete an invoice to be sent off. One of our Boston jobbers had a lot of 14,000 dozen making up in Paris, (when the war broke out), that had been waiting shipment six weeks, delayed by the non-receipt of a peculiar shade of green, one pair for each dozen. They were finally shipped with a different color sorted to make up the count. This seemingly small matter of substituting one color not specially ordered, ruined the lot, and the goods were sold as unmarketable.

The sizes of gloves sold in the United States are smaller than they were twenty years ago; and the call is still for snugger fits on smaller hands. The smallest gloves made are sold in the American market, and now the sizes 7¾ and 8 are not put up abroad in the assortments for the market. For the first time, sizes 5½, up to 6, are to be put up expressly for a Boston house. The colors now in use are lighter than formerly, as opera shades are very generally worn on the street. Gloves from abroad are ordered eight months ahead, and in lots to arrive from the coming fall or winter trade are four and five button gloves, seemingly an exaggeration of the present popular gauntlet style. The very general use of kid gloves has almost driven Lisle thread goods out of the market. These are a German manufacture, as are also our white cotton military gloves. It is the cheap labor that keeps this line of manufacture abroad. A very good kid glove is made in Philadelphia, and at Gloversville, N. Y. Some of our retail small ware dealers have them in ladies' sizes. They are not so thin and soft as the French article, but are really more serviceable, and if the trade would throw them into the market with a legitimate American brand, Yankee kids would be very generally accepted as a desirable article.

Nutrition.

The matter of properly selecting and preparing food, and its judicious variation, is one which does not receive the attention that it ought. Professor Blot, who is admitted to be authority on this subject, says that "it is by practical experience that we learn what is proper for us, and not by chemical analysis." How can it be otherwise, when the same articles which are relished and easily digested by some persons, are distasteful and indigestible in the case of others? As no satisfactory reason can be assigned for this, it must be attributed to the peculiar idiosyncracy of the individual, and it is only experience that can teach each one what particular article of food agrees with him, and what does not. It often happens that a certain article of food is highly relished and enjoyed, and yet is indigestible by the one who is thus fond of it. In this case taste will not do to be relied on, and experience will have to admonish when inclination prompts to indulgence.

The great chemist and physiologist, Magendie, made some interesting experiments on the effects of certain kinds of food. He fed geese on gum only, and they died on the sixteenth day; he fed some on starch only, and they died on the twenty-fourth day; he fed others on boiled white of eggs only, and they died on the forty-sixth day; he fed others on the three kinds mixed together, and they fattened instead of dying. Here is a proof of the necessity of not only varying but mixing food as much as possible, in order to supply the waste and necessities of every part of the system.

In the first instance, gum afforded a nourishment similar to starch and sugar, serving to sustain animal heat, but not to restore the waste of the tissues, on account of the absence of nitrogen. In the second instance, the starch served to keep up the animal heat, and being more highly organized than gum, enabled the birds to maintain existence a few days longer. The want of nitrogen, however, proved fatal, as in the case of gum food. Those fed on white of eggs alone had the nitrogen afforded by the albumen, but eventually died from want of a supply of animal heat capable of being yielded by the starch. Those fed on the three kinds of food mixed, not only survived, but throve because all the wants of the system were supplied.

As before stated, the preparation and cooking of food should receive its proper share of attention, if the greatest amount of benefit is to be derived from its introduction in the system. Blot, the professor of this art, says that green vegetables, such as cabbage, spinach, etc., should be put in boiling water, but dry vegetables, as beans and peas, should be put in cold water to cook, after having been previously soaked in lukewarm water. In the case of potatoes, the eyes or germs are to be cut out, and the skin rubbed or scraped off, then steamed or roasted. He thinks that fish, although only containing twenty per cent of nutritious matter, ought to be partaken of at least twice a week, as it contains more phosphorus than any other food, and serves to supply the waste of that substance in the system, and particularly in the brain. He says that the brain of an idiot contains about 1 per cent of phosphoric matter, that of persons of sound intellect 2½ per cent., while that of a maniac contains 3½ per cent. If this be so, it would seem that in a maniac the brain appropriates an undue proportion of phosphoric matter from the rest of the system, whereby its functions are materially impaired.

A Dutch Laundry.

At the top of the house, both in town and country, is invariably to be found a spacious laundry, extending, in fact, over the whole area of the house. In this the linen is stored in presses, and the clothing of the past season, winter or summer, all duly turned inside out, hangs on pegs all about. Here, twice in the year, Mevrouw holds her grand saturnalia. Without doubt, the most important item in a Dutch girl's dowry is linen. The quantity she thinks necessary for her own person and for household purposes is enormous. But then it should be known that she "washes" (the linen of course) but twice in the year. Cuffs, collars, and muslins, she says, must be washed often; but all other things are flung, for a time, into huge buck-baskets big enough for a half dozen Falstaffs to hide in; indeed these are astounding baskets, and when full will weigh four or five hundredweight. Every house has a block or pulley firmly fixed to the ornamented coping of the roof, which indeed, is purposely constructed to carry this useful machine, and forms a noticeable feature in the architecture of all the Dutch houses; and by means of the block, these huge baskets are readily lifted to and from the laundry, and furniture or heavy articles of any kind to the other stories through the windows. A visitor for the first time may see with amused bewilderment that particularly lumbering trunk of his wife's, which had been the despair of railway porters throughout his journey, whipped up by invisible hands to a hight of sixty or seventy feet in no time, and disappear through a bedroom window. The clothes are simply rough washed in the country, and, when sent back, all the females in the house set to work for a good fortnight to mangle and iron, starch and crimp; and you may be sure that every bit of clothing a Dutch young lady of the middle classes is wearing has thus been got up by her own fair hands. The original outlay in linen is, no doubt large; but the cheap mode of washing pays good interest for the money.

Manufacture of Artificial Butter.

In the recent siege of Paris, the inhabitants were almost entirely deprived of butter, and many processes were resorted to, to manufacture a wholesome article having all the qualities and appearance of the genuine butter.

The Mège artificial butter received the approbation of all, as being the best and most nearly approaching the real article. Since 1869 M. Mège has endeavored to utilize the oleine and margarine obtained on pressing animal fatty matters in the manufacture of stearine. The oily matter yielded has the same composition as butter, and Mège gave it the softness and the taste.

This result is obtained in the following manner:

1. Washing and grinding the crude fatty matter.

2. Soaking it in a solution at 30° to 40° of the acid contained in the stomach of hogs or horses, in order to dissolve the fibrinous matters.

3. Compression of the fatty matter between heated blades to separate the stearine from the oleine and margarine.

4. The oleine and margarine are brought to the consistency of butter by a thorough heating at the ordinary temperature.

5. Decoloration or bleaching of the paste thus obtained is done by beating with water acidulated by hydrochloric acid.

6. Transformation into artificial butter by soaking for three hours in the following mixture, heated to 30° to 40° Centigrade: Fatty matter, 100 parts; water, 100 parts; animal tissues, 2 parts; bicarbonate of soda, 2 parts; caseum, 2 parts; yellow coloring matter, *q. s.* The yellow coloring matter is generally annatto or carrot juice.

If M. Mège had been familiar with the New York adulterations, he would have known that thousands of pounds are sold daily, in that city, of butter adulterated with the stearine and margarine obtained from the chilling of cotton seed oil.

THE SPIDER.—The value of this disagreeable insect is well understood by dealers in quills and quill pens, as the spider preys on a most destructive moth which is attracted by the feathers of the goose.

[For the Scientific American.]

CHRYSALIDS AND COCOONS.

BY PROFESSOR E. C. B. DAY.

While the economical importance of insects, in the injuries that so many of them inflict upon us, and the aid that others give us in keeping those that are baneful in check, renders the subject of practical entomology a most interesting one, directly or indirectly, to all classes of the community, some knowledge of the same science, from a theoretical point of view, is even of more universal and higher application. The opportunities that insects afford for the exercise of our faculties of observation, perception, and inductive reasoning, constitute them, no less than plants, important aids to elementary education. Every child should be taught systematically so much of the nature and structure of insects as should enable him, in after life, to appreciate intelligently the facts of their history, facts which are not merely interlocked with his everyday pursuits, but which will serve to occupy, advantageously, his leisure hours, broadening his mind, and increasing his recognition of the wonders of the universe, by enabling him to realize better the vast intricacy of its design, the beautiful adjustment of all its parts, and the unceasing regularity of its every action. We have striven, in the present series of papers, to impress this view upon our readers, rather than to instruct them upon the more directly practical applications of entomology; for we have a keen feeling that the ignorance that prevails of the grand truths of Nature, is at once unworthy of the intelligence of man and derogatory of the honor that is due to the Great Creator of all.

There is no portion of insect history, there is no insect so insignificant, that it may not be made to strengthen our impressions of law and order in Nature, if we will but study its structure and its habits; and perhaps no phase of insect life is more especially full of instruction than that which involves the transition from the grub to the perfect insect.

The stages of the transformation, the chrysalis, and the cocoon that contains it each and all of them are full of suggestions of wondrous instincts, of the marvelous versatility of Nature, and of the courses and methods pursued by her in even more recondite series of phenomena. Why could not, says the believer in a development theory, the same Power that established the law which evolves the chrysalis and the butterfly from the grub without any distinct creative act, by the operation of a similar law develop a series of varying forms from one primitive stock? And would it not be additional proof of the intelligence of that Power, could we show that He had done so?

The variety of ways in which the preservation of the life of the insect is secured during this, its period of conversion, from one condition of existence to another, is alone very marvelous. Take the lepidopters, for instance; and how differently do different species, often in other respects very closely allied, dispose of themselves, for security, during this time of helpless inactivity! And what a variety of instincts and of adaptations to circumstances do they not display! Let the reader, during the summer, keep a few spined caterpillars of one of our common butterflies, say of the "Camberwell Beauty" (*Vanessa Antiope*), and let him watch the process by which the limbless chrysalis frees itself from its larval habiliments; and this while fixed in the most unpromising of attitudes, that is, while suspended by a few threads at its hinder extremity. The performance is one that cannot fail to strike the observer for its ingenuity, and almost puts to shame the rope trick of those spiritualistic jugglers, the Davenport brothers. The form, too, of these butterfly chrysalids has its lesson. The peculiar angular outlines that characterize them, seem almost caricatures in their oddity; but when you find yourself looking attentively at one of these irregularly shaped objects, suspended from the weather-beaten and lichened branch of an old apple tree, and not detecting but that it is a bit of bark partly detached, and until your attention is called to the fact that it is a chrysalis, you get an inkling that its very angularity, coupled with its admirable imitative coloring, must serve as a most effective device for insuring the safety of this, the casket containing the future *Papilio*. The prying eye of the insectivorous bird will be liable to be misled as much as your own has been.

Or take, for study, some of the silk producing caterpillars. See the dense, hard cocoons that they laboriously spin, and frequently invest, in addition, with a covering of some foreign substance, as leaves or grains of earth. These seem to be a perfect protection against parasite insects that might wish to lay their eggs in such a rich supply of nourishment; but, to your surprise, you will find that the parasites have been beforehand, and had actually laid their eggs in the caterpillars prior to their commencing their defenses; and you will realize to what shifts Nature is put to keep her machinery of life exactly regulated.

Do you believe in the inflexibility of instinct in insects? Keep one of the great green caterpillars of the *Luna* moth, lately described, in a box with loose paper and, without the necessary leaves in which it might inclose its cocoon, you will find that the dull worm readily adopts the substitute, and with a spirit worthy of this age of paper collars, makes its outer jacket of the same. Think you that each instinct is an endowment created special to a kind? Surely such a strange one as that manifested by those hairy caterpillars which actually pull out their own hairs to make their cocoons, must be so! Yet see, there are others that only cut off their hairs, instead of pulling them up by the roots; and again, which rub the hairs gently off, so that after all, the first process may be but an extreme development of a much more simple instinct.

Some caterpillars seek safety by burrowing into the ground and then cementing themselves a temporary tomb; others, as certain Teneides of Brazil, whose cocoons we have here represented, suspend themselves in a delicately netted hammock in mid air. Caterpillars burrowing in trees inclose themselves in sawdust, and others living in water, undergo their changes in cases attached to the underside of the leaves of aquatic plants. The exuberance of variation that Nature thus displays in her methods is all the more extraordinary when we consider her economy of material. The same secretion which, in its simple form, cements together the sawdust or the grains of sand, in more elaborate cocoons becomes the delicate silken fiber.

A strange, seemingly anomalous, and yet absolutely essential, character of the delicate warmth-loving insect, is its capability, if needful, of surviving intense cold. The cocoons of the *Luna*, and many other moths, lie on the ground, and must be frozen through by every frost; the chrysalids of many insects remain utterly unprotected; and we see those of the *Promethea* moth, lashed by silken cords to the twigs, swinging exposed to winter's coldest blasts; and yet at their allotted time the perfect insects are ready to sport in the extreme of summer heat.

One who can appreciate the leading principles involved in Nature, need never be at loss for mental occupation during a summer's ramble. Every plant and every insect will speak to him in simple language, but with most cogent logic, of a wisdom superior to his own; and if he will but condescend to listen to these little instructors, not a fall will come around but he will have acquired a new stock of thought to keep his mind employed during the winter months; and not a year will close, but what he will own that, in this matter at least, he is a wiser and a better man, liberalized and elevated by communion with these little beings, who have taught him in every lesson, "to look, from Nature, up to Nature's God."

COCOONS OF THE TENEIDES OF BRAZIL.

A New Process for Separating Gold and Silver.

Instead of precipitating the sulphate of silver, which results from the refining of gold by sulphuric acid, by copper, it is reduced, at the works of the San Francisco Assaying and Refining Co., by protosulphate of iron. The hot, thick, turbid mass, which is obtained by treating the bullion with sulphuric acid in cast iron pots, is placed into a cast iron vessel containing sulphuric acid of 58°B. heated to about 110°C. A very small quantity of water is then added, and after a few minutes the now clear solution is drawn into a second vessel, which can be cooled from the outside. By the addition of the water all the sulphate of lead is precipitated, which carries down all impurities, and all the suspended gold. As soon as the solution in the lower vessel is cooled to from 30° to 40° C., the mother liquor is pumped back into the upper vessel, where it is again heated and treated as before with acid of 58°B. The sulphate of silver is found in hard yellow crystals in a layer one or two inches thick, containing but very little free acid. The crystals are put on the false bottom of a box lined with lead, which is provided with wheels and an opening for letting off the liquor. These crystals are mixed with a red powder, essentially sulphate of copper. A hot aqueous solution of sulphate of copper is allowed to run through them. The copper salt is dissolved first, and collected in a separate vessel to be worked for sulphate of copper. As soon as the filtrate shows the pure brown color of the sesquisulphate of iron, it runs into another vessel, where on cooling the greater part of the dissolved silver salt is decomposed, and met llic silver precipitated, which is added to the principal mass on the filter. Here the crystals have been converted into a dense coherent mass of metallic silver, which may be considered as completely reduced as soon as the iron solution, filtering through, shows a pure green color. It is washed with water, pressed, and melted. The oxidized iron solution is collected in a lead lined vessel, which contains iron scraps. It is thereby converted into a solution of protosulphate, and used again. The small quantity of silver and copper, which is precipitated by the iron scraps, is from time to time added to the crystals on the filter where the copper is rapidly dissolved. One hundred pounds of silver, reduced on the filter, require about 20 cubic feet of solution of protosulphate of iron.—*F. Gutzkon, in the American Chemist.*

How to Build Ice Houses.

W. F. H. communicates to *The Technologist* the following directions for constructing an ice house:

An ice house, he says, may be economically built in the following manner, and will give entire satisfaction, if the dimensions be not less than twelve feet square by twelve feet high for the space to contain the ice. Presuming that the ice house is only for family use, select a shady position and dig a cellar two feet deep, and let the floor or bottom be properly smoothed off with a descent of eighteen inches in the twelve feet, leading to one corner. It should be made perfectly watertight and smooth with a coating of cement; and a wall, also laid in cement, should be erected therein three feet high, formed on the top with a rabbet on the inner edge of two sides for the purpose of receiving the joists for the inner lining of the house; make the size any way you please, only not less than twelve feet square inside; erect on this wall your double frame, carefully boarded with tongue-and-groove boards on the inside, and made as tight as possible. Pack the space between the inner and outer lining with dry sawdust or tan bark up to the beginning of the roof; let the roof be steep, and also lined inside with boards, but not filled, and let a space under the peak be left open three inches to conduct the warm air to a ventilator on either side of the peak, secured by wide slats in such a position as to make ingress of rain impossible. Another ventilator must be placed in the center of the peak, the openings of which must be larger in proportion to the house (say one foot square inside), and entirely secured against rain. Let the door for filling and taking out be on the north side of the gable, arranged like the roof, not filled, and a drain pipe of three to four inches, properly cemented, run from the lowest point of the bottom of the pit at least ten feet (fifteen feet is better) under ground, with a good descent for taking off the water, and your house is ready to receive the ice, and it will keep it well for all purposes. The filling of the house should be done in this manner: Place, at the bottom of the said pit, clean corn stalks, eighteen inches deep, closely packed and leveled; then cut your ice in square blocks, as even square as practicable, and place them on the cornstalks close together, like tiles in a hall; and when six layers are completed, take a watering pot with a middling fine nose, and pour clean water gently over all crevices left, until they are closed by the freezing of said water; continue then the filling, repeating at intervals the watering process until you reach the beginning of the roof; then let the ice settle, and, if you find that the crevices have not been completely frozen, choose a very cold day to finish the watering operation. You can then put in ice enough to go half way to the peak, and you can enjoy the luxury of ice until the new crop. To make the handling of the ice easy, have a beam extending three feet from the roof outside for block and tackle, and another one inside near the peak for the same purpose; also fix an easy ladder on the inner wall on the side where the door is, and the ice can be nicely removed with the tackle and ice tongs without any trouble. When taking the ice some distance from the house, it would be advisable to use a blanket to put it in while it is being transported, which blanket should always be kept aired, and should be cleaned every time it is used. Such a building should be painted from time to time on the outside; and, whenever the ice is finished, the cornstalks should be removed and the house well ventilated, so as to be free from any unpleasant odors. If so cared for, it will last a great many years, and will require very few repairs.

PEARL MANUFACTORY.—The Chinese have, for centuries, carried on a well organized system of manufacturing pearls. The invention was made early in the 13th century, and they still honor the inventor with a temple, and acts of ceremonial worship. The French pearls, which excel all others in the beauty of their imitation, are manufactured, in the first instance, out of the scales of tiny white fish, which abound in the small tributaries of the Seine and Marne. It takes from seventeen to eighteen thousand fish to make one pound of the famous *essence d'orient*. It is curious that the nearest cognate substance to the pearl is bezoar, a concretion of deep olive green color, found in the stomachs of goats, dogs, cows, and especially of camels. The bezoar used to be a valued alisman.

IF a coat of varnish be not rubbed down level, and freed from all grit and scratches, it may not be expected of the next coat that it will be perfect.

THE NEW SCHOOL OF MECHANICAL ENGINEERING AT HOBOKEN, N. J.

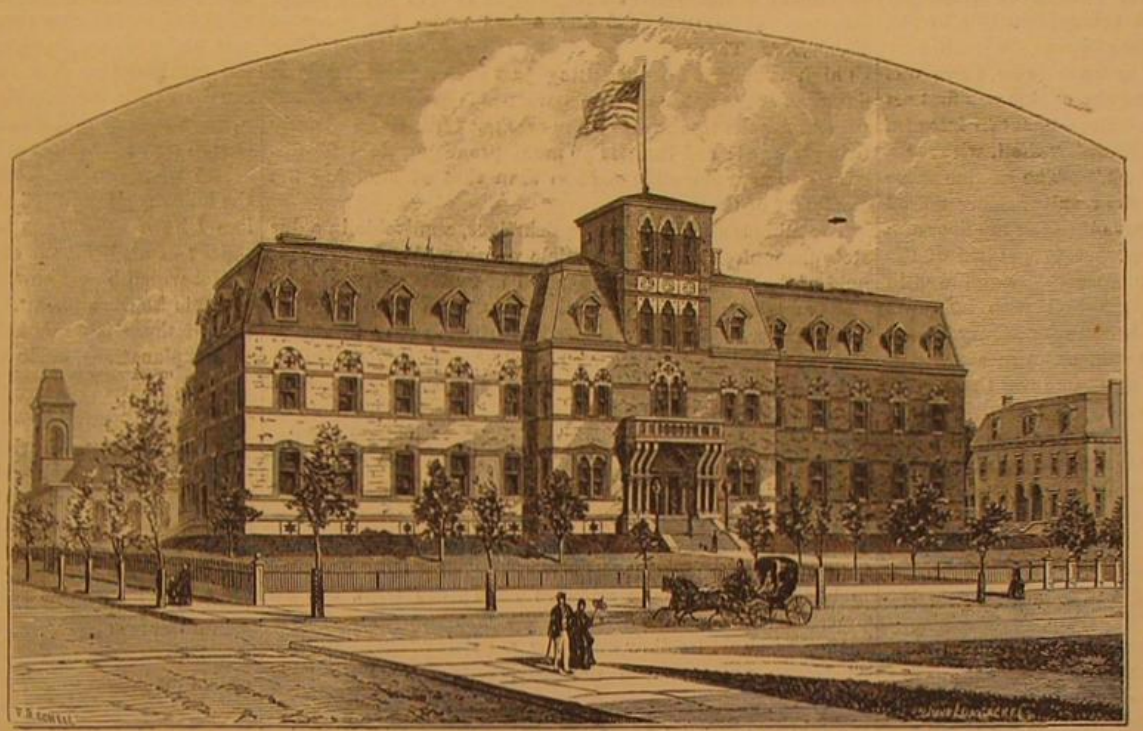
The most recent and, as it promises, one of the most complete of American schools of mechanical engineering, is that about opening in our neighboring city of Hoboken, N. J., the "Stevens Institute of Technology."

This noble institution was founded by a provision in the will of the late Edwin A. Stevens, who, as well as his brothers, John and Robert A., and father, Colonel John Stevens, before them, was well known to many of our readers as an able and successful engineer.

The bequest referred to provided that a lot of unoccupied land, in the finest part of the city of Hoboken, should be set apart from the Stevens estate for the purpose of erecting upon it "an institution of learning," and the sum of one hundred and fifty thousand dollars was appropriated for the building. Another sum of five hundred thousand dollars was set apart as an endowment, the income from which is expected to cover the running expenses of the school.

In accordance with these provisions, Mrs. Stevens and Messrs. Shippen and Dod, the trustees, have erected a fine building, of which our engraving gives an excellent representation, and which it was determined should be adapted for a school of mechanical engineering, in recognition of the evident necessities of the times, as well as with a view to the special appropriateness of such a disposition of funds furnished by a great engineer.

The building is now completed, a Faculty chosen, and an announcement is just formally issued. The Faculty are: as President, Professor Henry Morton, the brilliant lecturer on physical science, and former editor of the *Journal of the Franklin Institute*. As Professor of Physics, Dr. A. M. Mayer, formerly of Lehigh University, and well known among scientists by his valuable original researches in magnetism and other branches of physics. As Professor of Mechanical Engineering, we find the name of R. H. Thurston, late of the U.S. Naval Engineers, and a member of the Academic staff of the United States Naval Academy. Professor Thurston was formerly from Providence, R. I., where, under the eye of his father, then senior member of the well known firm of Thurston, Gardner & Co., steam engine builders, he obtained his practical workshop and office training. He was educated at Brown University, taking the course in engineering; and at the breaking out of the rebellion, entered the United States navy as an engineer officer, serving ten years, and meeting with every variety of practical work, as well as recently doing duty as "Lecturer on Natural and Experimental Philosophy" at the Naval Academy.



THE STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

Prof. Albert R. Leeds, the Chemist of the Institute, was lecturer at the Franklin Institute of the State of Pennsylvania, at Philadelphia, and is a rising man.

Col. Hascall comes from West Point to take the department of mathematics; and we judge that the others of the Faculty are equally chosen.

These gentlemen are now engaged in collecting apparatus and a library, and fitting up their several departments preparatory to the opening of the college, September 20th, next.

The *curriculum* begins with an extended course in mathematics, including the applications of the calculus, a course in chemistry, and the usual college course in physics, and also courses in French and German. Having thus laid a foundation, the superstructure is erected. This consists of an advanced course of qualitative and quantitative chemical analysis in the laboratories, a course of practical work in the physical laboratory, and the course in mechanical engineering; in other words, the course of applied science. The course of instruction in the physical laboratory is one seldom offered by our colleges, but is of especial importance to the mechanical engineer. It places in the hands of the student the barometer, the manometer, the densitometer, the balance, and the vernier, and every other instrument of physical investigation, and teaches him their use by actual practice,

Drs. Morton and Mayer have collected a splendid set of apparatus for this department; the optical collection—including the whole of the celebrated "Bancker collection" of Philadelphia—is the most complete in the world, and contains many instruments of great historical as well as practical interest.

For the mechanical department, large orders have been given, and others are in course of preparation.

In this collection are to be selections from the catalogues of Schötter, of Darmstadt, and Schöder, of Frankfort, as well as heavy drafts upon Salleron, of Paris. There may be found here the engine and boilers of a steamboat used by Colonel John Stevens, on the Hudson, sixty-seven years ago, the boiler being tubular, and equal in design to many of the "safety" tubular boilers of the present day, and the screws —*twin* screws—of as good form as many now running; here are models complete and incomplete, large and small, of the great, and once wonderful, Stevens iron clad battery, which still lies—modernized by General McClellan and Engineer I. Newton—in the same spot in which the keel was first laid.

Here is a most beautiful model of the oscillating engine and feathering paddle wheels, as built by the well known English firm of Penn & Son; here are pumps and engines, rotary and reciprocating, boiler models of all styles; and we are promised so much that is interesting that we hardly know where to stop cataloguing them.

In the workrooms and machine shop, where the student is taught the principles involved in tool using and in the trades auxiliary to engineering—pattern making, molding, and founding, and amachinists' work—is to be placed a small collection of carefully selected tools and machines.

Already a drill, by the Putnam Machine Co., and one of Browne & Sharpe's beautiful "universal milling machines" are in; and, in selecting other tools, the difficulty will probably be to determine which of our manufacturers shall be allowed to place their tools there, where they will be so continually on exhibition.

A course of instruction in drawing, under the direction of Professor McCord, accompanies and illustrates, and its earlier work precedes, the course in engineering, extending through the whole four years, and in all of the courses of instruction we are promised that great care will be taken to make each branch assist the others, and, in all, to give special attention to all principles having a directly practical bearing upon the student's professional work.

It seems to be the intention of those having charge of the institution, to go about the business of preparing young mechanical engineers for their profession in a thorough and business like manner, and we wish them the full success that they are evidently determined to command.

Correspondence.

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

Motive Power of Ammonia.

To the Editor of the Scientific American:

In your valuable journal of July 29, 1871, page 70, there there appears an article headed "Ammonia as a Motor," in which you describe the principle of the ammonia engine so clearly that I would not have troubled you with any remarks, had it not been for the following:

"The report of the examining committee, headed by General Beauregard, approves of the invention in terms which are too indefinite to be conclusive."

As one of the committee, I wish to be understood as indorsing liquid ammonia as a motor just as capable of running an engine as the liquid water, because heat applied to liquids expands them into steam or gas if not opposed by pressure. Water at 212° is confined by the pressure of the atmosphere 14·7 pounds in the square inch. So is ammonia equal to 14·7 pounds at 40° below zero, which is its boiling point. But if we add 120° to water and raise its temperature to 332°, it is held as liquid at a pressure of 100 pounds to the square inch; and I know from having examined the gage in connection with the ammoniacal boiler while running, that the pressure was over 100 pounds when the temperature of the atmosphere was at 80°. If we add 40° below to 80° above zero, it is just 120°, so that the power or pressure in ammonia has been got up at the same expenditure of heat—namely 120°—as the water. But if the water be allowed to expand into steam, and the temperature kept up to 332°, in an engine of the proper size in accordance with the heating surface in the boiler, the pressure will be constant, and never above 100 pounds on the square inch. It is exactly so with liquid ammonia. At 80° it exerts a pressure of over 100 pounds upon the square inch, and this force has been got up by 120° of heat.

When the heating surface is equal to the demand, the pressure is kept up so long as any of the liquid remains; and this heat is furnished by the atmosphere, which can never rise above 120°; hence the pressure cannot exceed 180 pounds upon the square inch. To this extent only can liquid ammonia be used as a motor without the application of fire; and wherever fire cannot be applied to raise steam, I consid[er] ammonia the best and cheapest substitute for steam, especially when I consider that a man can carry a bottle of this liquid in his pocket that will run a sewing machine constantly for a week, or, at the option of the operator, it may last for a year if used only occasionally, and will always be ready to do its work.

Hence my opinion is not indefinite but definite, that liquefied ammoniacal gas as a practical motor is just as much a fixed fact as steam is.

JOHN ROY.

No. 60 Camp street, New Orleans, La.

Plumbago in Virginia.

To the Editor of the Scientific American:

We desire, through your columns, to give to the public a short account of a remarkable deposit of plumbago, recently discovered near this city. This deposit is about 400 yards from the James River canal, a few miles below Lynchburgh. Though only a partial and very superficial examination has yet been made, the mine is found to extend over an area of one mile in length, and a quarter of a mile in breadth. It appears on the surface in parallel strata, of from one to two feet in breadth. The shallow diggings which have been made into it, show a rapid increase in the width of the veins, and improvement in the quality of the mineral below the surface. These veins, most probably, unite at no great depth, and form an immense mass of this valuable substance. Specimens taken from the surface show this plumbago to be of fine merchantable quality, and the quantity is believed to be almost inexhaustible. It is, indeed, the most extraordinary deposit of plumbago yet discovered. Being entirely free from rock, it may be mined with little expense, and its proximity to the canal affords the cheapest transportation to the northern cities. The multiplied uses and increasing demand for plumbago make this discovery of great importance to the manufacturing interests of the country. We send you a few small specimens of the mineral from different veins, as taken from the mine near the surfaec.

A. F. ROBERTSON & Co.

Lynchburgh, Va.

Rolling Bodies.

To the Editor of the Scientific American:

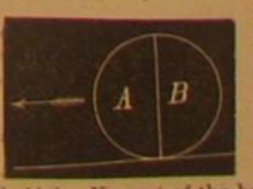
In the SCIENTIFIC AMERICAN of July 22, page 69, is the following editorial answer of L. C. to E. W.:

"All things else being equal, two wheels of different weights, will roll down the same plane, in equal times. No matter how the weight is distributed, provided the wheels are balanced, and not taking into account the resistance of the air."

I think the question of E. W. looked beyond the generally known fact, that all bodies, without regard to difference of weight (other things equal), would descend by gravity in equal times, and whether the theory found in standard works were true, namely, that with two wheels similar in all respects, excepting in the distribution of the weight being respectively near the center, or circumference, that the latter would be a longer time in descending the plane than the wheel with the weight near the center? If we use the equivalent of an inclined plane, in the form of a circular arc, on which the wheel should roll, or vibrate, the difference in time (if any) could be easily detected—and we are presented with this difficulty on the supposed trial on the arc of a circle: What becomes of the retarding force of the circumference weight, when arrived at the bottom? It is now accelerative, and a greater distance on the ascent is inevitable, with the extraordinary result of a weight raising itself to a point, higher than its original position, and so continually gaining in hight at each vibration. Make a pendulum of a large disk (no rod) suspended at the edge, having the weight around, to contrast with a similar disk, excepting the weight being near the center.

By the alleged error in the books, the starting, stopping, and reversal of the partial rotations of the outer weight, should cause slower vibrations than with the centrally weighted disk. But their vibrations would be in equal times.

I digress from the immediate question, to note the mistake of engineers, in ascribing a loss of power by the reciprocating motions of a heavy lever beam, or other weight. There is no loss (apart from friction) when attached to a crank, which is thereby equally and alternately aided and retarded.



Let the figure represent a wheel or cylinder on a horizontal plane. Bisect vertically—then no part of the half, *a*, can move in the direction of the arrow, without decrease of velocity in that direction, and therefore becomes accelerative to the half, *b*. No part of the half, *b*, can move in the direction of the arrow without increase of velocity in that direction, and is therefore retardive to the half, *a*. These counteracting forces are always equal, on all planes, inclined or horizontal,

and will also start, or stop the wheel without regard to the distribution of the weight. THOS. W. BAKEWELL.

Pittsburgh, August, 1871.

Paine's Electro-Motor.

"A little knowledge is a very dangerous thing."

To the Editor of the Scientific American:

Had Mr. Smith possessed a *little* more knowledge of the subject he has been discussing adversely to myself, I should not now be under the disagreeable necessity of placing him in a very ridiculous position. In order to meet his case understandingly I shall give you, as far as I am permi ted, the true status of the motor under consideration.

Two years since, and at the end of twenty-eight years of almost constant study and experiment, I succeeded in removing the last obstacle to what was deemed the successful utilization of electricity as a motive force. The subject was laid before capitallsts, who in their turn submitted it to electrical scientists. The result was that it was decided to raise funds for the purpose of experimental research and construction, and also the securing of patents at home and abroad. The first step taken was the construction of the present motor, which was built by the Messrs. Seymour and Whitlock of this city. As is usual in such cases, there was great impatience and great haste, and the engine was first set up on the ground floor of my back office *without its intended bed plate.* This bed plate is Mr. Smith's "shell, without a pin hole through which one may look." The engine more than realized the expectations, and its results getting noised about, I wr« soon compelled to remove it to the top floor of a building in the rear of the office, in order to get rid of the crowd of sight seers. On this top floor the engine was in operation three months without this "shell with not a pin hole, etc. etc.," and not until it became necessary in the course of my experiments to obtain an exact measurement of the power developed and cost of the same was the engine placed on its "shell." I might rest my case at this point, for the *animus* of Mr. Smith's whole article is to suggest fraudulent practices on my part, and that this "shell" concealed the whole, or in part, fraudulent mechanism.

The spread of the bed plate gave the engine firmer bearing on the floor; that was all the duty it performed. When the dynamometer brake was applied, when off the bed plate, the narrow base of the engine allowed the weights to cant the engine.

The tests of the duty of the engine were made by experts selected by the monied men of those interested. They brought their own batteries and dynamometers; they did their own weighing of the power and waste of zinc. On one occasion, the engine was started at 10.30 A.M., and moved without cessation till 4.30 P.M., under a break load of 66,000 foot pounds with a battery of four 8 inch Bunsen cells, and under the inspection of a committee of two, one of which constantly timed and watched the engine. And when it is added that the engine has repeatedly been stopped, taken off its bed place, and then again made to do its duty, how absurd do all Mr. Smith's quibbles about "eccentricity" of Mr. Paine's engine, and the "variegated statements of Mr. Paine" appear!

Now there are some scientific bummers so obtuse as to be excused for conceiving the possibility of a belt brought up through the "shell" from some auxiliary power, but there is no excuse whatever for the merest tyro when he attempts to account for certain results by suggesting a concealed battery. Mr. Smith having seen the engine knows that there is not more than six hundred feet of wire (No. 15) in circuit, and knowing this, he knows that if the whole building in which the engine stands was filled with a concealed, or otherwise, battery, it could not be of any auxiliary benefit in the production of the power he witnessed.

Ten Bunsen cells on that circuit will raise the temperature of the coils to 150 in ten minutes, and 20 cells set the commutator in a blaze in an instant.

Now, as regards the statement about the construction of an engine outside of my shop, I have to say, that a party interested, avowedly for the purpose of assisting me in my labors, proposed to construct an engine, but the proposal was emphatically rejected by the controling board of our company, upon the just theory, that as we were not constructing engines, but were prosecuting a long series of experiments to obtain *data*, and were also making applications for patents on new features, developing themselves daily, it would be inexpedient and hazardous to have the details of the invention, even as far as we were then advanced, scattered around in different shops. The wisdom of this determination is already evident, and must impress every candid person, when it is known that since that period we have taken another European patent, and two American patents, and have filed two caveats. But the party referred to did, secretly, without my knowledge or consent, proceed to construct an engine, which, in confidence to a friend, he avowed would be a great improvement on Paine's. I knew nothing whatever of the matter till after this improvement was proven a failure, and then, when I was approached to help them out of *their* difficulty, indignantly refused to have anything to do with it. As I am also entirely ignorant, at this date of writing, about the three other engines, Mr. Smith makes mention of, so of course it is impossible for me to have made any of the statements I am alleged to have made in connection therewith; it is simply a question of veracity, which I do not believe even Mr. Smith has the temerity to press to an issue.

With reference to Mr. Smith's last paragraph, I reply, that I have never asserted that my motor "was a perfect success." I have stated, and verified that statement, that I have succeeded in obtaining a duty of 66,000 foot pounds for twelve hours with four 8 inch Bunsen cells consuming three ounces of zinc.

The *obtaining* of such a result, and the *ability* to put it into such a shape that the Smiths and Rowlands could comprehend and operate it, are two different things.

And now I demand, by what right am I, an inoffensive experimentor, devoting the best years of my life to the realization of results that must inure to the great benefit of mankind, put on my defence as a criminal? Thank God, I do not live in Galileo's day, when the malevolence generated of chagrin and beaten skill could bring me to my knees or the rack.

Newark, N. J. H. M. PAINE.

Extracting Gold from Washings and Poor Ores.

To the Editor of the Scientific American:

Your impression of July 1, contains an article with the above caption, which, if found practicable, will be of the utmost importance to t e mining interest on this coast. Our export, from San Francisco, in 1868, of the precious metals, was $48,864,924. We are aware of a loss, as per fire assay, of 35 per cent by the present processes of amalgamation. The production of the Comstock ledge alone in 1867 was in round numbers $15,000,000, showing a loss under fire assay of $8,000,000. There are reservoirs of tailings, some containing as high as 500,000 tuns, awaiting just such a process as you describe. It is not more mines we need; it is an improved process for the treatment of the ores got from those already being worked; and there is no more promising field for discovery to your scientific readers than that of studying the treatment of these ores.

The minute subdivision of quicksilver, applicable in a dry state through the aid of a vehicle which will relinquish its hold of the mercury, when it comes in contact with the precious metals, is what we want. Many methods have been tried to effect this object; such as volatilizing the quicksilver and then condensing it, or by electricify, the dry ore being put into a wooden tub lined with copper, and, a solution of salt and sulphate of copper being added, the positive pole of a powerful battery is connected with the copper lining of the pan; and the revolving arms or mullers inside the pan being covered with copper, the negative pole is connected therewith, when a partial subdivision of the quicksilver takes place. Also by mixing zinc with the quicksilver to give it a barb like form so that it would the more readily catch the precious metals, and many more methods have been tried, but all practically failures.

I hope you will follow out your enquiries regarding this Australian process until the particulars are before your readers.

Baker Co., Oregon. JAS. DUNCAN.

Safety Valves of Steam Boilers.

To the Editor of the Scientific American:

Seeing in the papers the statement of Inspector Matthews in the Westfield case, that he never knew of a safety valve not working unless arrested by the engineer, I have been prompted to write you a little of my own experience.

When a boy, I was running a small stationary engine for Mr. Benjamin Brown, of Portland, Maine. The safety valve got stuck one day, and while we were at dinner, the steam accumulated till there was sufficient force to open the valve. When it did so, the whole building was filled with steam, which made a tremendous noise in its efforts to escape, equaling that of two Sound steamers when blowing off steam. Everything around and near the boiler was covered with a thin coating of mud thrown from the boiler. There was plenty of water in the boiler, as was ascertained afterward. No damage was done to anything.

The probable cause was that for some time there had not been steam enough carried to open the valve; and as I did not understand that it was necessary to occasionally lift it, a coating of lime or some other substance had cemented it fast. In all probability, if the boiler had not been new and strong enough to sustain sufficient pressure to force open the valve, we should have had an explosion, which people would have tried to account for by low water or defect in the boiler.

Undoubtedly many boilers have been exploded by this cause, therefore I think great attention should be paid to this subject.

Farmington, Minn. J. H. THURSTON.

Railroad Cars.

To the Editor of the Scientific American:

I beg leave to suggest an improvement in railway carriages, by which weight and cost would be diminished, and greater security insured. It is simply to frame the body of the car sides, ends and roof, of iron rods—in a word, to construct a cage. This might be covered with leather; *papier machê*, or even wood, might be introduced to any extent indicated by convenience or taste. In case of any kind of accident, the danger to passengers would be less from the bending of iron rods than from the breaking up of wood; and injury to cars would often be easily repaired at a comparatively small cost. P. G. S.

Baltimore, Md.

Photographic Concentrated Iron Developer.

To the Editor of the Scientific American.

I see by your issue of July 22, that Mr. Edwards finds considerable benefit by using sulphate of copper in his iron developer. It is now five years since I experimented with copper, and with favorable results, although laboring under the disadvantage of winter lights in England. I did not find it hasten the action of the developer, but it enabled me to keep the solution on the plate long enough to bring out the finest detail in the shadows, without destroying the delicate half tones of the parts that were fully exposed to the light, being especially useful in the case of white or fancy dresses. I used a larger proportion of copper than is given in Mr. Edward's formula. From a stock bottle of a saturated solution of protosulphate of iron, I took sufficient to reduce to a 15 grain solution, adding 1 oz. of alcohol and 1 oz. of acetic acid (glacial), to every 18 oz. In another bottle I kept a 15 grain solution of sulphate of copper, with the same amount of alcohol and acid, which I added to the iron (just before using), in quantities varying from 25 per cent to an equal amount, according to circumstances.

Oshawa, Ontario, August, 1871. JAMES S. HEATH.

Electro-Motors.

To the Editor of the Scientific American:

Mr. Paine does well to distinctly state [SCIENTIFIC AMERICAN, August 12], that a magnet specified by him "will acquire a lifting power of fifty pounds in the 120th of a second." All I have to say to this is, that experiments which I made last winter with a magnet of nearly the construction he describes, fully justify me in declining to accept his statement.

Mr. Paine objects to my experiments in a telegraph office on account of long circuits. It happens, however, that the third and fourth experiments are wholly on a very short circuit, and with very small magnets. If the relay magnet, with the manipulating key, be also put on a short circuit (and it can be easily done), this magnet will behave precisely the same in respect to time as when on a long circuit. What objection now to these experiments?

But what can Mr. Paine mean by saying that I have not the knowledge required to produce a model of his motor, unless I have had access to the secret archives of the Patent Office? I made all the electrical connections and tests of the model which he acknowledged to be correct, and I have also seen his English patent. Does he mean to deny the correctness of these now, or is his object to publicly repudiate his own explanations, made in his shop last winter?

J. E. SMITH.

Easton, Pa.

A CORRECTION.—A whole line seems to be omitted in my article on page 101. It should read, "He did, however, send a substitute with information that the magnets must be made of a certain size or they would not work; but the certain size given, that required by the English patent (which was held to be a correct guide) and that of the magnets in the Newark engine, were all at variance with one another." I mean that the manufacturers had three contradictory sizes to be guided by, coupled with the assurance that the magnets would not work unless made just so and so! J. E. S.

Breakage of Watch Case Springs.

To the Editor of the Scientific American:

The breakage of the case spring is one of the most frequent failures which occur in hunting case watches, and is as disagreeable to the owner as to the repairer of the watch. The former has to pay a considerable amount, and the latter gets only a small profit by this repair, because he is very often obliged to put several springs in the watch before one will stand. To obviate this inconvenience, I tried to make the springs of brass instead of steel, and found that, if well hammered, this metal suits perfectly to the purpose. After this, I made all case springs in the following manner: I take a piece of brass wire, a quarter of an inch thick and two inches long, and bend an eighth of an inch, in the vise, to a right angle; then I hammer it alternately on four sides, till it gets a sparkling appearance. This is the sign of the right temper. Then I bring it to the same shape as a steel spring, and make it fit in the case.

I will add, that I never saw a spring that was made in this way become weak or broken; and watch makers who will try this method will find that a brass spring is made in half the time that a steel spring is, beside saving of files and other tools. T. M.

Homestead, Iowa.

Sleep Walkers.

To the Editor of the Scientific American:

My observation has led me to believe that sleep walking is a habit of the system.

I have noticed that children who are allowed to go to sleep on the floor or lounge, in the evening, and afterwards, at some regular hour, are aroused (of course only partially awakened) and sent to bed, will in time acquire the habit of sleep walking. I have no doubt but that the man mentioned in the SCIENTIFIC AMERICAN of July 22d., who would get up and go to the cellar in the night for a drink of wine while asleep, had been in the habit of first going for it, in the night time, while awake. I presume but few have failed to notice how soon the mind, by dreams, will recognize a habit of waking at a particular hour for any purpose.

I think that the whole philosophy of sleep walking has its foundation in habit, acquired by disturbance at some regular hour devoted to sleep. E. H. R.

Bloomington, Ill.

THE COTTON STATES MECHANICS' AND AGRICULTURAL FAIR ASSOCIATION announces its second grand annual fair, to be held at Augusta, Ga., on October 31, November 1, 2, 3 and 4, 1871. We have received a list of the premiums to be awarded, which are very numerous and valuable, and are offered for successful practice in all branches of agriculture, mechanics, textile manufactures, domestic economy, etc. The pursuits in which competition is invited are selected with unusual care and judgment, and cover the whole ground of the useful arts and sciences. Mr. W. H. Tutt, of Augusta, is the President of the Association, and Mr. E. H. Gray, the Secretary.

THE WESTFIELD EXPLOSION.---HOW BOILERS OUGHT TO BE INSPECTED.---INTERESTING TESTIMONY BY A WIDE AWAKE MAN.

Having made, in another column, what comments we wish to make on the evidence of Mr. Robert K. McMurray, published below, we shall say little by way of introduction here. The gentleman named is an inspector employed by the New York and Hartford Steam Boiler Insurance Association, and was a manufacturer of boilers for fifteen years. We regard his evidence as the most important and valuable given at the inquest, and commend it to the careful consideration of our readers.

Robert K. McMurray was sworn and said: I am Inspector-in-Chief of the New York and Hartford Steam Boiler Insurance Association; my duties are to inspect all boilers of parties who ask to be insured, and reject any that are unsafe; I have been myself a maker of boilers for nearly fifteen years past, and have been with the Hudson River Railroad Company as an assistant inspector of boilers; our practice is to inspect boilers every three months, in accordance with the terms of the policy; we inspect the boiler internally, and then once a year we give notice to have the boiler cleaned and well swept, so that we can get at the condition of the iron.

HOW CRACKS IN BOILERS ARE DETECTED BY THE INSPECTOR.

We get what is then called a "cold inspection," and go in to see that there are no cracks, and see that the braces are tight, and if the "crow feet" are fast; we find a good many cracks, and we also search for leaks; on the outside of the shell we examine all the parts with a hammer and examine the seams; if there are any cracks we can discover them by the sound of the stroke of the hammer; sometimes, where there are seams cracked and we cannot distinctly get at them at first, we sound on to another sheet, and by comparing the difference of sound of the whole and the broken sheet we find out the crack; we have 1,500 boilers now to inspect, which we inspect four times annually; I would not swear that I could have discovered that crack in the boiler of the *Westfield;* we have many times to discover defects, and have not such good opportunities as in that; still in my own mind I have not the slightest doubt that by using a light pin hammer I should have discovered it; it is my special business to see if there are any cracks in boilers by sounding and testing.

BLISTERS.

Sometimes in searching a boiler we discover a blister; if that blister is not too thick we cut it off altogether; if too thick we patch it after cutting it; I believe the cause of the Vestfield explosion was in the laminated sheet; I have no idea how long those cracks had been there, but they must have been there for years; we have more trouble with her class of boilers than with any others, and where that crack was, was just the place we should have looked for them; I looked and could only see that there had been one saddle there; with regard to the fact of the boiler not having been opened for a year, we should have felt compelled to make a complete —we were duty bound to make a thorough—investigation; there was nothing that I could see to prevent there being a thorough examination made; there was plenty of room under there, and although it was very dirty we always look there because we find so much trouble there; we are all the time discovering defects, though we examine four times a year; it is common to find such defects; we have a thorough system of searching, and there is nothing in this type of boiler to prevent any one going in; we go clean through all the large flues and the under and upper parts of the shell.

THE HYDROSTATIC TEST OF LITTLE VALUE.

Immediately after the hydrostatic test, we often find a great many defects, so that *we can place no reliance whatever on the hydrostatic test;* we had a case the other day up in Buffalo, and I was there while the inspector was there with the hydrostatic test on the boiler; he had already given a certificate for the boiler to be worked up to ninety pounds per square inch.

TO FIND DEFECTS, GO INSIDE YOUR BOILER.

And immediately afterwards I went into one of the boilers and discovered an immense crack; we have no risks on the ferry companies; I have no idea of the amount of risks we have at present; if a man had inspected a boiler for us, and it afterwards turned out he had insufficiently done so, I should recommend him to be discharged.

EDUCATION NOT AN ESSENTIAL QUALIFICATION FOR ENGINEERS.

I do not see any reason why we should not accept the risk with an engineer running her the same as the one on the *Westfield;* I would not have hesitated at all, knowing the antecedents of such a man; if he was capable of taking charge of the water, and understood the management of the engine, I should think he would do well enough.

STANDARD OF EDUCATION FOR ENGINEERS.

Mr. McMurray continued the remainder of his testimony, bearing, for the most part, upon the general qualifications of engineers. He thought engineers and boiler tenders should be intelligent, careful, and sober, and should thoroughly understand the working of the boilers and engines placed in their charge. Beyond this, he did not regard a high standard of education necessary.

A CHARITABLE institution, valuable to the afflicted and to the science of surgery, is now open at 69 West 35th Street, New York. Its object and importance are indicated by its name, the New York Ear Dispensary. Drs. George B. Pomeroy and Samuel Sexton are the attending surgeons.

The Magnetic Mineral Wells.

These new wells are in the immediate vicinity of Grand Haven, Mich., at a locality called Fruitport, a village delightfully situated on the peninsula formed by the waters of Grand River and Spring Lake, and only about one hundred miles distant north from Chicago.

The water from one of these wells has been analyzed by Prof. Wheeler, of the University of Chicago, and has been found to contain 628·3719 grains of solid matters to the wine gallon of 231 cubic inches. The matters in solution are as follows:

Chloride potassium	4·2880
" sodium	405·5330
" calcium	113·4200
" magnesium	36·2000
Bicarbonate soda	0·0547
" lime	0·1308
" iron	1·0090
" magnesia	0·0040
" manganese	0·0534
Bromides	2·1700
Sulphate of soda	46·7000
Silicic acid	0·5030
Ammonia	0·0158
Organic matters	18·2902

With traces of lithia and alumina.

The water, independent of whatever magnetic properties it may possess, is certainly an interesting one. It is among the richest in solid constituents, and certainly ought to possess valuable therapeutic properties. Its dissolved matters are, in amount, fully two and a half times as great as those of the St. Louis spring—the latter footing up to 279·60 grains —and seem also to be more valuable and interesting qualitatively. They are fully double those of the Sara'oga Pavilion spring (311·7 grains per gallon), and one fifth greater than those of the Saratoga Excelsior (507·8 grains), and the Gettysburgh springs (566.3 grains). The Fruitport waters differ from all the others above mentioned in containing a large proportion of their constituents in the form of chlorides, and in having but a small relative proportion existing in the form of carbonates dissolved by means of carbonic acid as bicarbonates.

It is not at all surprising that these waters should have attracted some attention. Already their locality promises to be a favorite one for pleasure and health seekers from Chicago and other western cities, and excellent hotel accommodations for such have been provided by the enterprise of the first named place. The facility with which the locality can be reached will recommend it to many, while the ascribed wonderful magnetic properties of the waters, in connection with the pleasant and healthful surroundings, will serve to attract those anxious to find remedies for old ailments. The assertions, says the *American Exchange and Review*, which have been so persistently made regarding the magnetic properties of these and some other wells throughout Michigan are based not merely on the dictum of ordinary observers or visitors, but are founded measurably on the investigations of well known and able scientists.

In his latest report of the progress of the State geological survey, Prof. Winchell has the following on this somewhat novel feature in mineral waters: "The water, however, seems to possess the property of exciting polarity in a rod of neutral iron inserted into a bottle of it, through a cork. The polarity of the outer end is the same as that of the south end of the needle. I ought to add, however, that some experiments since made at Eaton Rapids by Dr. Hilgard, of the United States Coast Survey, with delicate apparatus, do not sustain the indications of my rougher experiments. Nevertheless, my results were so many times produced, from so many different wells and under such varying circumstances, and so completely in accordance with a rational method that, for the present, I cannot see the propriety of discarding them."

There remains much to be done before sufficient is collected for satisfactory generalization upon the origin of this peculiarity of the Michigan waters. In the meantime much will be accomplished by their use as a remedial agent.

The Scientific Value of Cheese Factories.

The American system of cheese factories was established nearly twenty years ago, and in its present condition of maturity it retains all the essential features which were characteristic of its infancy. The test of twenty years' experience in a country where apparent improvements are eagerly submitted to a fair trial is amply sufficient to prove the success of the system. Recently the question of the adaptability to English dairy districts has acquired considerable prominence in agricultural circles, and is now passing from the stage of discussion to that of experiment. The two great merits which are claimed for it are, economy in the labor of production, and superiority of quality in the produce. It is evident that if a dozen farmers convey their milk to one building (a factory) to be made into cheese or butter, fewer hands are required to perform the work than if the process were carried on at a dozen different places by as many sets of people. The factory can be furnished with better labor saving machinery than the farm dairy, and the former establishment requires no more supervision than the latter. The process of cheese-making, also, occupies practically the same length of time, whether the quantity of milk under treatment be large or small, so that two or three persons whose energies are concentrated at one place will produce as great an economic result as a dozen or more who are necessarily employed at as many different points, each one going through the same routine independently of the other.

The superiority in the quality of the manufactured article may be more difficult of explanation, for the best farm dairies produce as good cheese as any factory. The reason why the establishment of factories has improved the average make of cheese is because fewer first rate cheese makers are required under the factory system. But when Jesse Williams established the first factory twenty years ago, the great bulk of American cheese was extremely poor, and for many years after it was almost unsaleable in the English market. At the present day, on the contrary, it can compete on even terms with all but the very choicest English makes, notwithstanding that it has to undergo the ordeal of a long seavoyage. The factory system, therefore, has not only improved the average quality of American cheese, but it has very considerably raised the standard of the choicest brands.

Students of nature are perfectly well aware that the most sure and rapid progress is made by means of association and co-operation. The same phenomena are observed from different points of view by workers in the same field; a comparison of their notes leades to the grouping of kindred facts; the apparent exceptions are seen to be the product of attendant variations in the methods or circumstances of observation and, by a process of induction, an explanatory theory is arrived at, to be confirmed or rejected by future investigations. In this manner the cheese factory system has gone far towards the establishment in America of a science of cheese making. Each factory has been the theater of exact observations, which have been duly recored. The results of comparisons of these records have been embodied in papers read before the American Dairymen's Association; and the conclusions of the authors have been frequently put to the crucial test of experiment.

Hints to Carpenters.

The *American Builder* believes that there is much labor in vain in the ornamentation of houses, especially wooden houses. It tells carpenters, before making and fixing a quantity of ornament, to be sure that it is good, and goes on to say: There are many things that you do, and many others that an architect—if there be one in the case—will often instruct you to do, which are neither tasteful nor in good construction. Of course there are exceptions. You may be sure of this, however, that the more elaborate and covered with ornament and carving a building is, the more you are going on the wrong tack. Real beauty consists not in added features but in the body of the work itself, and this fact should always be borne in mind.

The principle of carving wood for outside ornament is wrong. We would not say it is to be discarded altogether, but, still, we have that leaning. Cut work, and that of the simplest kind, is the best. Complexity in forms and ornaments is mostly bad. It not only requires unnecessary labor to produce, but there is actually vexation in the mind of the spectator When people see a thing that is crowded with intricate work, that it takes them trouble to make out, it is tolerably good evidence that such work is not exactly what is wanted.

Give great attention to the sizes and proportion of doors and windows, and pay especial attention to the construction; and never, if possible, conceal its principles, but let them form the basis of ornament.

Moldings, cornices, and miters are not be put in exposed positions.

It is surprising what an excellent effect can be produced by cutting, even with little or no molding or carving.

We do not stick much molding or carving about a ship. How plain, yet how beautiful it is, simply because of its proportions and because—it looks like work.

BE CONTENTED.—Bulwer says that poverty is only an idea in nine cases out of ten. Some men with $10,000 a year suffer more for want of means than others with $500. The reason is the richer man has his artificial wants. His income is $10,000 a year, and he suffers enough by being dunned for unpaid debts to kill a sensitive man. A man who earns a dollar a day and does not go into debt is the happier of the two. Very few people who have never been rich will believe this, but it is true. There are thousands and thousands with princely incomes who never know a minute's peace, because they live beyond their means. There is really more happiness among the workingmen in the world than among those who are called rich.

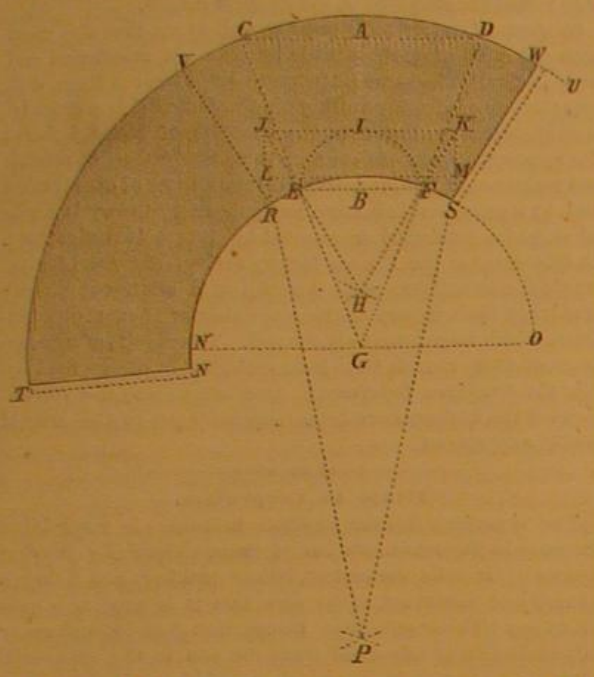
THE following ludicrous arrangement of sentences, quoted from different parts of a letter of H. M. Paine in the SCIENTIFIC AMERICAN, relative to his electro-motor, are produced by the *Brooklyn Eagle:* "Some years since I made the discovery that when hydrogen gas was treated by simple contact with turpentine, it was rendered highly luminous without any perceptible waste of the turpentine. An engine on this principle has been in constant operation for eight months running nine hours per day, doing a duty of 67,000 foot pounds, at an expense of three ounces zinc per day of nine hours."

THE use of petroleum as fuel for locomotives is again being discussed, a Frenchman having devised a new form of boiler furnace for the purpose. It is claimed by the inventor that the engine consumes its own smoke perfectly, a great desideratum in the combustion of petroleum. The oil is supplied to the fire very gradually, to avoid danger of explosion. We are informed that the consumption of oil was at a rate thirty-five per cent by weight less than that of patent compressed coal, of good quality.

A CURIOUS experiment, that of testing the vitality of fishes under a great pressure of water, was recently tried in France. Fishes preserved their health under the weight of 400 atmospheres, equivalent to that of a depth of 13,600 feet.

IMPROVED METHOD OF DRAWING PATTERNS FOR FLARING VESSELS OF SHEET METAL.

The invention illustrated by the accompanying engraving, is a new and convenient method of laying out on sheet metal the necessary lines by which to cut the metal so that it may be bent into the form of truncated cones of various degrees of inclination. The method pursued is as follows:—The hight of the cone is first measured on a line, A B, the extremities of which meet at right angles the lines, C D and E F.



The line, C D, is equal in length to the long, and the line, E F, to the short diameter of the truncated cone. Both the last named lines are bisected by A B. Lines are next drawn through the points, C E and D F, so that the point, G, is found. An equilateral triangle, E F H, is erected on the line, E F, and a semicircle, E I F, described from the center, B. The sides, H F and H E, of the triangle, are extended until they meet a tangent, J I K, of the circle, E I F, the said tangent being at right angles to the line, A B. The length, J K, thus found, is next, by perpendiculars, J L and K M, transferred to the tangent, L M, of a circle, N O, which is described from the point, G, and radius, G E; said tangent, L M, being parallel to J K. On the diameter, N O, is next erected an equilateral triangle, N O P, from the point, P, of which are drawn lines to the points, L and M, cutting the circle, N O, at R and S. From the point, G, and radius, G E, is next described the outer circle, T U. The radii, R V and S W, of this circle, through the points, R and S, produce between the two circles, N O and T U, just one half the designed length of sheet.

By adding another length as far as N and T, the entire sheet, N S W T, is produced, to the end of which sufficient material for overlapping may be added.

Patented, July 4, 1871, by Orlando B. Vandenburg, of Findlay, Ohio, through the Scientific American Patent Agency. For further information address the patentee.

Tommasi's Flux Motor.

We briefly noticed this invention last week. In our present issue, we have placed an illustration of it before our readers.

In the engraving, A is the level of average low water during the spring tides; B the level of the point which serves as a base of the unit of hight; C the level of average high water during the springs; D the pipe of communication between the reservoir and the sea; E the reservoir; F the lower compartment; G the upper compartment; H the tube of communication between the upper compartment and the sea; I the tube of communication between the lower compartment and the feeding tube of the motor apparatus; K the tube of communication between the upper compartment and the discharge tube of the same apparatus; L the factory; M the horizontal division; N the reserve compartment; O the cylinder, with piston of motor apparatus; P the pump for compressing the air; Q the valve; R the cocks, and S the shore. The acting force being at one of the levels above A, and the generator of force at F and G, the engine is at L, above a compartment of reserved force, N; and the force operates, and the movement is transmitted, as will be now explained. Let the sea be at the level, A; there being the junction by the pipe, D, there will, of course, be a corresponding level in the lower compartment of the reservoir, as shown in the illustration. There is a pipe of communication between the two compartments of the reservoir, as shown, the lower end of the pipe being submerged; and there are pipes for the escape of air from the compartments, the upper ends of the latter pipes being provided with stop cocks. As the tide rises from A to B, the air contained in the compartment, F, having no issue by the pipe, H, of which the orifice is submerged, and none by the pipe, I, of which the stopcock will have been closed, is compressed proportionately to the weight of a column of water of the sea.

"By putting, then," according to the inventor, this "compressed air into communication with the feeding pipe of a machine similar to the steam engine, and constructed in the proportions which would have due relation with the pressure and with the quantity of work desired, the machine will set itself in motion, and will continue to work up to the termination of the tidal flow—that is to say, during about three hours." During the time the water freely penetrates by the pipe, H, into the compartment, G—the pipe, K, being at the time in communication with the external air, it fills the compartment, G up to a level corresponding with the level of the sea. But the cock (one of those lettered R) which is on the pipe, K, is closed, whereby the escape of the water into the compartment, G, is prevented. Then as the sea descends to the level, B, the water suspended, as it were, in the compartment, G, rarefies by the effect of its weight the air between it and the machine, and it results that on placing the feeding pipe of the machine in communication with the external air, and its discharging tube in communication with the tube, K, the weight of the exterior air upon the piston of the machine will be more or less considerable, according to the degree of rarefaction of the air in the tube, K.

This rarefaction being proportionate to the weight represented by the hight of the water in the compartment, G, and this hight being the same as that of the water which a short time before exerted its pressure (at the rising tide), the pressure of the exterior air on the piston, and consequently the degree of work which results from it, will be the same as that of the compressed air, and will continue so to the end of the ebb, or reflux—that is, for about three hours. By the means described there will be about three hours of work and three hours of rest. For the branches of industry to which such intermittent work would not be adapted a machine would be constructed with two cylinders at right angles, to which would be added a certain number of pumps worked directly by its piston motors, O and P; and the tides occurring during the night, and on Sundays, would be turned to account and made to compress, by means of those pumps, the largest possible quantity of air, and to force it into the reserve compartment, N, which would be, in fact, the underground story of the engine house or factory. On the necessity arising for motive power from the machine during the three hours, a cylinder and its pumps would be taken from the machine and placed in communication with the reserve; and the compressed air there would furnish the power.

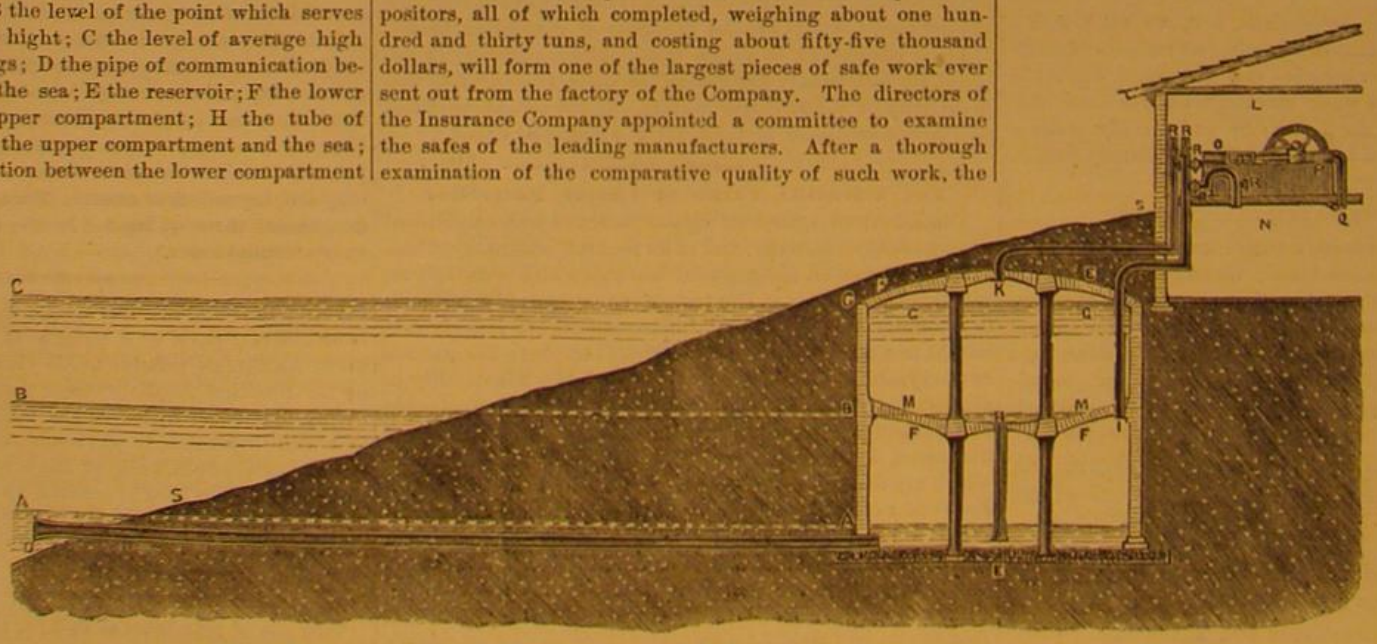
Improved Liquid for Galvanic Battery.

Mr. Victor Barjon's new battery liquid, mentioned by us in describing Mr. Emile Prevost's battery last week, is made by mixing a solution of bichromate of potash with a little lime, and with sulphuric acid. He puts two lbs. pounds of bichromate of potash into a gallon of boiling water, and lets the solution cool down to 68°, and adds two ounces of lime. After stirring, he adds sulphuric acid until the gravity reaches 35° Beaumé. Then, having stirred the whole, he lets it stand for twenty-four hours, when it is ready for use.

The American Steam Safe Company.

The Superintendent of the Company, George L. Damon, on Thursday last contracted with the Pennsylvania Company for Insurance on Lives and Granting Annuities, of Philadelphia, to erect in the banking room of their new building on Chestnut street, a "welded iron and steel" vault of great size with two thousand separate boxes, for the use of special depositors, all of which completed, weighing about one hundred and thirty tuns, and costing about fifty-five thousand dollars, will form one of the largest pieces of safe work ever sent out from the factory of the Company. The directors of the Insurance Company appointed a committee to examine the safes of the leading manufacturers. After a thorough examination of the comparative quality of such work, the Committee decided to contract with the American Steam Safe Company. This Company also furnished the Kensington Bank of Philadelphia with one of their first class burglar proof safes shortly after the bank was robbed.—[*Boston Post*, Aug. 4.

The warehouse of the American Steam Safe Company in this city, is No. 300 Broadway.



TOMMASI'S NEW FLUX MOTOR.

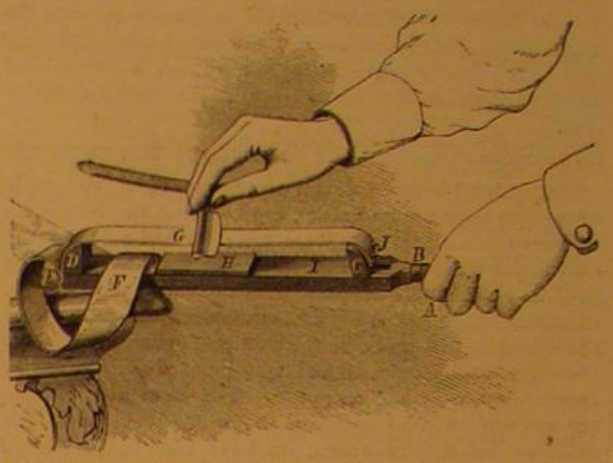
LUBRICATING oil has at last rewarded some persevering well borers at Terre Haute, Ind. The auger was driven 1,636 feet into the earth.

ADJUSTABLE TENSION RAZOR STROP.

The device for stropping and whetting razors, as represented in the annexed engraving, is the invention of Rev. Wm. M. Green, of Gallatin, Tenn., and was patented Aug. 1, 1871.

It is said that the idea of this invention was suggested by the piece of common leather so generally used in the barber shops of this country, and heretofore esteemed the very best strop for that purpose.

In Mr. Green's strop, two or more leathers, F and G, of varied qualities, may be used; these are attached to the sliding standard, C, by two eyelet pins, J, and to the stationary standard, D, by a thumb screw, E. The standards are of metal, and connect with and move in the frame, I, as shown. In the handle, A, is an adjustable screw, B, by turning which the tension of the leather is regulated. The leathers not in use may be fastened to the under part of the frame; on the face of this frame a hone, H, is secured. The advantages of these novel features are obvious.



For information as to sale of State rights, etc., address Messrs. White & Kirby, Gallatin, Tenn., sole agents and manufacturers.

Purification of Crude Fats of Commerce.

The crude fats contain many principles calculated to promote fermentation and decomposition. In place of purification by treatment with sulphuric, bichromate of potassa chlorine, fusion, boiling, filtering etc. M. J. Castlehaz proposes as a more economical method, the following: 100 parts of crude fat are taken, and to these are added 100 parts of boiling water. Four parts of crystallized carbonate of soda dissolved in 20 parts of water, are then added, and the whole heated to a temperature above the fusion point of the fat, and agitated to complete emulsion. Then 400 parts of water are added, the agitation being continued. The mixture is then allowed to stand, and the water siphoned off from below the layer of fat, which is again treated with 100 parts of water and treat as before, washing with four hundred parts of boiling water. At least two or three treatments of this kind should be applied, the second time with from 4 to 2 per cent, the third time with from 3 to 2 per cent of carbonate of soda.

To wash out the soda, water containing 1 per cent. of hydrochloric acid may be used, or pure water. The use of wated containing lime salts should be avoided in this process, as far as possible.

COLONEL AIKMAN, of the British army, recently exhibited at the United Service Institution, a newly designed rifle, intended to facilitate practice where a long range is not accessible. We give the Colonel's own description: I take an old musket and cut away the under part of the barrel. I then place a small barrel inside it, and bolt the breech of the same with the metal abutment in the stock; the breech of the outer barrel is cut away to admit of the smaller one taking its place. The inner barrel radiates from the breech, and is elevated or depressed by a screw. The principle of the invention is that, while the outer barrel is elevated to strike the target at the line of resistance, the inner barrel, or "tester," is kept point blank to the target, which is diminished in size according to the space available for practice, so as to present at the short distance the apparent size of the large target at the long range.

IN the London Central Telegraph Station, two lathes cut the paper for the Wheatstone and Morse printing instruments. These lathes, working nine hours daily, cut 750 coils of Wheatstone and 3,390 of Morse ribbon per week; the Central station alone uses 150 coils of Wheatstone and 1,390 of Morse ribbon per week. These two lathes can supply the whole kingdom.

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NEW YORK, SATURDAY, AUGUST 26, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

Accident at Paducah, Ky. 136
*Adjustable Tension Razor Strop. 134
A Dutch Laundry 129
A New Water Meter 136
A New Process for Separating Gold and Silver ore on a large scale 130
Answers to Correspondents 138
Applications for the Extension of Patents 140
Be Contented 135
Breakage of Watch Case Springs 132
Business and Personal 137
Carroll County Fair, Md. 136
Chicago Public Park 137
*Chrysalids and Cocoons 130
Disinfectants 129
Electro-Motors 132
Extracting Gold from Washings and Poor Ores 132
Germano Sommelier 137
Hints to Carpenters 133
How to Build Ice Houses 130
*Improved Clamping Devices 127
Improved Liquid for Galvanic Battery 134
*Improved Method of Drawing Patterns for Flaring Vessels 134
Improvements in Marbleizing Paper, etc. 136
Improvement in Pencils 137
Invalidity of State Laws regulating the sale of Patents 137
Inventions Patented in England by Americans 140
Ludicrous Error 133
*Magazine Breech Loading Gun 127
Manufacture of Artificial Butter 129
Motive Power of Ammonia 131
New Books and Publications 139
New Light for the use of Photographers 127
New Practice Rifle 134
New York Ear Dispensary 133
Nutrition 129
Objections to Darwinism 135
Official List of Patents 139
One Grain of Wheat 137
Paine's Electro Motor 132
Pearl Manufacture 130
Petroleum as Fuel 133
Photographic Developer 132
Plumbago in Virginia 131
Purification of Crude Fats of Commerce 134
Queries 138
Railroad Cars 132
Rating Steam Boilers 135
Recent American and Foreign Patents 139
Rejected Correspondence 138
Rolling Bodies 131
Safety Valves of Steam Boilers 132
Scientific Intelligence 136
Sleep Walkers 132
State Interference with Patents 135
Telegraph Paper 134
Telegraph Rates 136
The Steam Safe Company 134
The Cotton States Agricultural Fair 132
The Magnetic Mineral Wells 133
*The New School of Mechanical Engineering at Hoboken 131
The Scientific Value of Cheese Factories 133
The Spider 129
The Westfield Explosion.—How Boilers ought to be Inspected. 133
The Westfield Explosion. The Verdict 135
*Tommasi's Flux Motor 134
Vitality of Fishes 133
What our Hand Gear is, and where it comes from 129

THE WESTFIELD EXPLOSION. THE VERDICT---WARRANTS FOR THE ARREST OF THE PRESIDENT, SUPERINTENDENT, AND ENGINEER. WHO ARE THE REAL CULPRITS?

The shattered *Westfield* lies at the foot of East Thirteenth street, a melancholy witness of the horrors of the memorable 30th of July. Most of the fatally injured have been buried, but there still remain many maimed and crippled for life. The public have loudly clamored to know whom to blame for all this killing and maiming, and the coroner's jury have, after one of the most thorough investigations on record, found a verdict against the company and the engineer Robinson, in the following terms:

"That the deceased, Andrew Coyle, and others died through a rupture or explosion of the boiler of the ferryboat *Westfield* on July 30, 1871; that said explosion or rupture was caused by a flaw in the iron and by the negligence of the engineer, Henry Robinson, in carrying an over pressure of steam; that the company are responsible for the disaster, as the defect could have been detected if the Staten Island Ferry Company had had a competent superintendent, engineer and mechanic in their employ, and are, therefore criminally negligent. We recommend the District Attorney to take prompt action in the matter. We also think that the Government inspection is very imperfect as now conducted."

One juror, Chas. A. Kirtland, dissented from this verdict, as follows:

"I find that Andrew Coyle and others came to their death by reason of a rupture in the boiler of the steamer *Westfield*, in consequence of defects which could not be discovered by the ordinary and usual manner of inspection."

Warrants were at once issued for the arrest of President Vanderbilt, Superintendent Braisted, and the engineer Robinson, which will bring the matter before the Grand Jury. The press, as a rule, strongly advocates the indictment of these men, and the public sympathizes with the feeling that the company should be severely punished. This feeling has been greatly strengthened by the action of the company, since the disaster, in regard to its other boats. One of these, the *Middletown*, has upon it a boiler that on inspection was found so rotten that holes were easily knocked through it with a hammer. This boat was taken off for repairs, and after patching the boiler, the boat was again placed on duty and is now making its regular trips. This is interpreted by many as a defiant disregard of public opinion, and the effect has been to exasperate the already indignant feeling pervading the community.

But where does the real blame lie? The company complied with the law. The boiler of the *Westfield* was duly inspected; the safety valve, and steam gage were in good working order, the pressure, though a pound or two above that allowed, was not, according to the evidence, shown to be that which would endanger such a boiler known to be sound.

Was the boiler a sound one?

From the method of inspection adopted by the United States inspectors and their testimony, this question cannot be answered. The evidence on this point shows clearly that Government inspection is a farce. The testimony of one ex-inspector shows an ignorance of boilers and steam that would disgrace a tyro, and a present inspector is physically incompetent to inspect a boiler, because he is too large to get through an ordinary sized manhole. We unhesitatingly avow our belief that had the boiler of the *Westfield* been inspected in the manner described by Mr. McMurray, whose evidence we publish in another column, the boiler would have been condemned and the catastrophe averted.

If there is any fact whatever proved beyond dispute, it is that corporations will concede no more to public safety and comfort than the law compels them to do. Inspection, it seems, as now conducted by legally appointed officials, cannot be relied upon. It permits the companies to shift the responsibility from themselves, and throw it upon irresponsible men who can neither pay damages nor be compelled to undergo any worse penalty for neglect than impeachment.

But, it may be said, the civil damages, that companies may be made to pay for injuries received from accidents arising from neglect, should be sufficient to make them careful. This would, doubtless, be true, were law and justice uniformly meted out to wrong doers. But any one who has seen the way courts are manipulated by monopolists, and how laws are shaped, by money influence, to provide loopholes of escape for guilty corporations, knows that, as a rule, a prosecution for damages of this kind, is one which poor men will find so tedious and burdensome, that nine out of ten cases will be settled by the payment of nominal sums to sufferers, and that such litigations do not produce that wholesome fear on the part of the defendants, necessary to bring about the desired reform.

It is, then, primarily, in defective legislation, and in the inefficient execution of law, that we find the cause of the frightful disasters following each other in rapid succession in steamboats and railways, and coal mines. And is not the low moral sense of the public the source of such legislation? Are not such disasters a part of the legitimate fruit of the looseness of public morals? and will there ever be a change till the people, as a mass, suffer change?

We believe a change is coming, and that the apathy with which a large majority of Americans regard what are known as public duties, will soon be shaken off, not merely by steamboat and railroad explosions, but by those of a more serious character—social upheavals that will shake not merely fabrics of iron and wood, but the whole framework of society.

STATE INTERFERENCE WITH PATENTS.

By the Constitution of the United States, sole power is conferred upon Congress to create proprietary rights in patents for inventions; with which rights no State government has any authority, either directly or indirectly, to interfere. Indeed, it is the bounden duty of State governments and State officials, if they are called upon to act at all in the premises, to support the laws of Congress in respect to patents and patentees, not hinder or distress them.

Cheats and villains are found in every community, and they resort to all sorts of devices for swindling purposes, patents amongst other things. If they sometimes succeed in duping the foolish or the unwary, that is no reason why honest men, in the exercise of legitimate privileges, should be subjected to indignity or placed under the ban of suspicion. The old maxim is a good one to the effect that it is better for the guilty to go unpunished than that the innocent should suffer.

The legislatures of some of our Western States, under pretext of protecting their citizens against patent swindles, have passed special laws that are not only obnoxious to honest people, but clearly unconstitutional.

Some of these laws make it almost a penitentiary offence for a man to appear on the streets with a *bonâ fide* patent in his pocket. It is as bad or worse than the carrying of concealed weapons. And if an inventor should so far forget himself as to open his mouth with reference to a sale of his patent, not having first conformed to the requirements of some absurd State law, he is at once arrested, imprisoned in the common jail, and robbed of his money by unjust fines.

The seal of the United States granted to him as a sign of honor and reward is thus perverted into an instrument of abuse, and the deserving inventor, instead of profiting by his discovery, reaps only ruin and disgrace.

It seems incredible that this state of things can exist; but it does exist, and we have had many complaints from victims in different parts of the country.

We would urge patentees and their agents everywhere, not tamely to submit to such outrages, but to resist them by all legal means in their power. The issue of a patent is a grant under the broad seal of the United States, declaring that holder may freely enjoy the right to make, sell, and use his invention, and grant similar rights to others, in all the States and Territories of the Union.

The attempt of any State Legislature or State Court to restrict, regulate, or in any manner interfere with the operations of patentees or their agents in selling their patents, is unwarrantable. We think it probable that any State official who engages in such interference, is liable to both civil and criminal prosecution under the laws of the United States.

In this connection and in corroboration of the views now and heretofore by us expressed, we republish on another page the able decision rendered last year by Judge Davis, in the United States Circuit Court at Indianapolis, Ind., in a case similar to those we have suggested. The patentee's agent was thrown into prison simply for having offered a patent right for sale. But he had spirit enough and money enough to resent the outrage, and, on *habeas corpus* proceedings, the Judge ordered his instant release, and declared the Indiana law to be unconstitutional and void.

RATING STEAM BOILERS.

Preliminary Report of the Committee appointed by the Franklin Institute to Inquire into the Modes of Determining the Horse Power of Steam Boilers.

Our readers will remember editorial allusions to the existance of the above named Committee, called forth by a letter on the subject by Mr. Brown, one of its members. The articles referred to were published on pages 199 and 231 of our last volume. In them we took the ground that boilers ought not to be considered in connection with engines in rating them for horse power, nor in connection with the fuel consumed, as proposed by Mr. Brown in a paper read by him before the Franklin Institute.

We are now in possession of the preliminary report of the Committee, in which the views we expressed in our former articles are sustained.

The report, considering that it is a preliminary one, is quite elaborate and interesting. It reviews the origin of the term horse power, the standard as adopted by Watt, and then proceeds to discuss the various rules for computing the horse power of engines, including that understood by the term nominal, the British Admiralty rule, and Brown's rule for computing the power of high pressure engines. It then passes to the subject of the horse power of boilers, upon which it says:

"That at an early day, although subsequent to Watt's time, the evaporation of a cubic foot of water per hour, from and at the temperature of 212°, was ruled to be the measure of a nominal horse power.

"All subsequent authorities, without exception, have adopted this standard;—in the *steam boiler* they make no distinction between the nominal and actual horse power; there is only one definition of the term, and that is the evaporation of a cubic foot of water as previously stated. It is with this definition that we use the term horse power.

"This rule appears yet to be applicable, and it only needs some statements of conditions, such as will allow purchasers and sellers to conform to this requirement."

The report then passes to consideration of the conditions referred to, the first of which named is the size of chimneys and flues.

"For stationary boilers with natural draft, assuming that the chimneys and flues shall be adequate, in size and form, to afford the necessary draft, and that the fuel is coal of average good quality, it appears that nearly all writers give about $\frac{5.5}{100}$ square foot of grate to each horse power of boiler; and as this ratio gives a very small grate for the lesser number of horse power, about two feet are added as a constant."

The heating surface next claims attention. On this point, the Committee says:

"The arrangement and extent of heating surface should be such that at least the average result by evaporation of 9 lbs. of water from and at 212° with one pound of good anthracite coal burned (over and above ashes) shall be attained.

"As there are 59·48 pound of water at 212° in a cubic foot, it follows that 6·61 pounds of coal will be needed for its evaporation.

"Adopting the more convenient number of 7 lbs. as a liberal allowance, the rule would be $\frac{7 \text{ H. P.}}{0{\cdot}55 \text{ H. P.} + 2}$ = the number of pounds burned per hour per square foot of grate; or for boilers of—

10 H. P.	7½	sq. ft. of grate	9·33	lbs. per hour per	sq. ft. of grate.
20 "	13	" "	10·76	" "	" "
40 "	24	" "	11·66	" "	" "
60 "	35	" "	12·00	" "	" "

The hight of chimneys, above the surface of the grate, should be from 50 to 60 feet. The rule of Watt for obtaining areas of chimneys, based upon the number of pounds of coal consumed per hour and the hight of the chimney, is not, in the opinion of the Committee, applicable to powerful boilers with internal flues, though it will answer for land boilers of moderate size. For the former class of boilers, the sectional area should be from 6 to 8 square inches per horse power.

Upon grate surface the following remarks are made:

"When a forced draft is employed, as in the locomotive, we find the heating surface 65 times the grate area, and 80 lbs. of coal burnt per square foot of grate.

"These general conditions, dependent upon each other being fulfilled, namely, a grate surface so proportioned to the draft as to admit easily the combustion of 7 lbs. of anthracite coal, or combustible equal to that amount per horse power per hour, and the escaping gases not over the temperature before mentioned; it may be safely asserted that a boiler so set, of any given horse power, failing to evaporate that number of cubic feet of water per hour, with that amount of coal, does not produce its nominal horse power."

The Committee, however, disclaim the intention to limit the test of boilers by the conditions of chimney and grate surface as stated, but only put them forward as good average practice.

They conclude the report by some general remarks upon the setting of boilers, etc., and a request to engineers who have made or may make investigations relative to the heating surface of boilers to forward the particulars to the Secretary of Franklin Institute. Edward Brown, Robert Briggs, John H. Cooper, W. Barnet Le Van, and William H. Wahl constitute the Committee.

OBJECTIONS TO DARWINISM.

Darwin's theory may be epitomized as "the persistence of the stronger," "the survival of the stronger," "those forms of life survive which are best adapted to survive." There are a good many commonplace facts which appear to go contrary to this theory, and they ought to be explained by the

followers of Darwin. Mr. Howorth, in *Nature*, suggests some of them, and they appear to us to be worthy of attention. The gardener who wants his plants to blossom and yield fruit, takes care that they shall avoid a vigorous growth. He knows that this will inevitably make them sterile; in order to induce flowers or fruit, he checks the growth and vigor of the plant by pruning or depriving of food, and if he have a stub born pear or peach tree, which has long refused to bear fruit, he adopts the hazardous, but often most successful plan of ringing its bark. Large fleshy oranges have few seeds; the shriveled starvelings, on the contrary, are full of them. The same law appears to hold in the animal kingdom. "Fat hens won't lay," is an old proverb. Ewes, sows, and cows must be kept lean or they will not breed, and it is said that, to make Alderney cows fertile, they are actually bled. What is commonly known to be true of plants and animals is especially true of man. Individuals and classes are known to be affected by generous diet and good living; everywhere the rich, luxurious, and well fed classes are rather diminishing in numbers or are stationary; while the poor, underfed, and hard worked are very fertile. The same cause has operated to extinguish the savage races, which have decayed and died out when brought into contact with the luxuries of civilization, notwithstanding every effort has been made to preserve them. It is luxury and not want, too much vigor and not too little, that has destroyed these tribes. It appears to be true that, in stead of the strong surviving the weak, the tendency among the strong, the well fed, and highly favored, is to decay, become sterile, and die out, while the weak, the under fed, and the sickly are increasing at a proportionate rate.

These facts make it incumbent upon the supporters of the doctrine of natural selection to search for some explanation that will reconcile them with their theories. Darwin would hardly suggest that we must go back to the savage state in order to attain the highest stage of development; and yet it is perfectly notorious that savages cannot survive the effeminate luxuries of the civilized races. We submit these objections, not as subscribing to them, but by way of caution to those who have been too ready to subscribe to the Darwinian doctrines.

A NEW WATER METER.

Messrs. G. H. Fairchild and Co, of 18 Mercer street, New York, have recently brought out a water meter, which, it is stated, in a recent trial at the Jersey City Water Works, gave results showing a marked superiority over other instruments, the percentage of variation in its registering being at all times and under all pressures, very small, and whatever variation was noticeable being in favor of the consumer. It is said that its accuracy is all that could be desired.

The experiment referred to was the fifth of a series made to test the working qualities of the meter, and during its progress the extremes of pressure were one, and eighty pounds. Through the whole range between these extremes, the meter worked with singular uniformity.

The instrument is constructed on the principle of compensating centrifugal force, and dispenses with diaphragms, plugs, pistons, floats, valves, tilting buckets, and the other devices by which the solution of the difficult problem of measuring water automatically has hitherto been sought.

It is said to be strong, safe, and durable, that it cannot be stopped or corroded, and that it delivers the water in an unbroken stream, without absorbing so much power as to diminish the throw from a hose to any noticeable extent.

The experiment, which occupied some two hours, was witnessed by a number of experts, who expressed themselves highly pleased with the results shown.

The size of the meter which delivered a $1\frac{1}{16}$ inch stream is about that of an ordinary gas meter. Under the ordinary pressures it will deliver about 70 gallons per minute. It has a back motion as well as a forward one, and may be applied to measuring liquors as well as water.

The large waste now prevalent in the use of water renders either enforced economy or increased supply an imperative necessity in most large towns and cities. The invention of a simple, economical, and accurate meter, such as that herein described, is therefore a matter of much importance. It is is believed that further trials, soon to be made with the meter, will not only confirm but surpass the results already obtained.

IMPROVEMENTS IN MARBLEIZING PAPER AND OIL-CLOTH.

Mr. Thomas Carson, of Brooklyn, N. Y., has recently taken out patents for marbleizing paper and oil cloth for table covers, etc., the process being in substance as follows:

For paper, the process consists first in providing the paper with the ground colors, by applying any required plain color thereto by means of brushes or other means, or it may be colored at the time it is manufactured; then a bath of water is provided, and the color which is to most predominate being ground in oil and mixed with dammar varnish, is floated on the water bath, and broken by rapidly stirring with a stick. Care is taken that the varnish be mostly used with this color.

Then the veining colors, also ground in oil and mixed with a small amount of varnish, or, in some cases, none at all, are floated on the bath, and rapidly stirred with a stick.

The color mixed mostly with varnish does not break up so fine as the one mixed mainly with oil; therefore the former becomes the most prevailing color, and the other forms what are called the veins.

When the bath is thus prepared, the paper, being tacked on a board, is dipped edgewise in the bath and then turned down flat therein, so that the liquid in the bath will flow over the whole surface, from one edge to the opposite one, and drive the air away, thereby preventing air bubbles, which would be confined under the paper, if placed flatwise on the liquid, and cause blotches.

The paper is then taken out and laid, with the side which has received the floating colors up, to dry, after which it is varnished, and may be polished if preferred. By a judicious selection of colors the paper may, it is claimed, be made in exact imitation of the most beautiful colored or antique marbles, such, for instance, as the jasper, agate, malachite, lapis lazuli, gold stone, verde antique, Spanish, Pyrenese, Sienna, Brocatelle, Lisburn, Egyptian, etc.

This paper may be arranged in beautiful mosaics for a variety of purposes, as a veneer for walls, fronts of counters, mantels, book bindings, etc.

Very light and thin paper will serve as well or better than thicker, as it is more easily made smooth upon the wall to which it is attached.

Preferably the varnish is not put on till the paper has been put on the wall or other surface to which it is to be applied.

In marbleizing oil cloth the inventor applies the marbleizing colors previous to putting on the finishing coat of varnish. The marbleizing process is analogous to that described for paper, and therefore need not be described in detail, though it is covered by a separate patent.

SCIENTIFIC INTELLIGENCE.

CLARIFYING SUGAR BY ALUMINA.

To clarify sugar solutions, in a manner to adapt them for examination with the polariscope, says the *American Chemist*, is a somewhat difficult matter. Mr. Scheibler advises the use of hydrate of alumina, which has given him extraordinary results. He prepares the hydrate in considerable quantity by adding, to a not too concentrated solution of sulphate of alumina, or alum, an excess of caustic ammonia; he allows the precipitate which forms to subside, decants or removes by a siphon the supernatant liquid, and washes until every trace of the salt or the ammonia has disappeared, and also until red litmus ceases to turn blue. The bulky jelly of hydrate of alumina which remains should be kept in a well corked bottle. The manner of applying the clarifying hydrate is to introduce into a flask holding 50 C.C., 13·024 grammes of the sugar to be tested; add by means of a pipette three to five C.C. of hydrate of alumina, shake and filter. This yields a liquid extraordinarily clear or white, with a partially changed color, which may be perfectly polarized. The same hydrate of alumina can be used for clarifying a great variety of colored liquids and may also serve to purify potable waters.

ARSENIC IN PYRITES AND SODA.

H. A. Smith gives in the *Chemical News* some startling investigations in reference to the persistence with which arsenic in the crude material adheres to the various products even through the third and fourth stage of manufacture. He finds that 100 tuns of hard Norwegian pyrites contains one and a half tuns of arsenic before burning, and half a tun after the roasting. One hundred tuns of the same pyrites will yield 140 tuns of sulphuric acid containing one and a half tuns of arsenic; and after it has been used in making hydrochloric acid, there will be found in the latter nearly one per cent of arsenic. The sulphate of soda in Le Blanc's process was found to yield about four hundredths of one per cent of arsenic. No arsenic was discovered in the soda ash.

PRECAUTIONS AGAINST A TOTAL ECLIPSE OF THE SUN IN 1699.

The preparations made by the governments of the present age to have every phase of a total eclipse studied and recorded contrast favorably with the superstition that prevailed a few centuries ago. For instance, we find the following in one of our German exchanges: The Elector of Darmstadt was informed of the approach of a total eclipse in 1699, and published the following edict in consequence: "His Highness, having been informed that on Wednesday morning next at ten o'clock a very dangerous eclipse will take place, orders that on the day previous, and a few days afterward, all cattle be kept housed, and to this end ample fodder be provided; the doors and windows of the stalls to be carefully secured, the drinking wells to be covered up, the cellars and garrets guarded so that the bad atmosphere may not obtain lodgment, and thus produce infection, because such eclipses frequently occasion whooping cough, epilepsy, paralysis, fever, and other diseases, against which every precaution should be observed."

THE JUDD LABORATORY.

The recent gift of a laboratory to the college at Middletown, Connecticut, at a cost of $100,000, by Mr. Orange Judd, is an event that ought not to be passed over in silence. It is not many years ince Mr. Judd was a poor student at this college, seeking to lay the foundation of a knowledge of the natural sciences, which would be of value to him in after life. The difficulties he then encountered and the obstacles he had to overcome made a deep impression upon him, and it is greatly to his honor that, after the lapse of twenty-five years, he has not forgotten the resolve then formed, that if he were ever able he would lighten these difficulties and remove these obstacles for the benefit of the generations of students to come after him. The Judd Laboratory and Hall of Science was inaugurated at the last Commencement of the Middletown College. It is sixty-two feet front, ninety-four feet deep, and five stories high. The walls and portico are of Portland sandstone, the cornices and dormer window frames are of iron, the roof, slate; and an iron and brick floor separates the laboratory from the museum, so that the building is essentially fireproof. The basement, ten feet high in the clear, is chiefly above ground, and furnishes abundant room for heating furnaces, storages, assay work, and technical chemistry. The lecture room is handsomely fitted up with every convenience for illustration and comfort, and it is provided with a private entrance for visitors and for women when their sex is admitted to the college course. The laboratory is replete with every modern improvement, and as this is the latest, so it also appears to be the most thoroughly equipped school for scientific study in the country. Too much praise cannot be accorded to Mr. Judd for this munificent contribution to the cause of scientific education in our country.

ASTRONOMY AT CONSTANTINOPLE.

The chief astrologer of the Sultan has little occasion to cast the horoscope of the future, as less faith is entertained for that sort of prognostication at the present time than formerly, so he is chiefly occupied in computing the official almanac, and doing real astronomical work. They are actually giving lectures in physical science in Turkish, by Mussulmen professors, though there are not wanting devout men in Islam who maintain that such teaching is contrary to Scripture. The manner of computing time in Constantinople, is a sore puzzle to foreigners. As the day begins at sunset and has to be divided into twenty-four hours, there is a general setting of watches every evening, otherwise nobody would know at what time their railroad and steamboat departures would take place, and things generally would be out of sorts. The chief use of expensive clocks and watches is working out the canonical hours of prayer. Some undevout Englishmen have recently set up a noon gun at the arsenal for the convenience of foreigners.

METEORIC IRON FROM VIRGINIA.

Dr. J. W. Mallet, Professor of Chemistry at the University of Virginia, has recently examined three specimens of meteoric iron found in different localities, but evidently fragments of the same mass. The etched surfaces gave beautiful groups, known as Widmannstättian figures; and carefully conducted analyses yielded the following results:

	NO. 1.	NO. 2.	NO. 3.
Iron.....	88·706	88·365	89·007
Nickel.....	10·163	10·242	9·964
Cobalt.....	·396	·428	·387
Copper.....	·003	·004	·003
Tin.....	·002	·002	·003
Maganese....	trace	.....	trace
Phosphorus..	·341	·362	·375
Sulphur.....	·019	·008	·026
Chlorine.....	·003	·002	·004
Carbon.....	·172	·185	·122
Silica.....	·067	·061	·056
	99·872	99·659	99·947

Dr. Mallet does not consider the chlorine as a constituent of the iron, but traces it to the earth in which the specimens were embedded. Particular attention was given to the identification of the minute quantity of tin recorded in the analysis, as the presence of this metal in meteoric iron has been disputed by chemists, who have examined many specimens. There appears to be no doubt of the extramundane origin of meteoric iron, and as the revelations of the spectroscope become better known, we may eventually be able to trace those that are seen to fall, back to the sources from which they came.

RATES FOR TELEGRAPHING PUBLIC BUSINESS.—The Postmaster General has, in accordance with the Telegraph Act of 1866, fixed the rates of telegraph communication between the several departments of the Government and their officers and agents, which have priority over all other business. These new rates are exclusively confined to public business. One cent per word is named for each circuit of 250 miles or less. All the words of the communication transmitted are to be counted excepting the date and place at which such communication is filed. The rate for signal service messages and reports is two cents per word for each circuit or distance, irrespective of the length of the same. The rates took effect July 1st.

A PIECE of carelessness at the rolling mill in Paducah, Ky., recently came nearly being productive of very serious results. There was about half a tun of molten iron on the ground, the top of which had partially cooled and looked dark. A negro approached it with a bucket of water, which he threw on the hot iron. The explosion that followed was terrific. The hot iron was thrown all over the mill in large flakes, endangering the lives of many of the hands, and setting fire to the building. The fire was extinguished before any damage was done. The negro who was the cause of the mischief was unhurt, but his clothing was pretty badly burned.

THE CARROLL COUNTY AGRICULTURAL SOCIETY (Maryland) announces its third annual fair to take place at Westminster, Carroll Co., Md., on October 3, 4, 5, 6, and 7. The Society has published an extended list of prizes for successful efforts in all branches of agricultural economy, as well as in other useful pursuits. A most commendable feature is the awarding of subscriptions to magazines and periodicals, as premiums, thus widely disseminating practical knowledge of industrial subjects.

THE cabs in New York City are painted dark red, and striped sparingly with black. Vermillion broad lines, and carmine glazed on vermillion, are still used to some extent. Blue on panels, and for broad lines on the carriage part, may be occasionally met with.

THE value of the new money order system between the United States and Great Britain will soon be increased by the admission of France into a tripartite arrangement of the same nature.

INVALIDITY OF STATE LAWS REGULATING THE SALE OF PATENTS.

In the Circuit Court of the United States, District of Indiana.

Ex-parte Major J. Robinson—Petition for writ of Habeas Corpus.

Be it remembered, that heretofore, to wit, on the 30th day of May, 1870, before the Honorable David Davis, one of the Judges of said Court, the following proceedings in the above entitled cause were had, to wit:

It appears from the papers in this case, that the petitioner, being the duly authorized agent of the owners of certain patents granted to Henry B. Goodyear, administrator, and to John A. Cummings, offered, on the 23d day of May, 1870, to Harrison H. La Fever, a dentist, in the county of Grant, in this State, the right to use the invention patented, for dental purposes, within said county, for the sum of $100, which the said La Fever agreed to pay. Before the sale was completed, the District Attorney of the county instituted proceedings against the petitioner, under the provisions of an act of the legislature of Indiana, entitled "An Act to regulate the sale of patent rights, and to prevent fraud in connection therewith," which took effect on the 23d day of April, 1869.

These proceedings resulted in the petitioner being committed to the jail of the county, because he had failed, before he had offered to sell the patent right, to comply with the terms of the law.

If the law is valid, he was properly held in custody; otherwise, he should have been discharged. This law declares that it shall be unlawful for any person to sell or barter any patent right in any county within the State without first filing with the Clerk of the Court of such county copies of the letters patent duly authenticated, and at the same time swearing to an affidavit before such clerk, that such letters patent are genuine and have not been revoked or annulled, and that he has full authority to sell or barter the right so patented. Which affidavit shall set forth his name, occupation and residence, and, if an agent, the name, occupation and residence of his principal. A copy of this affidavit shall be filed in the office of said Clerk, who shall furnish a copy of the same to the applicant, who shall exhibit the same to any person on demand. Penalties are imposed for any violation of these provisions.

This is an attempt on the part of the Legislature to direct the manner in which patent rights shall be sold in the State, to prohibit their sale altogether, if these directions are not complied with, and to throw burthens on the owners of this species of property, which Congress has not seen fit to impose upon them. I have not time to elaborate the subject, nor even to cite the authorities bearing on the question, and shall therefore content myself with stating the conclusion which I have reached.

It is clear that this kind of legislation is unauthorized. To Congress is given by the Constitution the power "to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries." This power has been exercised by Congress, who have directed the manner, in which patents shall be obtained, how they shall be assigned and sold.

The property in inventions exists by virtue of the laws of Congress, and no State has a right to interfere with its enjoyment, or annex conditions to the grant. If the patentee complies with the laws of Congress on the subject, he has a right to go into the open market anywhere within the United States and sell his property. If this were not so, it is easy to see that a State could impose terms, which would result in a prohibition or the sale of this species of property within its borders, and in this way nullify the laws of Congress which regulate its transfer, and destroy the power conferred upon Congress by the Constitution. The law in question attempts to punish by fine and imprisonment a patentee for doing with his property what the National Legislature has authorized him to do, and is therefore void.

The petitioner is discharged.

Improvement in Pencils.

Mr. Henry T. Cushman, of North Bennington, Vt, has invented an improvement in lead pencils, which consists in providing them with a coating of flock, by means of which they are less liable to be lost, and more easily handled than those now in use. The pencils are covered with glue or other adhesive liquid, and then coated with flock of any desired color. This gives the pencil a coating which causes it to adhere to cloth, and thereby prevents its sliding or slipping from the pocket. This improvement does not add to the cost of the pencil, as the rough coating may be applied as readily and as cheaply as the ordinary varnish or polish.

Germano Sommellier.

The death of this eminent Italian engineer was briefly announced in our issue of last week, and we are now enabled to give a few particulars of his life and works.

He was born in the province of Faucigny, in Savoy, in the year 1815, and his parents, having given him a sound preliminary education, perceived his genius for mathematics, and sent him, in his fifteenth year, to the Polytechnic School at Turin. He took high honors at this school, and after spending a few years in traveling through France, Germany, and England, he published a pamphlet, urging the government of the then king (Charles Albert) to arrange with the French authorities for the construction of a tunnel under the Alps. The expense of the project prevented its immediate success; but Sommellier struggled undauntedly for twenty years, and was at last rewarded by seeing the work finally resolved upon, and intrusted to him for execution. There is no need to add to the many descriptions of this enormous undertaking which have already been published; but the entire credit of its execution is due to Signor Sommellier. It was his own offspring from beginning to end. His inventions for tunneling and ventilating have been described to our readers; and his last achievement was the devising a means of maintaining air currents through the tunnel, so as to render it a safe passage for travelers under all circumstances.

He was able to complete his work before he was taken away; but the pleasure of seeing a train run through the Alps was denied him. He gave his life to this work, and exhausted it in its execution.

THE people of Chicago have appropriated one thousand and fifty-five acres of land on the south and southwest of the city, at a distance of some six or eight miles from the business center, for the purpose of a public park; and Mr. F. L. Olmsted has been invited to examine the land and to prepare a plan for the work. The site consists of two tracts, a mile or a mile and a half apart. One of these tracts contains nearly six hundred acres, lying upon Lake Michigan, on which it has a frontage of a little more than a mile and a half; and the other, three hundred and seventy-two acres, entirely inland. The situation is by no means picturesque, but it is hoped that a liberal use of the resources of landscape gardening, under the direction of a competent artist, will do much to remedy that defect.

ONE GRAIN OF WHEAT.—Mr. Login, of the Indian Civli Service, recently forwarded to the editor of *Nature* a photograph of the produce of a grain of wheat, grown in India on the Egyptian system. One hundred and sixty shoots sprang from the grain, of which one hundred and five became ears of corn. The broad cast system of planting, in general use in India, shows seven ears of wheat as an average yield from one grain.

VERY cheap varnish is dosed with a material in great favor with Ole Bull and all other violinists, which they use to prevent the bow from slipping.

PATENT OFFICE DECISIONS.

In the matter of the application of Daniel Pratt for the extension of letters patent, bearing date July 14, 1857, for improvement in Cotton Gins.—DUNCAN, Acting Commissioner.

The invention covered by this patent is a simple device by means of which a spiral movement is communicated to the cotton within the hopper of the gin, the result of which is, that fresh masses of the cotton are successively presented to the action of the saws, and all portions are equally ginned; and, it is alleged, with less injury to the fiber than in the old machine.

The patentee entered upon the manufacture of the improved gin even before the grant of the patent, investing a large capital in the business. Notwithstanding the interruption of his business occasioned by the late civil war, he has built and put upon the market about seven thousand gins. This fact alone demonstrates the value of the invention to the public, and the numerous affidavits placed upon file in relation to its importance, are simply cumulative evidence. Patentee's business was in Alabama, and, as was to be expected, he has suffered severely by reason of its utter prostration caused by the war, losing thereby, not only the profits that would otherwise have accrued upon the manufacture and sale of machines, but also the interest upon the large amount of idle capital invested in his factory and stock, and the interest during the war upon some $40,000 of outstanding credits. These credits he sold in 1866, at an enormous discount, receiving therefor only $50,000.

Applicant describes himself a peaceful, quiet citizen, who remained at home during the hostilities, taking no part in the war; but whether this be so or not, the interruption of his business consequent upon the war was a matter entirely beyond his control. He cannot be charged with any lack of diligence. On the contrary, he has exhibited unusual energy and capacity in the introduction of his invention. Special favor should be shown to the inventor who, having devised a useful improvement, devotes his time and energy and capital to its manufacture and sale. This often has a far more important bearing upon the industrial prosperity of the community at large than does the mere making of the invention.

The examiner reports the improvement to have been new at the time the patent was granted; and, as the balance sheet shows the patentee to be largely in arrears by reason of the invention, in the introduction of which he has shown such a large measure of diligence, it is deemed both just and proper that the extension asked for be granted.

In the matter of the application of Abel Combs for letters patent for alleged improvements in watches.

This appeal is taken from the decision of the primary examiner, who holds that the application embraces several distinct and separate improvements in watches, which for that reason can be considered only when embodied in as many separate applications.

From the specification it appears that the various improvements described may be arranged under the following heads:

1. A safety attachment in connection with the main spring and barrel, to prevent damage to the train from the breaking of the main spring or the failure of the ratchet.
2. The central arrangement of the second hand.
3. The change in the escapement devices, by which, it is alleged, the number of escapements in a given time is reduced to one half the former number.
4. The construction and eccentric location upon the dial of a calendar and the connected mechanism to mark the day of the month.
5. The mounting of the second hand staff and the calendar hand staff upon springs, for producing the requisite friction between the staff wheels and the surfaces over which they move.

This is substantially the classification made by the examiner; and after a careful consideration of the argument presented by the applicant's attorney as well as in applicant's own letter, I fail to see that there is any such connection between the improvements specified, as to make any particular one of them necessary to the presence and successful operation of any or all of the others.

The safety attachment would be equally serviceable in a watch provided with the old escapement; and neither the safety attachment nor the improved escapement has anything to do with the calendar mechanism; and a similar remark is applicable to the second hand mechanism, and to the friction springs.

It may perhaps be admitted, as urged by applicant, that the new arrangement of the second hand has necessitated an eccentric system for setting the hands, and likewise a modification in the construction of the canon pinion; and rightly enough, therefore, these devices may be regarded as properly embraced in the same application. But as regards the devices previously named, there seems to be no other necessary connection between them than that they are embraced in the same article of manufacture.

Is this sufficient reason for permitting them to be patented in a single application?

In Bennet *vs.* Fowler, 8 Wall, 445, the Supreme Court recognizes the difficulty of defining by general rules the conditions under which two or more inventions or improvements may be joined in one application; the language used in the decision is as follows: It is difficult, perhaps impossible, to lay down any general rule by which to determine when a given invention or improvements shall be embraced in one, two or more patents. Some discretion must necessarily be left on this subject to the head of the Patent Office. It is often a nice and perplexing question.

In Linus Yale, Jr., *ex parte* Commissioner's decisions, 1869, 110, the Commissioner of Patents, while admitting by implication that under some circumstances two or more inventions may be covered by one application, still demands that this shall not be done whenever it would disturb that established classification of inventions which has been found necessary to facilitate the work of examination and ensure its correctness.

The reasons assigned for applying this rule to cases that would otherwise call for double examination by different examiners seem equally strong in relation to the established sub-classes under the same examiner.

This subdivision of the subjects of invention is not made arbitrarily by the office.

It follows the course marked out by inventors themselves. A man who, being the first to invent a watch, should ask a single patent upon the several distinctive elements of its mechanism, should undoubtedly be entitled thereto; but when, in the progress of the art, the efforts of inventors have been directed to the separate parts of the watch, and at their request patents have been issued upon such separate parts, a corresponding classification of subjects necessarily arises in the office, and must be observed in considering any subsequent applications relating to the general class; otherwise, the work of examination would be rendered far more difficult, and at best would become uncertain and misleading. It is not alone the convenience of the office that is consulted in the classification which is adopted. Inventors themselves are deeply interested in having a prompt and thorough examination upon their applications, which can only be secured through this very means. As the several improvements in the present case fall into sub-divisions already established by the course of invention, and by the previous practice of the offices and as these several improvements have no necessary community of operation, it is held that they form the subject matter for separate applications; and therefore that the present application cannot properly be proceeded with until the applicant shall have made such amendment as to confine it to that one of the improvements which he may elect to prosecute therein. Upon this point the examiner's views are affirmed.

SAMUEL A. DUNCAN, Acting Commissioner.

U. S. Patent Office, August 9, 1871.

Examples for the Ladies.

Miss Sarah Lynch earned with a Wheeler & Wilson Machine, in 1870, $731.63, stitching neck-ties.

"George P. Rowell & Co., the N. Y. Advertising Agents, have the monopoly of space and location in many hundred newspapers, and know by their experience just where to invest money to the best advantage."—*Berkshire Courier.*

Whitcomb's Asthma Remedy.—No established remedy has stood critical tests so well.

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.

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To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 15 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 of Waltham Watches. All prices reduced since February 1st.

Quinn's Patent Ferrule makes good all leaky boiler tubes. Address P. Quinn, South Newmarket, N. H.

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.

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See advertisement of new Machinist's tool on last page.

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.

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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.

Makers of 4 in. light Cast Iron Pipe, address E. Whiteley, 61 Charlestown Street, Boston.

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

For cars and track of the Portable Railroad, send your orders to Val. Hilburn, Easton, Pa.

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.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Peck's Patent Drop Press. For circulars address the sole manufacturers. Milo, Peck & Co., New Haven, Ct.

Railway Turn Tables—Greenleaf's Patent. Drawings sent on application. Greenleaf Machine Works, Indianapolis, Ind.

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

The greatest invention ever made is the "Mechanical Paradox." No Inventor or Mechanic should be without it. Sent to any address on receipt of $1. L. Phillips, manf'r, Room 9, Hoffman's Bl'k, Cleveland, O.

Manufacturers of Coal Tar Pitch, send address and price list to H. M. Field, Jericho, Vt.

A Practical Galvanizer, having a complete apparatus, would sell, or operate with partner. Address "Galvanizer," Saco, Maine.

Wanted—Brass Finishers. Also, a first class man as foreman. Good wages. Address Pittsburgh P. O., Box 574.

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

Manufacturers of Cucumber Wood Lumber, send address to H. M. Field, Jericho, Vt.

Manufacturers of Engine Lathes and Power Hammers, send circulars and prices to Harris Manufacturing Co., Janesville, Wis.

Wanted—To employ a competent man having a thorough knowledge of all the details connected with building Mowing and Reaping Machines. Address, with reference, Lock Box 35, Wheeling, W. Va.

Sam'l I. Seely, N.Y. (Patentee of Iron Roofing and Clapboarding), or his representative, will send address to Box 403, York, Pa.

Steam Fire Engines—Two second hand ones, at $1000 and $1500. Also new. Send for catalogue. R. J. Gould, Newark, N. J.

Fire Arms—We would call attention to the advertisement in another column of our paper under the above heading.

The well known works of John Dane, Jr., Newark, N. J., is the place to get labor saving machinery built. Patent Office Models, the best Foot Lathes, Screw Cutting, and other styles; Punching and Stamp-typing Presses, &c. Office, 95 Liberty Street, New York.

Declined.

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

ANTI-INCRUSTATOR—C. G. F.
FLYING MACHINE—T. B.
IS THE BRAIN THE ORIGIN OF THOUGHT?—J. M.
NARROW GAGE CARS—T. D.
NEW MOTIVE POWER—G. H. M.
RAILROAD CARS AND THE WIND—U. B. V.
STEAM ON CANALS—J. McG., M.D.
THE EARTH CLOSET SYSTEM—F. M. H.

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.

MARINE GLUE.—J. H. P. must take of coal naphtha, 1 pint, pure (not vulcanized) rubber, 1 ounce, cut in shreds; and macerate for 10 or 12 days, and then rub smooth with a spatula on a slab; add at heat enough to melt, 2 parts of shellac by weight, to one part of this solution. To use it, melt at a temperature of about 248° Fahr.—E. H. H., of Mass.

ELECTROTYPING ON WOOD.—Dip your wood in melted wax, then brush over with black lead until you get a polish, insert a wire of copper, and see that it also is covered with the plumbago, and in contact with that already on the wood; now attach to the pole of your battery, and immerse in the solution of sulphate of copper. The battery should not be of too strong intensity.—E. H. H., of Mass.

CEMENT FOR EITHER LEATHER OR RUBBER STRAPS.—This may be of service to some of your readers, and it is, I know, a useful thing. Gutta percha, 16 oz.; India rubber, 4 oz.; pitch, 2 oz.; linseed oil, 2 oz. Cut the rubber in shreds and add the oil, which in a few days will have softened the former. Melt carefully the gutta percha and pitch together, and stir in the rubber solution, or paste, apply hot, and press joints.—E. H. H. of Mass.

VISE BOX.—S. A. wishes to know how to fasten threads in a vise box. Take clay 3 parts, cow dung, 1 part, mix them intimately and work into a stiff uniform mass. Into the open end of the box fit a stout cardboard washer, the hole in it being less than the inside diameter of the thread, into the hole fit a taper wooden plug. Imbed the box in the prepared clay an inch thick, all over, withdraw the plug and set the clayed box away. When dry, put in by the plug hole sufficient tough brass and borax, and keeping the opening highest, introduce the box into a smith's fire; move the box about so it may be equally hot all over; increase the heat till the brass, seen through the plug hole, melts; take the box from the fire and roll it on the ground till the brass is set. When the fire color has left the inside, put a little clay round the plug and push it tight in the hole, and plunge the whole in water. When cold, break the "batch" and dress up.—P. D., of Ca.

CONE PULLEYS.—The sizes for the pulleys of the cones of a foot lathe may be found as follows: Decide on the sizes for the pulleys, say on the small cone, and on the size of one pulley on the large; then make a full size drawing of the pulleys decided upon, with the distance between centers the same as they are intended to run at; also draw the pulleys on large cone whose sizes are sought, with the difference in their diameters a little less than the difference in the diameters of the decided pulleys on the small cone. Now draw tangent lines representing the course of the belt on the two mating decided pulleys, and draw radii, cutting these tangents at right angles with the center. Measure the length of the lines representing the belt between these cutting radii, and set their sum down as part of the length of the belt. Now, with a protractor, measure the number of degrees in the arcs bounded by the radii, and covered by belt of the two pulleys; and if the whole circle or 360° — so much, then one degree — the 1-360 of the whole circle; and multiplying the amount in one degree by the number of degrees, we have the length of the arc; adding the lengths of these two arcs found to the lengths of the two tangent lines found, we have the total length of belt. Now, measure the tangent lines and arcs representing the belt on the second set, to see if the circuit is of the same length as the first; if not, change the size of assumed pulley according as the circuit is more or less than the length of belt, and measure a second time, when, if careful to consider how much more or less in change it would take, you will come very close, and a third trial will be close enough for all practical purposes. Find the size of second assumed pulley in the same way, also third, etc. If it happens that you have to decide on the sizes of the large pulley instead of the small, the operation would be the same, except that you would have to make the difference in diameter of the assumed pulleys a little more than the difference in diameter of the large pulleys, instead of a little less as when you decided the small first. I used this method in making a foot lathe, and although it is a little tedious to work out, it pays for the trouble. My belt runs beautifully, and the operation is easily seen through; it is simply finding the length of belt on one circuit, and bringing the others all up to the same length of circuit. Changing the distance between centers of cones of this description would change their relations to each other.—D. L. B., of Pa.

WATER WHEEL POWER.—In No. 6, current volume, W. A. W. makes a somewhat curious inquiry. It reads as though his stream might afford forty square inches of water under a head of thirty feet. If so, is the actual opening forty square inches? or, is the opening large enough so that the section of the stream (or vent), measures forty square inches? Perhaps it is over a weir forty inches long and one inch deep, or twenty inches long and two inches deep. Or is it flowing along the bed of a stream? Or, is it a smooth sluiceway? Call it the utmost allowable, there is no wheel venting forty square inches of water, under thirty foot head, that can drive the four foot stones as fast and as strong as they may be driven with safety; although a first class wheel would give out over fifty effective horse power, and grind at least fifty bushels of corn per hour into merchantable meal, or make from nine to ten barrels of family flour in the same time. One hundred horse power could, without doubt, be used on a properly constructed pair of stones in making corn meal. The same amount may be applied to a circular board mill also. However, forty inches of water, under thirty feet head, would do as fast grinding and ginning as W. A. W. would be likely to wish for. If his stream is only forty square inches over a weir, it is an entirely different affair, and would be only equal to one third of one horse power constantly, or equal to eight horse power one hour in the twenty-four. That would do a good business driving the pair of stones, or the sixty saw gin, if no water is allowed to waste during the other twenty-three hours.—A. M. S.

BORING CYLINDER.—What does G. A. Y. mean by "under the leverage of his lathe pulleys?" "The tool backs the metal," does it? "and the cut is more of a break." That's a fact in most shops, both inside and out, too, as well as on plane surfaces. It is scraping and tearing and grinding, instead of peeling the shavings off, and out, in little quirls.—A. M. S.

DRIP PIPE OF STEAM HEATER.—A. S. will see the necessity for introducing the drip pipe into the boiler below the water line, if he reflects that any other arrangement would leave the condensed steam between two equal pressures, and so leave it suspended in the pipe instead of returning it to the boiler. The plan about which he asks ensures the return of the drippings to the boiler, and so keeps the system of pipes free from water.—D. B., of N. Y.

TABLE CUTLERY.—To give R. S. S. H. a plain reply to this query, let me say that boiling water cannot possibly draw the temper of steel. There is something in the knives or the treatment of them that has not yet been stated.—D. B., of N. Y.

WALNUT STAINS.—In answer to W. H. B, in July 18, I would say that the juice of ripe tomatoes will remove the stain of walnuts from the hands, without injury to the skin.—J. S. B., of Ill.

BAND SAWS.—I have had no practical experience with band saws, but we all know that a steel band will not conform to, or be affected, as much by the pulleys, as a leather or other elastic band. I think a band saw would run to the largest part of the pulleys, provided the pulleys were made of some substance that would not let the saw slip and slide about and wriggle itself out of a tight place, particularly at that point where it is entering on the pulley. J. W., you know it is the nature of things when drawn over a slippery bunch to slide off if possible.—S. G. D., of Pa.

A CORRESPONDENT ASKS:—"Can I subscribe for the SCIENTIFIC AMERICAN for a shorter period than one year?" This is a frequent enquiry, and in reply we say: yes, you can subscribe for any period not less than three months, at the yearly rate, which is $3. Send 75 cts. for 3 months, $1.50 for 6 months, $2.25 for 9 months, or $3 for a year.

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.—SONOROUS STONE.—Situated about three miles from Pottstown, Pa., is a spot called Ringing Rocks, being a place about 100 feet square, filled with rocks piled on one another. These, if struck with a hammer or stone, give out distinctly musical sounds, but if removed from the locality lose this property. Two stones, however, that have been taken away still ring. Can any of your readers explain the phenomenon?—W. S. R.

2.—HARDENING GUTTA PERCHA.—Will you please inform me if there is any substance that can be mixed with a solution of chloroform and gutta percha that will render the gutta percha less sensitive to heat, and at the same time not interfere with its adhesive nature?—H. L. B.

3.—BELTS.—I would ask J. W., I. B. L., F. E. H., and particularly M. D. C., of Mass., why it is that when a belt runs on straight faced pulleys, and a straight faced tightener pulley is used on slack side of belt, and close to the receiving pulley on to which the belt is running, the belt will run to the end of the tightener which is applied most forcibly? And, when crowning faced pulleys are used, the opposite results are produced.—S. G. D.

4.—RADIATION OF HEAT.—I have a dry house heated by means of exhaust steam passing through a six inch galvanized iron pipe. Will the pipe radiate or throw out more heat if I paint the outside of the pipe black?—J. R. L.

5.—LIQUEFYING TALLOW.—Can you tell us of any substance that will liquefy tallow and keep it fluid without impairing its good lubricating properties?—T. & M.

6.—FOUNTAIN.—I wish to build a fountain in my door yard, the water to be supplied by a hydraulic ram. I have four foot fall at a distance of four rods, with surplus water. Distance from ram to fountain, 200 feet; elevation from ram to top of fountain, 25 feet. I wish to spurt the water up from fountain through small jets, for ornamental purposes only. Can that be done direct from the ram, supposing I use 1¼ inch pipe for the supply and ¼ or ⅜ inch for the discharge, or must there be an elevated reservoir? Would there be danger of bursting small lead pipe when a jet is put on, as they would be frequently changed? What size and what kind of pipe (lead or iron) is best to use with No. 4 ram?—G. M. G.

7.—WRITING ON CHINA.—Will some of your many readers give me a formula by which I can put names on china or stoneware, so that they will not wash off? Can it be done after the ware has been glazed?—R. S.

8.—ROLLING THIN METAL.—Has any metal ever been rolled thinner than 4,800 sheets to an inch in thickness?—C. H.

9.—FORM OF VEHICLE.—Which will run the easiest, a thimble skein or an iron axle wagon, the wheels being the same size and both wagons capable of carrying the same load?—C. H.

10.—CLEANING MEERSCHAUM.—How can I clean a meerschaum pipe, that is colored very nicely, without spoiling the color?—F. H.

11.—GETTING WOOL OFF DRY SALTED SHEEP SKINS.—Can any of your readers inform me what to do with dry salted sheep skins, so that I can pull the wool off without injuring the skin? I can wet them in water and sweat them, but this rots the skins.—A. R. S.

12.—KILLING TREES.—Is there not something that, by giving a sapling a hack with an axe, and depositing it in the cut, will kill the tree, top and root at the same time? It should be cheap, and not of such a nature as to poison stock that might lick it. There are wood preservers, and I think there ought to be destroyers also. If these saplings are cut down they sprout again, and the roots do not begin to rot for a long time and to girdle them would take too much time.—J. H. L.

13.—SAND BELTS.—How are sand belts for finishing spokes made? What kind of sand is used, and how is it put on? What is the proper length and width for belts? What is the right diameter and speed for the pulleys?—E. T. C.

14.—COAL CUTTING MACHINE.—I am anxious to learn what coal cutting machines are, and what they are used for. Can I see any in this country, whether in use or not? and have there been any articles written describing them?—W. W. W.

[They are used in getting coal in mines, and one was fully described in SCIENTIFIC AMERICAN, Vol. XVII., Nov. 16, 1867, page 312.—EDS.

15.—GRINDING CLAY.—What is the best and cheapest machine for grinding wet clay, so as to crush any gravel contained therein?—D. H. S., Jr.

16.—WATERPROOF CLOTHS FOR BRICK HACKS.—Are cloth covers ever used to protect hacks of bricks from storms? And if so, what is the best and cheapest cloth to use for that purpose? Is there any composition or paint with which I can render common cotton sheeting waterproof, and still have it pliable and not liable to stick when rolled?—D. H. S., Jr.

17.—BURNING BRICK.—In burning brick with wood, which will produce the most even burn with the smallest consumption of fuel, two or three brick benches? What are the usual quantities of oak cord wood or pine slabs used, per thousand in burning? And can brick be well burned with the soft and sulphurous bituminous coal of Iowa and Illinois? And if so, what is the proper method of setting, and amount of coal to use per thousand?—D. H. S., Jr.

18.—PRINTER'S INK.—Will you give me a recipe for making black printer's ink?—O. S. C.

19.—MOUNTING CHROMOS.—Can you tell me how to mount chromos?—L.

20.—STAINING BUTTERNUT.—What is the best method of staining butternut and other woods so as to imitate black walnut? Can the grain of the walnut be successfully imitated?—E. S. H.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

Is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller, if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

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Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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OFFICE IN WASHINGTON—**Corner F and 7th streets,** opposite Patent Office.

Recent American and Foreign Patents.

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

STEAM GENERATOR.—George A. Barnard, New York city.—This invention is claimed, by its construction, to obtain a thorough and rapid circulation, so that the generator may contain a liberal supply of water, while only a part of the said water is exposed to the heating surface. An easy transmission of steam from all parts of the generator, and a collection of all the sediment, are claimed as additional advantages. The thinness of the stratum of water over the heating surface will, it is alleged, insure a rapid vaporization. The invention appears to be one of practical merit and value.

ELASTIC DOOR GUARDS.—William N. Clark, Chester, Conn., has petitioned for an extension of the above patent. Day of hearing, November 1, 1871.

SEWING MACHINES.—Earle Harry Smith, Bergen Heights, New Jersey, has petitioned for an extension of the above patent. Day of hearing, October 25, 1871.

JOIST HOOK.—James S. Miller, of Terre Haute, Ind.—This is a combination of a standard, lever, hook,and arm, whereby a simple, effective, and convenient device for raising joists, to level them after being placed in a wall, is ecured.

HORSE SHOE NAIL CLINCHER.—Daniel Mater, Jr., assignor to himself and Ira Mater, Bellmore, Ind. The object of this invention is to provide a convenient tool for clinching horse shoe nails after they have been driven into the hoof; and it consists in the construction and arrangement of two jaws pivoted together, and operated by means of a curved lever.

DITCHING MACHINE.—Stephen S. Wood, of Brooklyn, N. Y.—This invention relates to improvements in ditching machines; and it consists in a construction, combination, and arrangement of the several operative parts, whereby the earth scooped up by an oblique scraper or plow is discharged on to an inclined elevating apparatus, from the top of which, after being elevated, it is transferred to a lateral conductor to be discharged upon the bank at one side of the ditch.

DITCHING PLOW.—Robert M. Primmer, Vinton, Iowa.—This invention consists in a new way of constructing a mold board for ditching plows, by shaping the working face so as to carry the sod up against a vertical plate,which turns it over on the said mold board, and from which it is again partially turned to one side, but with the grass side toward the ditch.

HOLLOW AUGER.—Silas Katz, of Bossardsville, Pa.—This auger may be used for cutting tenon on spokes and for other purposes. Its advantages are: It may be readily adjusted to cut tenons of different diameters and different lengths. It may be operated in a lathe or in a hand brace, as may be most convenient. The cutters are slotted and placed obliquely to the center on the sliding jaws, so that they are readily adjusted to cut as required.

WHEEL PLOW.—Andrew J. Borland, of Charlestown, Iowa.—The object of this invention is to construct a cultivator that can be completely controlled by the driver, so that the plow will run at a suitable depth and desired angle. The invention consists in a new arrangement of levers and connecting rods, whereby the position of the plow can be fully regulated in accordance with the nature of the soil to be worked and with the objects for which it is to be prepared. The near horse walks in the furrow, the other one or two on the land side of the plowing. The driver can with his feet control the depth of the plow, and with his hand, by means of a lever, the inclination of the same. The working depth of the plow can also be regulated by lengthening or shortening a strap. The driver is thus given complete control over the plow. His weight, by being near the wheel, tends rather to ease the plow than to add to the weight of the same.

RAILWAY JOURNAL BOX.—Isaac Dripps, of Altoona, Pa.—This invention has for its object to improve the construction of journal boxes for railroad cars, so as to prevent heating and irregular wear, while allowing the journal to have the play necessary for running around curves or upon uneven tracks; and it consists in the construction and combination of various parts, whereby the desired result is secured.

DRAFT DEVICE FOR VEHICLE.—Jonathan S. Tibbets, of Brazil, Ind.—This invention relates to improvements in road carriages; and it consists in a novel safety detaching apparatus for disengaging the team if it becomes ungovernable. It also consists in an adjustable arrangement of the tongue, whereby it is adapted for attaching to carriages in which the clips are more or less distant from each other; and in improvements in the clips and connecting pins for preventing the latter from falling out.

COMBINED CHECK AND GLOBE VALVE.—G. W. Shields, Louisville, Ky.—This invention consists of a common globe valve provided with a vertical stern having a horizontal disk on its top in combination with a vertical frame inclosing said disk, the valve stem passing through the lower end of the frame, which latter has a threaded stem projecting from its upper end, said stem passing through a stuffing box in the upper side of the valve chamber, by turning which threaded stem the frame may be lowered so as to ouch the valve and confine it to its seat, or elevated away from the valve, to as to leave the latter free to rise under the action of steam, gas, or water.

COMBINED CORN HARVESTER AND HUSKER.—Leonard Devore, Victor, Iowa.—This invention relates to a machine that, when drawn through a field of standing corn, gathers the ears, drops them into an elevator, cuts off the knobs, slits the shucks while on the ears into transverse ribbons, doing such cutting and slitting at the same time that the ears are being elevated, drops the ears from the elevator into the shucker,strips off the husks, throwing them out of the machine, and finally conveys the ears off to one side of the apparatus, where it lets them fall into any receptacle that may be provided.

GAGING AND PLAITING ATTACHMENT FOR SEWING MACHINES.—This is an improvement upon a gaging and plaiting attachment patented by the same inventor, Jacob S. Atler, of Leavenworth, Kansas, May 3, 1870. As now arranged, the work can, it is claimed, be done in the most satisfactory manner, requiring but very little attention of the operator in adjusting the binding on the edge of the cloth in advance of the instrument, which insures the exact adjustment of the binding, by reason of the natural tendency of the feed to cause the lower part to work under the cloth and draw off from the upper side being counteracted by the bottom of the hook acting on the edge of the binding, keeping it in the position required. This mode of attaching the binder is also applicable for attaching ruffling or other instruments.

SCHOOL DESK AND SEAT.—J. Peard, of New York city.—This invention provides an useful and very convenient school desk and seat,the most prominent feature of which is that both the desk and seat can be folded into a vertical position during the exit and entrance of pupils in the performance of exercises, and in the sweeping and cleansing of the building. This great convenience is coupled with a tasteful design.

DENTAL DRILL.—This is an arrangement of foot treadle with a pulley affixed to an upright standard by which a horizontal shaft, extending from a revolving cap at the top of the standard, is driven. From this shaft a system of universal friction gearing (this gearing being made of india rubber) together with suitable shafts enables the power of the prime mover to be transmitted in any direction and position for drilling or dressing teeth as required by dentists. Mr. Greene V. Black, of Jacksonville, Ill., is the inventor.

STEM WINDING WATCH.—Samuel Jaccard and Justin Jaccard Jaques, of St. Croix, Switzerland, assignors to D. Constant Jaccard, of St. Louis, Mo.—This invention relates to a new stem winding and setting watch of that kind in which, by pressure against the stem, the setting, and by the closing of the case, the winding attachment is thrown into gear. The apparatus operates to a great extent automatically—that is, with the opening or closing of the lid, but the claim rests upon a combination of a lever with the catch and a spring lever to operate by the action of the sliding stem as specified.

GANG PLOW AND CULTIVATOR.—W. J. Arrington, Louisville, Ga.—This invention relates to that class of cultivators which are composed of a fixed and two adjustable side beams, and consists in an improved construction and arrangement of parts, whereby the parallelism of the side beams is preserved under all adjustments to or from the central beam.

MILLSTONE BALANCE.—Zedekiah Dawson, Cole Creek, Ind.—This invention relates to balancing a millstone by a system of weights secured to the rim thereof by means of bands encircling the stone. The invention consists in a peculiar arrangement of bands and weights calculated to attain the desired result with the least possible weight of metal and time required for shifting the weights.

STEAM PLOW.—Herman Miller, Bellville, Texas.—This invention relates to an apparatus for turning up soil in which the resistance of the plows is overcome by means of a chain fastened at one end to one side of the field, and passing over a toothed wheel which is rotated by a steam engine supported on the same truck as the shaft of said toothed wheel, which latter hauls in the chain and thus causes the machine and plows to advance, an apparatus being also provided for paying out the chain at one side of the machine as fast as it is hauled in, said paying out apparatus leaving the chain stretched on the ground behind the machine in the line in which it must lie in order to be hauled in on its return.

WATER GATE.—William Penn Hubbard, of Farmland, Ind., assignor to himself and James H. Fegans, of same place.—The object of this invention is to produce a durable and reliable fence or gate, to be put up across streams, rivers, creeks, and low grounds which are subject to overflow. The invention consists in constructing the fence or gate of sections, which are hinged to a stationary sill, and in providing the same with pivoted arms which sustain them in the erect position, and, in case of a flood, serve to hold them down upon the bottom.

RAFTER HOOK.—John Newton Bebout, of Oberlin, Ohio.—This invention relates to a new rafter hook, which remains under complete control while being applied, one part being connected with a supporting stem or pole, while the other has a pivoted hook that carries the pulley and rope. The invention consists in the general arrangement of parts, whereby the desired result is obtained.

CULTIVATOR.—Edwin Reese, Eutaw, Ala.—This invention relates to a wheel cultivator, in which the shovels are attached to a frame placed beneath the main frame, and connected,by means of chains fastened to its front end, with the extremities of a whiffletree that is pivoted beneath the tongue said whiffletree being the instrument, and serving to prevent one chain from slackening while the other is kept bent in turning the machine to either side.

WINDOW FASTENING.—Thomas J. McCarver, Oregon City, Oregon.—In this invention a pawl or catch is pivoted to a plate attached to the window sash, and provided with a rigid bar or extension which passes through a slot formed in a flange of said plate. A spiral spring encircles the bar, and rests against the flange, so that the pawl is kept in contact with a notched bar or edge of the casing, and thus holds the sash at any desired elevation, or locks it when closed.

SCREW PRESS.—W. J. Arrington, Louisville, Ga.—This invention relates to that class of presses in which the box rotates on a vertical axis, and in which there are two followers attached to the ends of screws, one right and the other left, which screws pass through fixed nuts, one at the top and the other at the bottom of the frame, so that, as the box is rotated, the followers turn the screws, and are thereby made to advance toward or recede from each other.

GARDEN IMPLEMENT.—D. S. Wilholt, Madison Court House, Va.—This invention consists in the construction of the stock of a garden implement to qualify it for attaching and detaching of various blades, instruments, or devices requisite in garden culture.

MILLSTONE BUSH.—James Brown, Fonda, N. Y.—This invention consists in a peculiar relative construction of the bearing blocks or followers and the casing, whereby all wear is automatically taken up as fast as it occurs.

COMBINED CHAIR AND CANE.—David Otho Parker, of Liverpool, Nova Scotia.—This invention has for its object to furnish an improved combined chair and cane, which shall be so constructed that it may be readily adjusted for use as a chair or stool and as a cane, and which shall, at the same time, be simple in construction, neat in appearance, and serviceable in either capacity.

IMPROVEMENT IN MANUFACTURE OF RUBBER CUSHION FOR BILLIARD TABLES.—Mathew Delaney, of New York city.—This invention has for its object so to construct a flask or mold for vulcanizing long billiard cushions that the apertures through the latter for the reception of the bracing and strengthening wires will be straight and smooth. The invention consists in combining, with the said flask or mold, a wire, which is drawn through the non-vulcanized rubber, and then stretched and straightened to properly form the desired aperture. Heretofore it has been found quite difficult to provide long cushions for billiards with straight small holes, and only by the application of the stretched wire has the difficulty been overcome.

OILING JOURNALS.—W. G. Winne, of Albany, N. Y.—This is intended more especially for journals of vertical shafts, but it can be applied to horizontal shafts with advantage. A spiral groove terminating in a ring groove at the upper end is turned upon the journal. The oil flows from a reservoir through a channel to the lower end of the bearing, and is then carried upward by the groove, whence it flows back through another channel to the reservoir, and so on, a constant circulation over the bearing surface being thus maintained.

COOKING STOVE.—Seth Gregory, South Norwalk, Conn.—This invention has for its object to improve the construction of cooking stoves so as to more thoroughly utilize the heat developed by the combustion of the fuel. The invention consists in the construction and combination of certain parts of the stove for effecting the desired result.

UTERINE SUPPORTER.—Dr. Lyman D. McIntosh, Waseca, Minn.—This invention relates to a uterine supporter having a soft rubber stem, within which is placed a nut and also a screw bolt passing through the nut, said bolt terminating at both ends in hard rubber parts of the instrument, and being provided with a knob at one extremity, by turning which the screw is rotated, and the soft rubber stem lengthened or shortened accordingly.

NEW BOOKS AND PUBLICATIONS.

THE ACTION OF NATURAL SELECTION ON MAN. The Development of Human Races under the Law of Selection: the Limits of Natural Selection as Applied to Man. By Alfred Russel Wallace. New Haven, Conn.: Charles C. Chatfield & Co.

This is another addition to the already profuse literature on the subject of Natural Selection. Mr. Wallace agrees with Mr. Darwin, that Natural Selection has played an important part in the development of the various races of men, but denies that it alone accounts for the facts of man's present existence, his moral nature, etc. As a writer, Mr. Wallace is not inferior to Darwin; as a thinker, he ranks high, and his arguments are of a kind not easily refuted.

THE FEDERAL GOVERNMENT: ITS OFFICERS AND THEIR DUTIES. By Ransom H. Gillet, formerly M. C. from St. Lawrence Co., N. Y.; more recently, Register and Solicitor of the U. S. Treasury Department, Solicitor for the U. S. in the Court of Claims, Counselor at Law, etc. Woodworth, Ainsworth & Co., 51, 53, and 55 John Street, New York; 111 State Street, Chicago, Ill.

There is a general lack of the information supplied by this work. It is astonishing how few know anything of the functions of the various offices and officers who transact public business, and the routine of the General Government. To those who wish a book of convenient reference on the subject named, Mr. Gillet's book will be welcome. It is a handsomely bound and printed octavo.

THE DURATION OF FUTURE PUNISHMENT. By Henry Constable, A.M., Prebendary of Cork. Reprinted from the Second London Edition. New Haven, Conn.: Charles C. Chatfield & Co.

This is one of those works, of a speculative theological kind, which we regard as not the most profitable reading. The author maintains the total annihilation of the wicked after death, and the eternal life of the good.

A PRACTICAL TREATISE ON THE MANUFACTURE OF SOAPS. With numerous Wood-cuts and Elaborate Working Drawings. By Campbell Morfit, M.D., F.C.S. Formerly Professor of Applied Chemistry in the University of Maryland. New York: John Wiley & Son, 15 Astor Place. London: Trubner & Co., Paternoster Row.

The wide reputation of Professor Morfit, as writer upon and teacher of applied Chemistry, is a recommendation of the present work which alone would secure it a remunerative sale; but we can assure our readers that this is its least recommendation. The subject is treated systematically, perspicuously, and practically, while the theoretical principles involved are not neglected. The work is valuable for any technical library; but to the soap manufacturer, we scarcely need say that it will prove a reliable guide in the by no means simple art of soap making. The list of working drawings numbers sixteen, including all the apparatus essential to the successful prosecution of the business; and the parts of the work devoted to the various materials used are full and complete. The work is a large octavo, printed in beautiful style, and handsomely bound.

A BOOK OF DESIGNS FOR MURAL AND OTHER MONUMENTS. By James Forsyth, Sculptor. With an Introduction by Charles Boutwell, M.A. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street.

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118,175.—STALK CUTTER.—E. A. Wright, Fort Madison, Iowa.
118,176.—STEERING APPARATUS.—E. S. Drew, New Orleans, La.

REISSUES.

4,512.—STEAM GENERATOR.—G. H. Babcock, S. Wilcox, New York city.—Patent No 65,042, dated May 28, 1867.
4,513.—SIGNAL BOX.—M. G. Crane, Newton, and E. Rogers, Boston, Mass.—Patent No. 92,275, dated July 6, 1869.
4,514.—STOCK CAR.—J. S. Kendall, St. Louis, Mo.—Patent No. 90,851, dated June 1, 1869.
4,515.—STILL.—C. Lockhart and J. Gracie, Pittsburgh, Pa.—Patent No. 80,294, dated July 28, 1868.
4,516.—AUGER BIT.—J. Swan, Seymour, Conn.—Patent No. 78,709, dated June 9, 1868.
4,517.—AUGER BIT.—J. Swan, Seymour, Conn.—Patent No. 100,816, dated March 15, 1870.

DESIGNS.

5,197.—BARN DOOR HANGER.—P. P. Child, St. Louis, Mo.
5,198 and 5,199.—CARPET.—G. Crompton, Worcester, Mass.
5,200.—CORNER PIECE.—C. A. Durgin, East Andover, N. H.
5,201.—HOE.—C. Fisher, Canton, Mass.
5,202.—PAPER WEIGHT.—G. B. Garrett, Philadelphia, Pa.
5,203.—STAIR ROD.—W. B. Gould, New York city.
5,204.—TONGUE SUPPORT.—J. Keller, Laury's Station, Pa
5,205.—CARPET PATTERN.—H. S. Kerr, Philadelphia, Pa.
5,206.—JELLY GLASS.—W. M. Kirchner, Pittsburgh, Pa
5,207.—ORGAN PIPE.—C. E. Snell, Chatham, Canada.
5,208.—HARNESS.—O. Wiener, Newark, N. J.

TRADE-MARKS.

422.—CURTAIN FIXTURE.—S. S. Putnam, Boston, Mass.
423.—MEDICINE.—E. S. Sharp, Salem, N. J.

APPLICATIONS FOR EXTENSION OF PATENTS.

SEEDING MACHINES.—Albert Franklin, Genoa Cross Roads, Ohio, has petitioned for an extension of the above patent. Day of hearing, October 25, 1871.

MACHINES FOR TURNING PILLARS FOR CLOCK MOVEMENTS.—Wilford H. Nettleton, Bristol, Conn., Charles Raymond, Guelph, Canada, and Anson Hatch, New Haven, Conn., have petitioned for an extension of the above patent. Day of hearing, November 1, 1871.

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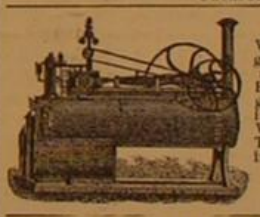

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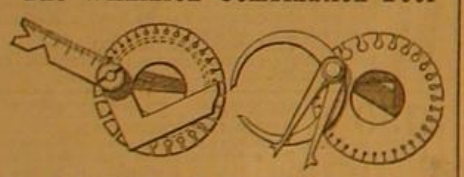

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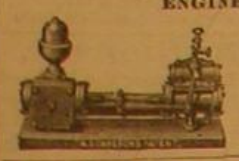

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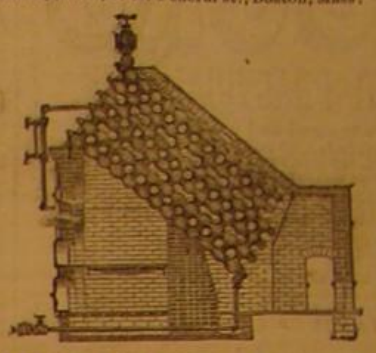

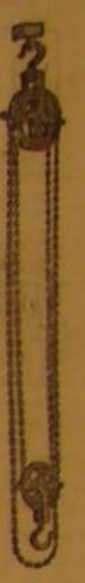

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

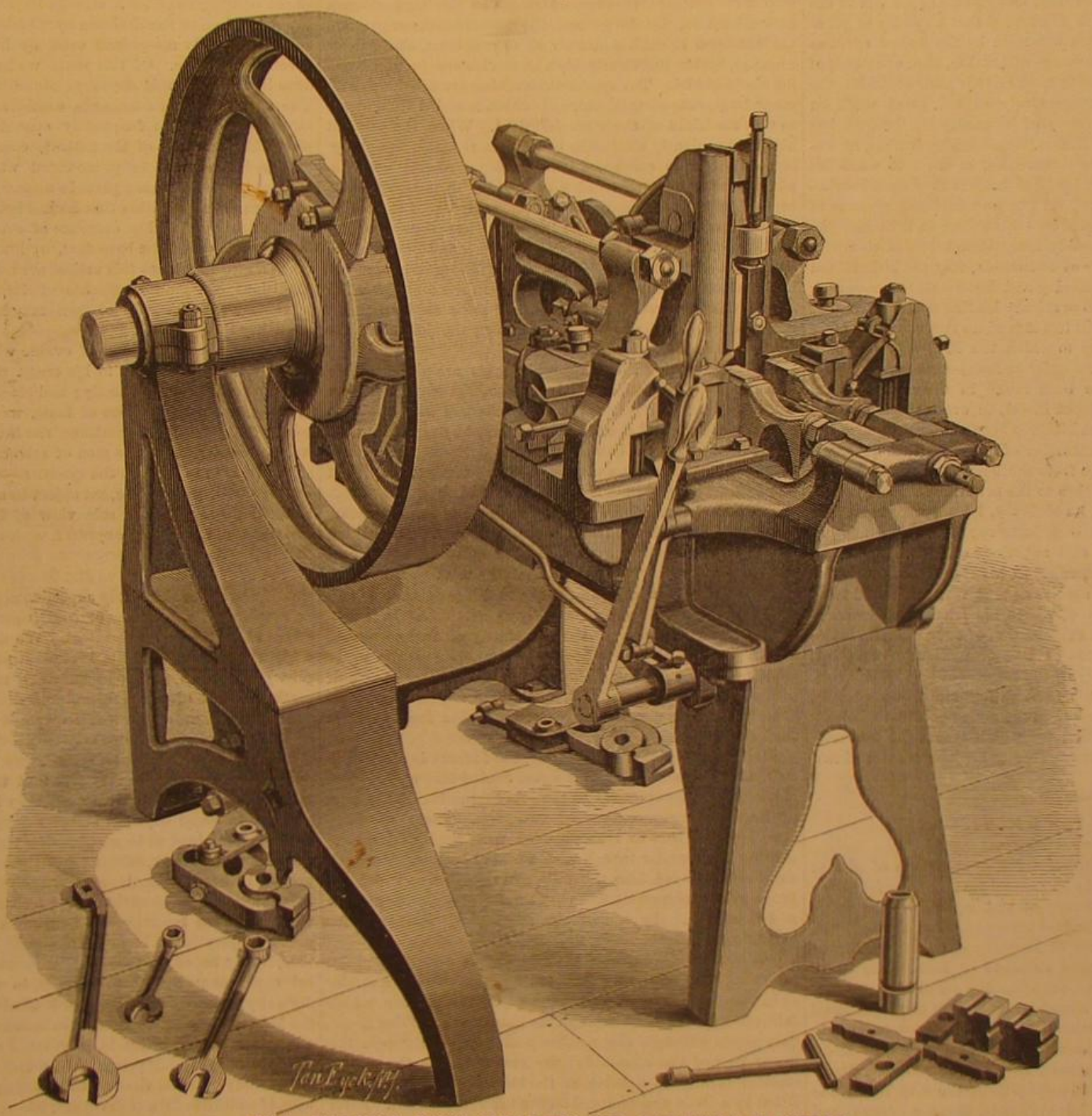
Vol. XXV.—No. 10. [NEW SERIES.] NEW YORK, SEPTEMBER 2, 1871. $3 per Annum. [IN ADVANCE.]

The Burdict Bolt Heading Machine.

Our engraving represents a view of the Burdict bolt forging or heading machine, of which Messrs. Plumb & Burdict, of Buffalo, N. Y., are proprietors. Thirty of these machines have been put in operation during the past fifteen months, and used by bolt makers, car and locomotive builders, railroad companies, etc. They are particularly adapted to the manufacture of square heads, but capable of making any desired style of head. One has lately been put up with twenty-four and one with thirty-six changes of dies. It is claimed by the manufacturers of these machines that they will do more and better work than any other.

We shall not enter into a description of its details of construction, as this would entail the use of auxiliary engravings, and require far too much space. We will content ourselves with a brief summary of the well demonstrated capabilities of the machine, which is put up in the best manner, and requires but little power. It is quickly adjusted from one size or length of iron to another, and can head bolts of any length. Unlike others, where the blanks are held horizontal, the blank in this machine remains stationary until the head is completed.

Other machines clamp the blanks tightly with the holding dies, and at the same time turn one quarter or one half around, thereby reducing the size of the rod directly under the head where the dies strike it. In this machine the end of the blank rests against a stop, and the holding dies simply close on the iron, and remain so until the head is completed. The stock for the head is upset by a plunger, which recedes, and the forging dies acting simultaneously on the four sides form the head to the required size and shape, thus producing heads uniform in size and retaining the full strength of the rod. It is so arranged that it makes four, six, or eight revolutions—each head receiving twenty, thirty, or forty blows, according to the finish desired—and stops to discharge the bolt and receive another blank. The working parts of the machine are in operation only while the bolt is being headed, thus reducing the wear in proportion to the work done.



THE BURDICT BOLT HEADING OR FORGING MACHINE.

The capacity of this machine is such, that in a contract with Messrs. James Wood & Co. Pittsburgh, it was required that 4,000 one half inch bolts should be headed in ten hours, and 3,500 five eighths inch bolts in the same time. The first number was finished in eight hours, and the second in less than nine hours. In their own works, the manufacturers state, that 4,500 three fourths inch T-headed bolts have been made in ten hours.

The dies can be reversed, which greatly prolongs their usefulness, and when worn are readily sharpened by grinding. Four sizes of the machine are furnished, adapted to head from one fourth inch to two and one half inch iron.

The machine is covered by two patents, dated respectively Sept. 3, 1867, and Nov. 30, 1869. For further information address Plumb & Burdict, corner Clinton and Adams streets, Buffalo, N. Y.

THE DANGERS OF SEWAGE IRRIGATION.

From a pamphlet by James Alexander Manning, referred to in a recent editorial on the "Sewage Question," we extract further particulars, showing the dangers arising from sewage irrigation. He says:

"The late Marquis of Salisbury, only three or four years ago, joined his neighbors, near Tottenham, in a petition to the Privy Council, against the practice of sewage irrigation, which had proved not only fatal to many, but universally disgusting to all the inhabitants of the vicinity, and must ever be so on stiff clay land, where, as soon as the surface is covered, the sewage must run off into the ditches, and, while creating the most offensive odors, rendering life insupportable, must contaminate the land springs, and render the water totally unfit for culinary or ordinary domestic purposes. The whole system of sewerage is vicious, as proved by the high death rate in all our large manufacturing towns, and the frightfully increased poor rates; and it is now admitted by the scientific world that upwards of 100,000 lives are annually lost in this country, which might be saved by attention to sanitary requirements. As far as the sewers of towns are concerned, I am satisfied that the purposes to which they are now devoted will ere long undergo a very important modification, and as science advances it will be found indispensable to the health of the inhabitants that they shall be maintained only for surface drainage—that is, rainfalls and household slops, leaving the solid and fluid human excreta to pass into proper receptacles, where, by chemical treatment, they will be rendered innocuous to man and invaluable to agriculture. At the present moment, all I can suggest as a substatnial benefit to the inhabitants of this great metropolis, though I am fully aware that it will meet with powerful opposition, is the effectual trapping of the gully holes and the street gratings, as well as the water closets and sinks in every house, and their being liable to periodical police supervision to keep them in good order. Ask the medical faculty the cause of the disease, squalid misery, and deaths of thousands of the poorer, and hundreds of the wealthier classes of London in every year. They must reply that the contamination of the air in the confined spaces they occupy, and the mephitic emanations from the sewers and water closets, the pipes of which, owing to an imperfect system of regulation, are ever charged to the utmost with the foulest gases, which rush into the closet the moment the plug is raised, and continue filling the chamber with poison until the valve is again closed and jointed, as it is called, with water, as well as from the kitchen or scullery sinks, where, in ten cases out of twenty, in the dwellings of the poorer classes, the traps are either defective or deficient. Many folio volumes might be written on this subject in proof of all I have advanced without once repeating either my argument or the few facts I have adduced, but I cannot close this part of my subject without referring to the dreadful mortality in Brussels during the cholera outbreak of 1866, which, it is now universally admitted, was, if not positively produced, greatly aggravated by the contamination of the atmosphere, both externally and internally, by reason of sewage miasmas, caused by the condition of the river Senne, which intersects the town, a considerable portion of which was open, having been used as a common sewer to receive all the house, hold drainage of every description.

Statistics speak for themselves; thus, by the report of the Registrar-General, it appears that the deaths from cholera in Great Britain and Ireland in that year, out of a population of twenty-eight millions, amounted only to little over 6,000, while upwards of 6,300 were carried off by that frightful scourge in the small city of Brussels alone, containing at that period a population only of 250,000; and that out of a population of between four and five millions, of which the whole kingdom of Belgium is composed, upwards of 30,000 victims succumbed to the malady in that year. I have frequently discussed the subject with eminent Belgian physicians, and not one has ever disputed the theory I laid down, as to the cause of such frightful ravages. I have also called their attention specially to the great annual mortality prevailing in almost all the agricultural districts of that kingdom, arising from the use of liquid sewage supplied to their fields by means of the barrel cart and scoop.

"During the manuring season of each year, as soon as this practice commences, the rural population, and particularly children, are afflicted with swollen glands, and a fever called by the faculty 'la fièvre milliare,' which soon places a whole village in mourning, and no stronger proof as to the cause can possibly be adduced than is to be gathered from the fact that in the Walloon districts of Belgium, Mons, Charleroi, Jemappes, Ath, etc., etc., where no such practice prevails, the inhabitants are entirely free from these fatal attacks. I recommended to the Burgomaster of Brussels the trapping of all the gully holes of that city, as well as the passing of a

law, or some police ordinance, rendering it obligatory on the inhabitants to trap their sinks and water closets. I thought the opportunity for effecting this object had then arrived, as Mr. Doulton, the drain pipe manufacturer, was then in high favor with the municipal authorities of Brussels, and I further advised the town council that the contemplated improvements by the covering in of the river Senne, of which speculation Mr. Doulton was one of the chief promoters, would effect no real sanitary improvement unless the gully holes of the city were trapped, and that I was quite satisfied that Doulton's earthenware traps would, while being the cheapest that could be employed, answer all the desired objects. I had some years previously made a similar suggestion to Dr. Letheby, the medical officer of London; but though he fully approved of such a step in the right course, he felt that, on the ground of cost, it would meet with substantial opposition, and this was probably the view taken by the Burgomaster of Brussels. I will now refer to more recent discoveries which have created a serious feeling of alarm and apprehension in the minds of many of the learned and eminently scientific members of the faculty, in the event of the adoption in this country of any general system of sewage irrigation, or even its application on a large scale. One of the most eminent members of the faculty of medicine, Dr. Spencer Cobbold, after devoting many years of his life to the study of Entozoology, has discovered that a species of parasite, so small as to escape detection by the naked eye, has been introduced into the sewage of London, and, of course, of other towns, by our colonists from certain parts of Africa, the Mauritius, etc., etc. Irrespectively of his great work on 'Entozoa,' in the pure cause of humanity Dr. Cobbold has also published, through Messrs. Groombridge & Sons, of Paternoster Row, a sixpenny pamphlet, in order to warn the British public against the horrible dangers they must inevitably encounter should any of the contemplated systems of sewage irrigation be carried into operation; in it he graphically describes the miserably insignificant insect to whom thousands, and hundreds of thousands, may yet be indebted for long years of acute suffering and death—all the reasoning and conclusions of inductive science leading to the conviction that sewage irrigation will introduce into this country a more horrible disease than any to which the British flesh is heir. These—apart from their enmity to man—most contemptible insects in creation, have been found in the states of ova, larvæ, or the fully developed insect, in every portion of the London sewage which has hitherto been analyzed by him and his colleagues in the examination of this important question; he describes their passage from the body of the patient into the water closet, from thence to the sewers, and finally to the river and the sea; there, he observes, let them remain, they can do no harm to any one; but once let them reach our fields, then the misery and sufferings of humanity will be terribly augmented. According to his statement, this insect is of precisely the same species as that which is found from the overflowing of the Nile, where his friend, Dr. Grunnenstein, in the post-mortem examination of 300 peasants, found that the deaths of upwards of 100, or more than one third, had been occasioned solely by the ravages of this little insect. They are swallowed in the food, either animal or vegetable, when not sufficiently exposed to the action of fire to destroy them in their several states, for which reason he earnestly recommends our abstinence from underdone meat and raw vegetables.

PLASTER OF PARIS MANUFACTURE.

The quarrying of gypsum and the manufacture of plaster are important industries in Paris, and we (*Engineering*) have recently taken the opportunity of visiting one of the establishments of this kind, the best arranged—that of M. Morel, at Montreuil. The plaster of Paris, or gypsum, consists, as is well known, of hydrated sulphate of lime. The water being removed by roasting, the stone is ground into powder. When this is afterwards mixed with water it combines itself again, and forms a solid mass, which is employed in an infinite variety of ways. The abundance of gypsum at Montmartre, Pantin, Menilmontant, Belleville, Charonne, Montreuil, &c., all close to Paris, even within the city limits, the good quality of, and the large demand for, the plaster, and the ease with which it is employed, have caused the development of this great industry in the capital. The plaster of Paris has a European, and even a still more extended reputation. It is employed everywhere, and is put to the most varied uses. It is molded into hollow bricks, and tubular blocks, in building up partitions and walls, for paving slabs, and for smoke conduits to chimneys. One sees, even in the neighborhood of the quarries, houses of three and four stories, which are built in molded stones of plaster, or made in plaster in such a manner that they form a monolith.

The bed of gypsum worked at Pantin is horizontal: it has a thickness of 37 feet 2 inches. There is also a small bed adjacent, and of little thickness, but this is not quarried as a rule. The gypsum of this bed is almost entirely crystalized, and there are found there, in abundance, those beautiful specimens called *fers de lance*, on account of their form. These fragments split with ease into thin transparent leaves, and when the apparent limit of diversibility has been found with the blade of a knife, if one takes one of the leaves, which has less than 1-80th inch of thickness, and heats it, it exfoliates into more than twenty films as the water it contains is heated and disengages itself in steam.

The bed of gypsum that is excavated is covered by some 40 feet of earth, consisting of calcareous deposits, and marl and clay. It is excavated, for the most part, by subterranean galleries, but it is sometimes found more economical to work from the surface, in spite of the great thickness of superincumbent earth, because there are numerous situations where the excavated material employed to fill elsewhere can be made a source of revenue, while the limestone can be sold to make lime, and the clay to make earthenware, or bricks.

It is thus that the quarry of Eprisette, worked at first in galleries by M. Morel, is changed at the present time into open excavation.

The gypsum is extracted by blasting. Holes are pierced in the rock, which, for the most part, is sufficiently soft for a workman to drive in less than an hour a hole from 4ft. 6in. to 6ft. deep and 2ft. in diameter. After a blast, the rock is struck with crowbars, which divides it into blocks from 30 to 40 meters cube, advantage being taken of the numerous faults in the material, which the workmen learn to recognize at a glance, and which they call "*maillances*." A heavy blow, or the introduction of a pick, at the right spot, divides easily the largest blocks into convenient fragments.

These fragments are loaded upon trolleys, which follow the face of the gallery or cutting or tramways, and which lead up to the eight furnaces composing the factory. These kilns, or furnaces, are of the simplest form. They consist of an end wall 15 ft. long, and of two side walls of the same length. The three walls are also 15ft. high, and the square hearth that they surround, carries perpendicularly to the end wall, five gratings, through which passes the air necessary for combustion. On the ground, the largest blocks of gypsum are arranged in such a manner as to construct, above these gratings, arches sufficiently high to receive the fuel for burning the material. The spaces intervening are filled up with other fragments of rock, more of which is added from above so that the hight of the mass is raised. When the greatest hight conveniently attainable by hand is reached, the charging of the kiln is continued from trolleys brought upon inclined planes which are also supplied with rails. This is carried on until the hight of the charge is equal to that of the walls of the kiln. All the interstices are then carefully packed with small fragments of the stone, and the front of the furnace, which is raised by a low wall, receives a movable cover of plate iron intended to prevent the loss of heat by radiation; and to retain such morsels of stone as become detached during the operation of baking; the joints in the front of the kiln are luted.

Everything being then prepared, fagots are placed within the arches and lighted, and when the embers are in full glow and the arches half empty, they are charged with *briquettes* of artificial fuel, and the fire is so managed by regulating the access of air, that the baking of the mass is effected equally throughout without any extremes of excessive or imperfect burning. The operation is complete in 24 hours.

The employment of *briquettes* is one of the improvements introduced by M. Morel into his establishment. The baking was generally done with wood, and the substitution of coal has effected a saving of two thirds of the total quantity produced. There is a comparatively small loss of heat in this apparatus, so simple and apparently so primitive. In calculating the calorific power of the quantity of fuel consumed and the amount of heat necessary to evaporate all the water contained in the gypsum, it is found that he utilizes one half of the available heat, which is certainly a satisfactory result considering all the various losses inseparable from an identical enterprise.

After the calculation is complete, the furnace is allowed to cool, and the burnt gypsum is again loaded into wagons and carried off on the tramway to the grinding mills. This part of the manufacture consists of two parts. There are millstones in cast iron or stone, banded with rings of iron and turning in a circular trough with a grated bottom. The calcined stone is fed into the mill, and those parts which are ground down extremely fine pass through its gratings. The rest is removed by a suitable mechanical appliance for grinding.

One of the mills carries a most ingenious arrangement for screening the fine powder. Below the grate there is a strainer in the form of a truncated cone. Of the powder which falls upon this strainer through the base of the annular grate, part passes through the meshes and escapes through the lower part of the apparatus; the rest slides on the conical strainer falling on a table at the bottom, and is constantly lifted by a chain and replaced on the table of the mill. After the powder is sufficiently ground, it is conveyed below into a storehouse where it is placed in bags. The machines are driven by a 12 horse steam engine.

The whole of this establishment is ably arranged and managed, from the quarries to the plaster depôt; and the working out of all the practical details does honor to the able proprietor who created them, and who still works daily to improve them.

Mr. Crookes on the "Psychic" Force.

With a boldness and honesty which deserve the greatest respect, Mr. Crookes has come forward as an investigator of those mysterious phenomena which have now been so long before the public that it is unnecessary to name them, more especially as their generally received name is very objectionable. Two things have contributed to retard our knowledge of these strange events. In the first place, until lately, few men of name have been associated with their occurrence, so that outsiders have not had the facts put before them in a proper manner. In the next place we are inclined to indorse the remark of Mr. Crookes, that men of science have shown too great a disinclination to investigate the existence and nature of these alleged facts, even when their occurrence had been asserted by competent and credible witnesses.

Before adverting to the results obtained by Mr. Crookes, a few words may be said about our mode of procedure in accepting testimony.

Let us suppose that a man comes before us as a witness of some strange and unprecedented occurrence. Here it is evident that we are not entitled to reject his testimony on the ground that we cannot explain what he has seen in accordance with our preconceived views of the universe, even although these views are the result of a long experience; for by this means we should never arrive at anything new. Our first question is manifestly one regarding the man's moral character. Is he an honest and trustworthy man, or is he trying to deceive us?

Let us assume that we have convinced ourselves of his honesty; we are then bound to believe that *he thought he saw* what he described to us; not necessarily, however, that the occurrence which he described actually took place. Convinced, already, that he is not deceiving us, the next question is whether he may not be deceived himself. Let us, however, assume that, upon investigation, the circumstances are such that collusion of any kind is out of the question, and that the man is neither trying to deceive us, nor that it is possible that he himself can have been deceived by others. Even yet we have an alternative in our judgment of the event. The phenomenon may be *subjective* rather than *objective*, the result of an action upon the man's brain rather than an outstanding reality. For nothing is more certain than the occasional occurrence of such strange impressions; and that the cat or the dog, or the skeleton by which the patient is haunted, is frequently recognized even by himself as having no external existence. Of late years we have been able to produce instances of this depraved consciousness almost at will. The author of these remarks considers it certain that the electro-biologist has frequently caused them. The unimpeachable character of the patient, combined with the fact that he has sometimes pronounced water to be wine, or a snow storm to be taking place in a room, can only be accounted for on the supposition that he has been put into a peculiar state, during which his evidence of events is utterly worthless. But beyond the bare fact, we know next to nothing of the laws that regulate this action, nor can we tell under what conditions one man is capable of influencing another, or whether a man or body of men may not be capable of influencing themselves.

To come now to the class of events which Mr. Crookes has witnessed. It is greatly to his credit that he has come forward so frankly and honestly; and since he has begun to investigate the peculiar class of facts, we are sure that he will consider it his duty to continue the investigation in such a way as to convince those men of science who may not themselves be able to take up the question—outsiders in fact. Mr. Crookes will, we are sure, not object to a few critical remarks honestly made with the sole view of finding out the truth, and we would therefore express a wish that, in order to facilitate operations the experiments should, in future, be conducted by only such men as Mr. Crookes himself, and that it should always be absolutely superfluous to investigate whether machinery, apparatus, or contrivance of any sort, be secreted about the persons present. We should thus start from a higher platform, and the investigation would gain in simplicity, although perhaps something might be lost in the marked nature of the results obtained.

Allowing, however (as we are disposed to allow), that things of an extraordinary nature are frequently witnessed on such occasions, yet we are by no means sure that these constitute external realities. The very fact that the results are uncertain, and that, as far as we know, they have never yet been obtained in broad daylight before a large and unbiassed audience, would lead us to suspect that they may be subjective rather than objective, occurring in the imaginations of those present rather than in the outward physical world. Nor can this doubt be removed by any precision of apparatus; for what avails the most perfect instrument as long as we suspect the operator to be under a mental influence of the nature, it may be, of that which is witnessed in electro-biological experiments? The problem is, in fact, one of extreme difficulty, and we do not see how it admits of proof, provided the influence cannot be exerted in broad daylight and before a large audience. There is, however, a cognate phenomenon which admits of easy proof. We allude to clairvoyance, and have in our mind at the present moment a man of science who, if not himself a clairvoyant, has yet the power to command the services of one who is. Now, were he at once to communicate to a journal such as *Nature*, in cipher if necessary, the knowledge derived through the influence, giving the proof afterwards when obtained in an ordinary manner, the public would soon be in a position to judge whether there is any truth in the influence or not.

It is, in fact, somewhat hard upon the writer of these remarks and some others who are disposed to allow the possibility of something of this nature, but have not the opportunity of investigating it, that those who have will not satisfy the public with a convincing proof.—*B. Stewart, in Nature.*

Lace Manufacture in Brooklyn, N. Y.

There is now in course of construction on Park avenue, near Hall street, a large brick structure, to be 60 by 140 feet in dimensions, and five stories high, surmounted with a Mansard roof, which is to be provided with the most approved modern machinery for the manufacture of Nottingham lace and also of fine silks. A large amount of capital is invested in the undertaking, and, if successful, additional buildings are to be erected on the adjoining lots. It is said that when the works are in full operation, a thousand females, and nearly as many males, will be employed in the establishment. The first story of the main building is now up, and the work progresses as rapidly as the weather will permit. One reason for selecting Brooklyn is that the Ridgewood water is chemically well adapted for dyeing purposes.

TEETH.

Chamber's Journal.

Every dentist insists upon it that he, above all others, is the one who has made the most felicitous discoveries in odontology. We hear very little about dentist failures; because those unhappy beings who require a new mouthful of teeth shrink from saying much about it. A good box of ivories is a precious treasure when real, and a costly one when artificial. We ought to have our fair proportion of incisors, to bite through the beef and mutton; and of other teeth, to break and to crack harder substances, by means of saw-like serrations and file-like roughnesses. Professor Owen tells us that the teeth of the lower animals perform many more kinds of work than those of man—weapons of offence and defence, aids to locomotion, means of anchorage, instruments for uprooting or cutting down trees, and apparatus for the transport and working of building materials. As to our own species, he proceeds to say that the milk teeth or children's teeth ought to be twenty in number; comprising four front teeth, or incisors; two dog teeth, or canines; and four double teeth, or molars, in each jaw. When we come to man's estate, however, (or woman's), the permanent teeth should be thirty-two in number, to enable us to seize, tear, divide, pound, and grind our food—four incisors, two canines, four premolars, and six true molars, in each jaw. It is rather mortifying to learn that a pig (who is his own dentist) beats us hollow in this respect; since he has no less than forty-four teeth.

Some old folks cut their teeth when far advanced towards centenarianism. An old woman named Dillon, living near Castlerea, in Ireland, cut an incisive tooth in the lower jaw when seventy-five years old; it confirmed a strange hallucination with which she had long been possessed—that she had been dead, and was come to life again, with the usual infantine career of teething, etc. Mrs. Fussell, living at Acton, about a dozen years ago, cut an entirely new set of teeth when about eighty years old, after having been many years toothless. In 1732, Margaret White, of Kirkcaldy, in Scotland, cut eight new teeth in the eighty-seventh year of her age—thus winding up a toothless period of many years. Mrs. Page, a dame of Southwark, after being toothless from seventy to ninety years of age, cut several new teeth. The Rev. Samuel Croxall, translator of Æsop's *Fables* from the Greek, "died of fever, occasioned by the pain he underwent in cutting a new set of teeth at the great age of ninety-three." Edward Progers, aged ninety-six, died in 1713, "of the anguish of cutting teeth, he having cut four new teeth, and had several ready to cut, which so inflamed his gums that he died thereof." The late Sir George Cornewall Lewis was very skeptical as to people ever living to the age of a hundred; he would probably, therefore, have pooh-poohed the story of Robert Lyon, of Glasgow, who cut a new set of teeth at the age of a hundred and nine; and still more that of James Hook, of Belfast, who, in the time of Queen Elizabeth, and at the age of a hundred and twelve, "gott a new set of teeth, w^ch has drove out all y^e old stumps."

As if to take revenge for the duplications, or rather triplications of teething, nature sometimes requires us to dispense with dental apparatus altogether. At Gayton le Marsh, in Lincolnshire, there is the following epitaph: "Elizabeth Cook, a poor woman, aged 86, and who never had a tooth, was buried June 11, 1798." On the other hand, some folks greatly exceed the orthodox number of thirty-two. Dampier, in his account of the Philippine Islands, says: "The next day the Sultan came on board again, and presented Captain Read with a little boy; but he was too small to be serviceable on board, and so Captain Read returned thanks, and told him he was too little for him. Then the Sultan sent for a bigger boy, which the captain accepted. This boy was a very pretty, tractable boy; but what was wonderful in him, he had two rows of teeth, one within another, in each jaw. None of the people were so; nor did I ever see the like."

The "pearly teeth" of the poet and novelist would not be valued by some of the Eastern and Polynesian nations. The Chinese blacken their teeth by chewing the fruit of the areca, or betel nut. The Tonquinese and Siamese gents and belles, in bringing about the same result by nearly the same means, almost starve themselves for three or four days, while the dyeing is going on, lest the food should disturb the dye. The Sunda Islanders sometimes blacken all the teeth but two with burned cocoa nut; covering the two excepted teeth with thin plates of gold or silver. The Macassar people sometimes pull out two front teeth, in order to supply their place with teeth of pure gold or silver! Two Italian girls, twins, have been known to have natural teeth of a light red rose color—both the milk teeth and those which succeeded them.

The charms, omens, signs, panaceas relating to the teeth constitute quite a formidable item in folk lore. In some parts of Sussex there is a superstition that if you put on your right stocking, right shoe, and right trouser leg before the left, you will never have toothache. To drink out of a skull taken from a graveyard; to take a tooth from such a skull, and wear it round the neck; to apply the tooth to your own living but aching tooth; to put a double nut in your pocket; to pare your finger nails and toe nails, and wrap up the parings in paper—all are charms against the toothache. If you catch a mole in a trap, cut off one of his paws, and wear it as a charm; you will "soon see the effect," provided a right paw be used for a left tooth, and *vice versâ*. When an aching tooth is extracted, mix it with salt, and burn it. There is in Norfolk a custom of calling the toothache the "love pain," for which the sufferer is not entitled to any commiseration; whether he (or she) fully assents to this, may perhaps be doubted. Many other items of tooth lore have no connection with toothache. For instance: if the teeth are set wide apart, there will be good luck and plenty of traveling for the fortunate possessor. When a tooth is drawn, if you refrain from thrusting your tongue into the cavity, the new tooth to grow in its place will be a lucky one. Lady Wentworth, in a letter written in 1713, to her son Lord Strafford, spoke of the efficacy of wolves' teeth set in gold to assist children in cutting their teeth: "They are very lucky things; for my twoe first one did dye, the other bred his very ill, and none of y^e rest did, for I had one for al the rest." Bless the good lady; her grammar and her logic are about on a par!

Why do some people's teeth come out more readily than others? The reasons for this are probably many. About the middle of the last century, Peter Kalm, a Swede, visited America, and wrote sensibly about what he saw. He observed a frequent loss of teeth among settlers from Europe, especially women. After discussing and rejecting many modes of explanation, he attributed it to hot tea and other hot beverages; and came to a general conclusion that "hot feeders lose their teeth more readily than cold feeders." Mr. Catlin, who some years ago had an interesting exhibition of Indian scenery, dresses, weapons, etc., noticed that North American Indians have better teeth than the whites. He accounts for the difference in this strange way—that the reds keep the mouth shut, whereas the whites keep it open. The teeth, he says, require moisture to keep their surfaces in good working order; when the mouth is open, the mucous membrane has a tendency to dry up, the teeth lose their needed supply of moisture, and thence come discoloration, toothache, ticdouloureux, decay, looseness, and eventual loss of teeth. Mr. Catlin scolds the human race generally for being less sensible than the brutes in this respect, and the white race specially in comparison with the red. We keep our mouths open far too much; the Indian warrior sleeps, hunts, and smiles with his mouth shut, and respires through the nostrils. Among the virtues attributed by him to closed lips, one is excellent—when you are angry, keep your mouth shut.

There is reason to believe that the Greeks and Romans knew something about false teeth. Martial, in one of his epigrams, said that Thais's teeth were discolored, while Lecania's were white. Why? Because the former wore her own teeth, whereas the latter wore those of some other person. There was an old Roman law, which allowed the gold settings of false teeth, or the gold with which they were bound, to be buried or burned with the deceased. There is also some indication that the Greeks were wont to extract teeth, and to fill up decayed teeth with gold. Dentistry was certainly known in England three centuries ago. Blagrave's *Mathematicall Jewel*, published in the time of Queen Elizabeth, tells us that "Sir John Blagrave caused his teeth to be all drawne out, and after had a sett of ivory in agayne." Ben Jonson, in his *Silent Woman*, published in 1607, makes one of the characters say: "A most vile face! and yet she spends me forty pound a year in mercury and hog's bones. All her teeth were made in the Blackfriars!" An almanac for the year 1709 makes mention of one John Watts, who was a maker of artificial teeth in Racket Court, Fleet street. The Sunda Islanders at the present day are in the habit of employing their old women to dress up the teeth of the youths and maidens at wooing time; the canine teeth are filed to a fine smooth edge, and the body of the tooth made concave, or they will notch the edge of the teeth like a fine saw, as an additional means of beautifying. An imperial toothache once made the fortune of a poor barber. The present Sultan of Turkey, Abdul Aziz, having a touch of toothache one day, sent for the court physician; he was hunting, and could not be found. The domestics hurried about Constantinople, and at length found a poor, ragged barber surgeon; they took him to the palace, and furbished him up. He drew the offending tooth, and soothed the pain of the Commander of the Faithful. Whereupon a nice house and sixteen hundred piastres a month were awarded to him.

During the days of the resurrectionists or body snatchers, when grave yards were subjected to pillage for supplying anatomists with subjects for dissection, the teeth from the dead bodies formed a frequent article of sale to dentists. Sometimes graves were opened for the teeth alone, as being small and easily concealed articles. Mr. Cooper, the surgeon, relates an instance of a man feigning to look out a burial place for his wife, and thus obtaining access to the vault of a meeting house, the trap door of which he unbolted; at night he let himself down in the vault, and pocketed the front teeth of the whole of the buried congregation, by which he cleared fifty pounds! Mention is made of a licensed sutler or cantineer during the Peninsular war, who "drew the teeth of those who had fallen in battle, and plundered their persons. With the produce of these adventures, he built a hotel at Margate. But his previous occupation being discovered, his house was avoided, and disposed of at a heavy loss." He afterwards became a dealer in dead men's teeth.

The making of artificial teeth is a trade in which a large amount of ingenuity is displayed, both in the adaptation of new substance, and in the modes of shaping and finishing. When artificial teeth began to be made, instead of using the natural teeth of dead persons, they were made of bone, or the more costly kind of ivory, from the tusks of the elephant, rhinoceros, hippopotamus, walrus, or narwhal. If only a single tooth were wanted, it was customary to cut a bit of bone to the proper shape, and tie it to the next tooth by a ligature of wire. It is still found that tusk bone possesses the best combination of properties. It combines, as a learned authority in the dental world, tells us, "lightness, strength, and solidity, with a natural appearance and a certain congeniality to the mouth, possessed by no other material, which render both partial pieces and entire sets at once the most useful substitutes for the lost natural teeth."

The mechanical dentist must be a genuine workman. When he is about to make bone or ivory teeth, he cuts a tusk into pieces, and shapes each piece by an elaborate series of mechanical processes. Sometimes for a customer who has plenty of guineas to spare, he will make a whole set, upper or lower, as the case may be, out of one piece. He saws his block of ivory roughly to the size; and then, with infinite patience, files and graves it into shape. He has at hand a model of the patient's gum, and works to that model with exactness. The teeth are not separate pieces; they are cut into apparent rather than real separation, like the teeth of a comb. An artistic workman will take care that the teeth shall present some of that irregularity which our natural grinders always exhibit; a learner falls into the mistake of making them too good. Many persons do not like to wear dead people's teeth; there is something uncomfortable in the idea; there is also frequently a germ of decay in such teeth; and these two reasons led to the custom of making artificial ivory teeth. Ivory, however, with all its excellences, becomes discolored; and hence the chief motive for making teeth of certain mineral or vegetable compositions. There is, in fact, a sort of triangular duel always going on among the ivory dentists, mineral dentists, and vegetable dentists, each class fighting stoutly against both of the others.

Whether your dentist really makes the teeth which he inserts in your cranium, is a question he does not deem it necessary to answer. In truth, he very rarely does anything of the kind. There are certain dealers who sell sets of teeth, half-sets, twos or threes, singles or doubles, front or back, top or bottom, finished or unfinished; as well as all the apparatus and tools required for the dentist's art. And some of these dealers themselves are supplied by manufacturers, who conduct operations on a considerable scale. There is one firm in the metropolis at the head of the trade, who built a really beautiful factory a few years ago, replete with steam engines, tool making shops, and all the appliances for a well organized staff of two hundred operatives. How many incisors and canines, premolars and true molars, such an establishment can turn out in a year, we will leave Cocker to calculate.

Our American cousins, it appears, are not at all behind us in this art; while they are, perhaps, still more ready than ourselves to apply steam power to its development. A recent computation makes the number of artificial teeth fabricated in the United States as high as three millions annually—symbols (according to some folks' notions) of three million attacks of toothache. In one of the largest and most complete factories, where mineral teeth are made, the chief ingredients comprise felspar, silica, and clay; those of subsidiary character are sundry metallic oxides, to produce those tints of discoloration which are necessary to make the imitation a good one. The felspar, silica, and clay are ground to an impalpable powder under water, then dried, and made into a paste. The teeth are cast in brass molds, varied in size and shape to suit the requirements of the mouth. A special kind of paste, to form the enamel, is first put into the mold with a small steel spatula; the platinum rivets, by which the teeth are to be fastened, are adjusted in position; and then the paste forming the body of the tooth is introduced until the mold is filled up. Next ensue powerful pressure and drying. When removing from the mould, the tooth goes through a process called biscuiting (analogous to a particular stage in the porcelain manufacture), in which state it can be cut like chalk. It is then sent to the trimmer, who scrapes off all roughness and unnecessary projections, and fills up any depressions which may have been left in the operation of molding. A wash called enamel is made, by selecting various ingredients more fusible than those of the tooth, grinding them to a fine powder with water, and applying the thick liquid as paint, by means of a camel hair pencil. The tooth then goes to the gummer, who applies a gum comprising oxide of gold and other ingredients. At length heat is applied. The tooth, when dried, is put into a muffle, or enameller's oven, where it is placed on a layer of crushed quartz strewed over a slab of fire resisting clay. After being exposed for a time to an intense heat, the tooth is taken out, and cooled—and there it is, beautiful for ever.

A SPONTANEOUS EXPLOSIVE.—Some experiments recently conducted at the Philadelphia High School developed the fact that when a strong solution of phosphorus in bisulphide of carbon is poured upon finely powdered chlorate of potassa resting on paper, and the mixture exposed to air, upon the evaporation of the bisulphide of carbon, the phosphorus being left in a very finely divided state, intimately mixed with the chlorate of potassa, the mixture presently explodes spontaneously, with a loud detonation. The explosion in this instance is analogous to the case of phosphorus and chlorate of potassa when struck or rubbed together, the mixture of the two substances in the present case being, however, much more perfect than can be obtained by any mechanical means.

MR. DAVID OLMSTED, of St. Anthony's Falls, Minn., having read the correspondence on the subject of the relative value of coal and zinc, as power producers, suggests the employment of water power to produce electricity, which can be conveyed by wire to less fortunate localities. Mr. Olmsted's idea of sharing the advantages of the city in which he lives with others not so favored is very generous; and if the inhabitants of St. Anthony's Falls will erect a turbine to convert the eighteen foot fall of the Mississippi into power, the neighboring villages could easily erect shafts to convey it into their factories; while a magneto-electric machine, of the requisite size, could produce currents for the supply of manufacturers at a distance. But the first step towards these desirable results is to erect the turbine.

THE ROAD STEAMER AND OMNIBUS.

The attention of mechanical engineers and men of business has lately been turned to the use of common roads for haulage by steam power. The difficulty of transporting heavy weights where no railway exists, the increased price and scarcity of horses and of their fodder, the development of productive industry both in India and the colonies, and the preference shown by many farmers at home for steam instead of animal power, have led the English public more especially to take great interest in traction engines and road steamers.

Steam engines were made to run along the common roads many years ago, but have never yet become a commercial success; nor have they been used, with a few exceptions, for transporting goods and passengers to and from towns, or as feeders to main lines of railway, from villages and towns not large enough to support a branch line of rails.

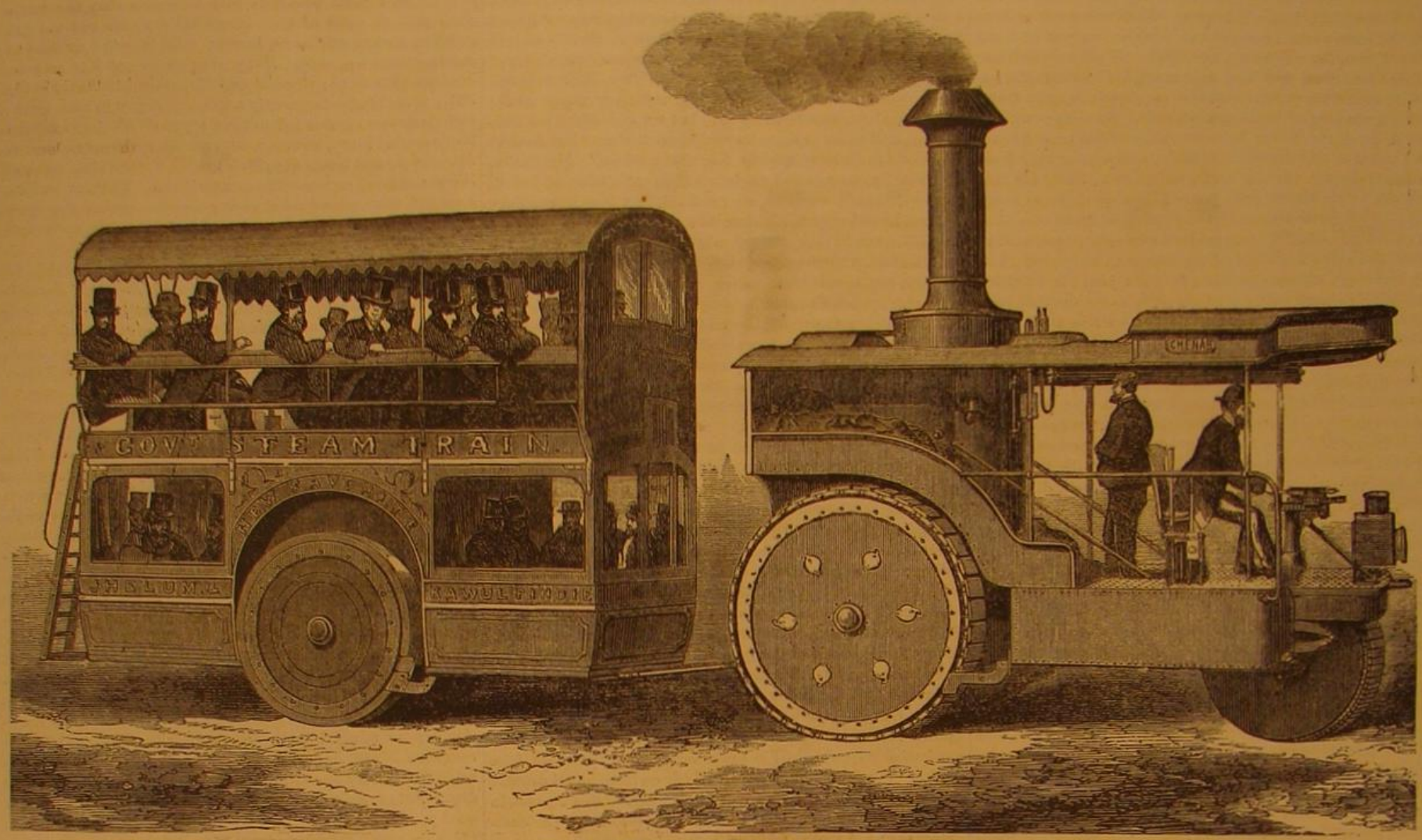
The first designs were simply the adaptation of some well known form of mechanical arrangement to the end of transmitting the rotary motion of the crank shaft of an ordinary portable engine to the road wheels. But, from a variety of circumstances, these engines were not applicable for the purposes of general haulage on common roads. It was not until a completely new engine was designed by Mr. R. W. Thomson, of Edinburgh, that the object was practically attained. These engines have been described in our pages on a former occasion. Their principal feature is the adoption of rings or tires of india rubber round the driving wheels, which are flattened by the weight of the engine, giving the wheels a greater surface of contact with the ground, and consequently more adhesion, than the cast iron or wrought iron wheels usually employed in traction engines, especially on sandy and rough roads. Besides this, the engine is placed on three wheels, instead of four, giving it a smaller wheel base, and enabling it to turn in its own length, and to manœuvre in narrow and crooked roads. All the various parts are of steel or wrought iron, which renders the engine much lighter than the cumbrous machine hitherto seen on roads.

Our illustration shows one of these engines with its omnibus. It was built by Ransome, Sims, and Head, from the designs of Mr. Thomson and Lieutenant Crompton, appointed by the India Government. It is designed to run, with three more such engines and omnibuses, from Rawul Pindee to the Jhelum, in the Punjaub, a distance of about sixty-eigl t miles, for the conveyance of passengers and mails, and occasionally of troops and baggage.

These engines and carriages are complete, with all the newest improvements that engineering science could devise. The following are their principal dimensions:—Diameter of cylinders, 8 inches; length of stroke, 10 inches; revolutions per minute, 172; working pressure, 140 lbs.; diameter of main road wheels, 6 feet; width of india rubber tires, 14½ inches; their thickness, 4½ inches; fast speed of engine, ten miles, slow speed, three miles an hour; capacity of water tank, 370 gallons; that of coal bunkers, one tun; weight of engine, in complete working order, with water tank and coal bunkers full, about twelve tuns.

The omnibus will carry about sixty-five passengers, in addition to luggage and mails. It is fitted with the usual steel springs; and, as the wheels are surrounded with india rubber tires, the movement is so easy, at a speed of ten miles an hour, even on a rough road, that it is quite possible to write perfectly when sitting inside.

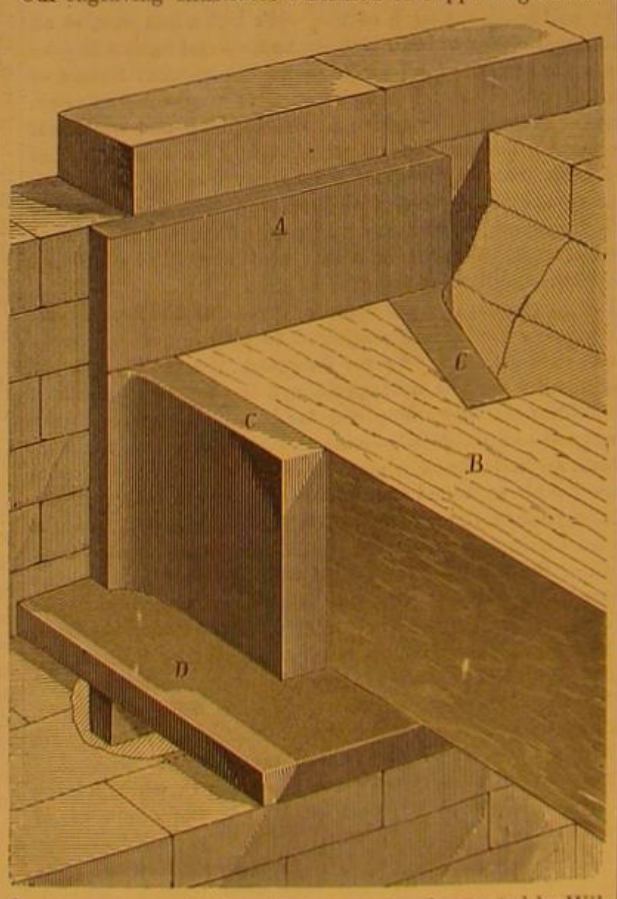
About the end of May a trial of the first of these engines, with its omnibus, took place at Ipswich. A large company sat in the omnibus attached to the road steamer, and traveled at the rate of three miles and a half an hour to the racecourse, a distance of about a mile and a half. The road lay through one of the most crowded parts of the town, but the engine and omnibus turned sharp corners with the greatest facility, mounting an incline half a mile long, with a varying gradient of from 1 in 12 to 1 in 25. Having arrived at the racecourse, the engine was started at full speed, running along the course at the rate of twelve miles per hour; then mounting, with the greatest ease, a hill representing a gradient of 1 in 10, while all the passengers were delighted with the pleasant movement of the vehicle and freedom from noise of the engine.



ROAD STEAMER AND OMNIBUS.

ANCHOR BEAM SUPPORT FOR BRICK WALLS.

Our engraving illustrates a method of supporting and anchoring beams to brick walls, invented and patented by William W. Goodrich, of Rondout, New York, Nov. 22, 1870.



The method consists essentially in casting the supporting and anchoring devices together in a single casting, the parts of which are as follows:

A is a vertical flat plate which is placed between the outer course of brick and the inner ones. The beam, B, rests upon a horizontal plate, D, cast with the vertical plate, A. The end of the beam is dovetailed as shown, the dovetailed portion fitting the recess between two vertical plates, C, cast together with A and D.

In this way the plate is anchored to the wall, and the beam is firmly held to bind opposite walls together. It will be seen that the method is cheap, substantial, and practical. For further information address Mr. Goodrich, as above.

The Preparation of Fancy Soaps.

Fancy soaps, which are made in great variety for the toilet, are usually scented with some aromatic oils. For this branch of the trade the ordinary commercial soaps are used, after undergoing a process of refinement; or a soap is specially made for the purpose from almond oil, or the like. Much taste is shown by the best London makers in the selection and combination of the perfumes, which, along with the coloring matter, such as vermillion, yellow ocher, aniline, etc., are usually boiled up with the soap. To facilitate this operation, as a well dried soap does not readily melt, it is usually cut up into fine shavings, and after boiling is well worked under rollers until it presents a uniform appearance. If the soap is intended to be highly scented, or very extensive perfumes are to be employed, the cold process is adopted, as much of the strength of the scent is lost by boiling. In this case the soap is shredded as before, and the perfume and coloring matters well amalgamated with it by being worked in a mortar with a pestle. It is then divided into lumps, and roughly molded with the hand into something of the shape it is finally to assume. After being left on a rack to dry for about a week, it is pressed into a mold, which imparts to the cake the form and device which may be required, and when taken out, the edges are trimmed and the surface polished with the hand.

Oil Proof Rubber for Steam Packing, etc.

James M. Flagg, of Providence, R. I., has invented an improved preparation of rubber for carriage washers, gaskets, belting, and other purposes, where rubber comes in contact with oil, so prepared that the oil will not affect the prepared rubber. The invention consists in combining aluminous clay with vulcanized rubber. The clay which is preferably used, contains by analysis about thirty-nine per cent of alumina, forty-six per cent of silica, thirteen per cent of water, and about two per cent, or a mere trace, of iron, magnesia, and lime. Any appreciable quantity of these last mentioned substances would defeat the object in view, since they would lump and form a gritty surface, and their particles would not contact with sufficient closeness to exclude oil. In preparing the rubber the clay is mixed with the caoutchouc and sulphur, which mixture is then prepared and vulcanized in the ordinary manner, according to the particular use to which it is to be applied. Plumbago may be added to the mixture, or not, according to the use to which the rubber is to be applied. For carriage washers the compound is vulcanized upon an arbor, and washers of the desired thickness are afterward cut off.

This seems an important improvement, and, if it does what the inventor claims, will supply a want long felt.

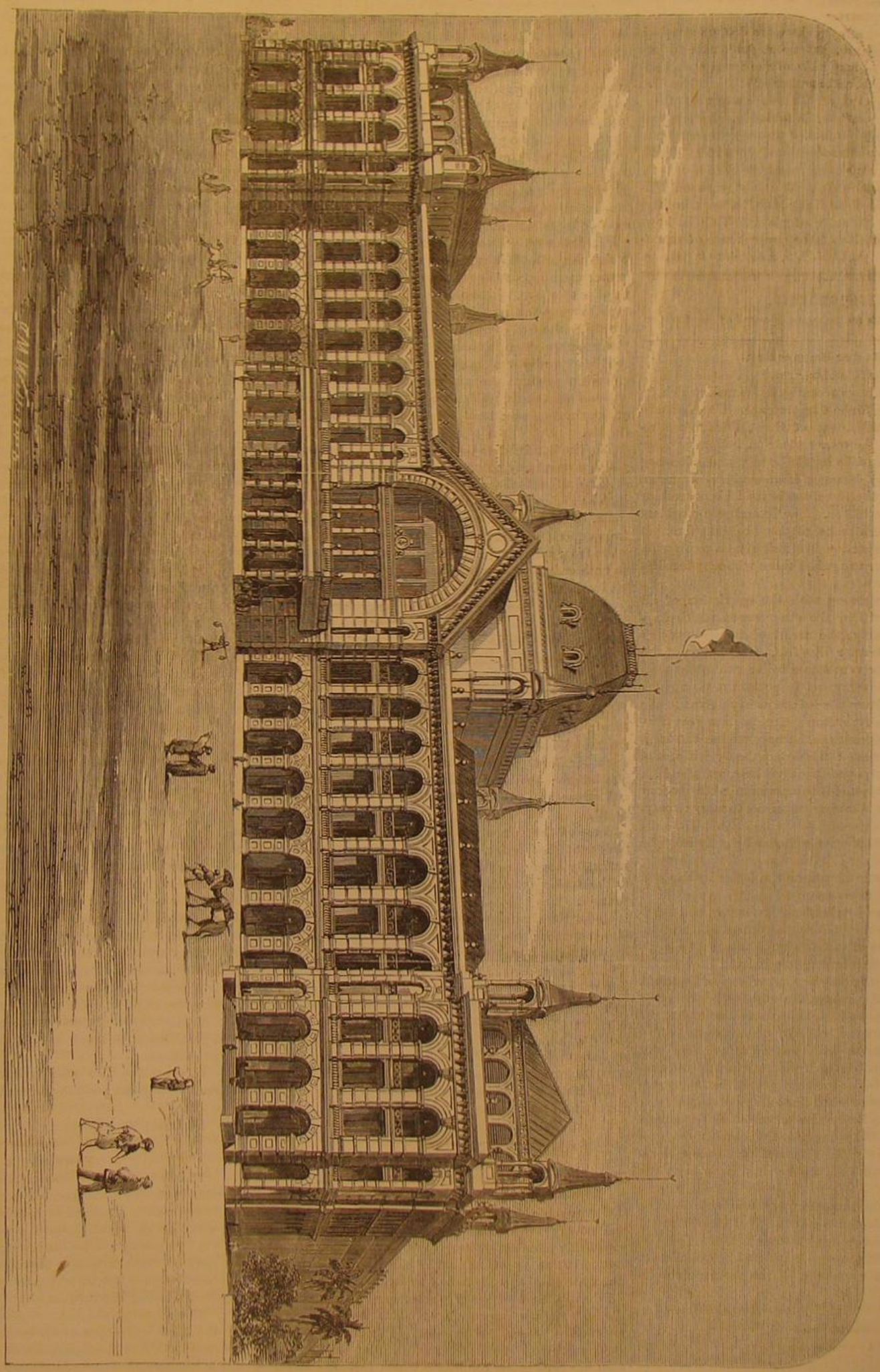
RECENTLY as a train on the Mount Holly Railroad, near Merchantville, was going at full speed, the engineer saw far ahead a little girl running along the track. He reversed steam and whistled down brakes, but the grade being downward, it was impossible to stop in time to save the child's life. Meantime the fireman, Lewis Ebertson, ran out to the front of the locomotive. Standing on the cow catcher, he caught the child as the locomotive touched her garments, and lifted her out of danger.

THE NEW HOTEL, CAIRO, EGYPT.

As the opening of the Suez Canal is turning men's minds towards Egypt, our readers may be glad to know something of the Oriental Hotel Company's new hotel at Cairo, in Egypt, which has recently been opened for the convenience of travelers to the Nile, and by the overland route to India, as also for the reception and accommodation of the many invalids who find benefit from a winter residence in Cairo. We give a view of one front of it.

The hotel is beautifully situated, facing the gardens of the Ezbekiah and the Rue de Boulaac, and commands a good view of the Pyramids. The foundation stone was laid with great ceremony by his Excellency Nubar Pasha, Minister of Public Works, on the 10th of January, 1865, being the anniversary of the accession of his Excellency the Viceroy.

The hotel, when completed, is intended to form a quadrangle (with large open gardens in the center), of which only the principal front, facing the Boulevard d'Ezbekiah, and a portion of the return fronts facing the Rue de Boulaac and the new street, have been as yet erected. The building is Franco-Italian in style, and has been erected from the designs and under the superintendence of Mr. Christopher G. Wray, of London, who, from a long residence in India as an officer of the Public Works Department, had knowledge that enabled him to arrange an hotel suitable to the requirements of the climate.



THE NEW HOTEL, CAIRO, EGYPT.

It is constructed with stone from the neighboring quarries, with terra cotta enrichments, which were sent from London, as also were all the woodwork and fittings. The portion at present built has a frontage towards the Boulevard d'Ezbekiah of about 400 feet in length, and returns about 86 feet towards the Rue de Boulaac, and about 140 feet facing the new street, and it is about 70 feet high. It contains upon the ground floor a *café*, 61 feet by 36 feet; *table d'hôte* room, about 80 feet by 30 feet; bazaar, 61 feet by 36 feet; billiard room and suites of public offices, all 21 feet high; as also a grand staircase, 60 feet by 23 feet; and at the rear a kitchen department, serving rooms, and other offices.

The hotel is surrounded on all floors by wide verandahs, affording a passage way around the building, and supplying a comfortable lounge. The *table d'hôte* room is supplied with an orchestra for evening entertainments, and is laid with parquetrie, so as to afford a dancing floor.

Upon the first floor are a ladies' *salon*, 41 feet by 21 feet, and 20 feet high; nine private sitting rooms, with bedrooms *en suite*; and forty-two bedrooms, besides various serving rooms and W. C.'s, which are numerous, and conveniently arranged, those for ladies being entirely separate, and approached through their own retiring rooms. The bath rooms are fitted with large baths, and shower baths over all, supplied with hot and cold water, the whole of the apparatus and fittings being of the best London manufacture.

The second floor is somewhat similarly arranged, and contains fifty-nine bed rooms, besides ladies' rooms, serving rooms, baths, etc., as on the floor below, and all 15 feet high. The floors are variously laid with parquetrie, marble, and stone paving, bordered with Maw's encaustic tiles, which give a rich effect. The various apartments throughout are supplied with Bregnet's patent electric bells. The total cost of the portion of the building already erected has exceeded £100,000.

Tea and Milk.

The Chinese have always despised European tea drinkers for disguising the fragrance of the sacred herb by the admixture of milk, and the Celestial nation would appear to have reason on their side, for, it is asserted, that on mixture the albumen of the milk unites with the tannin of the tea, and forms minute flakes of that material which is, or ought to be, the main constituent of a pair of boots. There may be nothing like leather, but a leather lining to one's stomach is hardly a specimen of the eternal fitness of things. When we, ourselves, so vitiate the cheering cup, we can hardly wonder that the "Heathen Chinee" considers the leavings of his own decoctions quite good enough for us, and we can have no reason to complain of shipments of re-fired leaves, but it is another matter when the process goes a step further, and takes the form of 'Maloo' mixture, a delicate euphuism for willow leaves and maggots, iron filings, and plumbago.—*London Milk Journal.*

Medicine and Medical Practice in China.

The following remarks occur in Dr. Dobell's "Reports on the Progress of Medicine." They are contributed by F. Porter Smith, M. B., of Hankow:

The medical system of China is like a penny piece, it has a head and a tail, both very plainly superscribed, with a heavy, thick mass between them—the substantial support of both—not worthy of the name of a body. There is, on the one hand, the great medical college at Pekin, which is really the office of Imperial physician put into commission; and, on the other, the profitable calling of the druggist, whose shop is always the smartest in the street, exercised all over the empire with much dignity and more profit. Between these two terminal points, of not very elevated position, there is a long line of disorderly representatives of the "noblest of professions," who practice upon the people of China "the vilest of trades." These ignorant, mercenary practitioners divide themselves into the "literary," the "hereditary," and the "knowing" doctors.

There are as many as thirteen specialties of practice allowed by the Pekin College of Physicians, as it is called by some; but the departments of external (surgery), internal (medicine), ophthalmic, female, infantile, and small pox practice, are the most frequent divisions of the medical profession, leaving out the traveling quacks.

There is also a division, recognized by that excellent digest of law, the Tartar code, into the "ordinary" or general practitioner, and the "notable" or physician. There are midwives, who have the sense to confine themselves to their plain duties of "receiving the born," as their name signifies in the Chinese vernacular.

There is no teaching or training, or any qualification but presumption required of those who essay to heal the sick man in China. A bundle of prescriptions, and the hereditary possession of secret and empirical methods, are the surest grounds of success in the medical line, in populous and credulous China. The power of looking grave over the dignified operation of "regarding the pulse," as they call it, combined with the plentiful use of terms drawn from the dual philosophy of the *Ying* and the *Yang*, are important accomplishments.

Any foreign student who devotes his leisure to a brief study of the pharmacology, which is the great branch of their medical literature, may puzzle the greatest wiseacre of the whole lot of Chinese doctors. And yet it would be very unwise, unkind, and untrue to say that these men, ignorant of the correct anatomy of the body, to say nothing of other sciences, are altogether without availing themselves of the splendid resources of a varying climate and a vast country, which provide a copious *materia medica;* they secure the relief or *euthanasia* of many of their faithful patients. Chary in the use of mineral and metallic preparations, which they nevertheless know how to prepare with some skill, they stick to the safer remedies of the vegetable kingdom, which rules so royally over all their empire. Cautious, like all Oriental peoples, in invading the mortal territories of the human system, they bring to bear all their force upon the safe surface of the body, which they pierce with needles, burn with lamps and moxas,

and scarify with rude cupping instruments. Some few are bold enough to use the dreaded knife, and bleeding, incision of abscesses, and removal of growths, have been known to be attempted with some deserved success. Malpractice is provided against by the Tartar code, which inflicts temporary or perpetual prohibition from practice, upon the finding of such a verdict by medical assessors. Instances of vexatious actions at law against bold and enlightened practitioners who have been unsuccessful in their departure from routine have come under the writer's notice. Veterinary doctors have been in existence for 3,000 years in China, and they possess a formal literature. We even hear of cattle plague statistics being kept at that early period.

As to the public medical service, there are doctors attached to the staff of general officers, but no regimental appointments. There is a medical mandarin, of the ninth rank, connected with each prefecture, and another of still lower grade, connected with each district city. These are a sort of medical tutors, who often undertake, in addition, the medical charge of the jails, or they are locked up with the students in their protracted triennial examinations. The oldest medical works were written by the early monarchs Shin-nung and Hevang Ti, of alarming antiquity. The best work on Chinese medicine is the "Pun Tsau Kang Muh," a work in fifty-two volumes, with three volumes of plates. This is, however, above the comprehension of the present race of practitioners. It was written by Li-Shi-chin, a district magistrate.

Correspondence.

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

Steam Boiler Inspection.

To the Editor of the Scientific American:

Two important events have recently happened, which, in the future, will be of the highest importance. The Commission appointed by the Parliament of Great Britain has reported in substance that the owner of steam boilers or other machinery must be responsible for the safety and efficiency of the same, and must pay damages if an accident happens, unless he can prove that the same was beyond his control, or in spite of all known precautions. The Commission considers inspection of steam boilers to be of the highest value, but considers Government inspection insufficient as a guarantee, and a shield for the owner as against those who may lose life or limb by an explosion.

That this report is in harmony with the conviction of all unprejudiced men is shown by the other event which happened in New York, namely, the arrest of the owners and officers of the ill fated steamer *Westfield*. This action of the coroner will do more to prevent steam boiler explosions than all the labor of all the Government Inspectors combined, including even all such jobs as the lockup safety valves. It is placing the saddle on the right horse; for, to show that Government inspection is a mere sham, let us examine the testimony of Inspector Matthews: "I tested the boiler of the *Westfield* at South Ferry, on the Brooklyn side, on the 12th day of June last, and subjected it to a pressure of thirty-four pounds to the square inch, allowing the vessel to carry twenty-five pounds of steam."

"That pressure was put upon a boiler by a hydrostatic pump."

Question: "Was the pressure put on the boiler by the boat pump, or did you use your own pump?"

Answer: "It was put on by the Brooklyn water, and regulated by the stop cock on the dock; the hydrant had a pressure of about sixty pounds; I tested it by that water."

Question: "In testing this boiler, how did you prevent the full pressure coming on, or going beyond what you required?

Answer: "By regulating it from the supply."

Now, who can read this and not be satisfied, first, that the pressure was not put upon the boiler by a hydrostatic pump; second, that if it was filled with water the pressure was "about sixty pounds" the instant it was full; and, third, that it is impossible to test a boiler to thirty pounds on the square inch by hydrostatic pressure when the column of water from which the pressure is received presses "about sixty pounds on each square inch?" What must be the conclusion if the boiler was tested as stated? That it must have been seriously injured by the test, and such injury may have been the cause of the explosion.

If, on the contrary, the Inspector was deceived and the pressure not put on the boiler as stated, the cause of the explosion must be traced to careless inspection.

The question I should like to see ventilated is, can a boiler be tested as stated in the testimony of the Government Inspector?

Boston, Mass. JOSEPH A. MILLER.

Acoustics.

To the Editor of the Scientific American:

The construction of a piano by substituting steel in some form for strings, has been a vexed problem for more than a hundred years. All attempts in that direction have hitherto been disastrous failures, because the inventors mistook mechanical ingenuity for inventive genius, and lacked knowledge of acoustics. I shall endeavor to show why those inventors failed, in the hope of deterring others from wasting their time, labor, and means on impracticable schemes.

This class of inventors had only four tracks to pursue, four different sound mediums to try. Either of them looks promising enough to inexperienced inventors, but failure has been universal, not even leaving a foundation for succeeding inventors to build upon. No practical results originated from these experiments.

The first principle is the free bar, so called because it gives its tone without the aid of a sound board, and does not require to be fastened in some particular manner. Strips of glass or metal, square plates, bells, disks, triangles, etc., are all modifications of one and the same principle. It gives its tone freely, and that is about the only thing in its favor. On the other hand, its compass is limited to the highest three octaves known; its tones, although loud and clear, are unpleasant to a fine ear on account of their harmonics, and it occupies more space in an instrument than the keyboard would allow.

II. The tuning fork with its varieties is not much better adapted to a musical instrument. It is true that its tones are pure and sustained, and it gives four or five octaves of the lower and middle tones, if brought into connection with a sound board or resonant cavity, and that it occupies no more space than an ordinary keyboard. But as the two prongs cause interference with each other, the ordinary pianoforte action will not start the vibration of the prongs. And as the forks will not transmit their vibrations through a metal plate, but must be planted directly and loosely on the sound board, they act as mutes to each other, besides developing an unpleasant stroke of the hammer on the sound board. To develope their tones by means of a resonant cavity is equally impracticable, as each of them requires a separate one, according to its individual pitch.

III. The reed or tongue (principle of the music box) of which the coiled bell wire, jew's harp, etc., are modifications, is much more promising than either of the other principles mentioned above. It transmits its vibrations through metal, thus leaving the sound board free and unincumbered. It furnishes the full compass of six to seven octaves, and occupies no more space than the key board. But the tone of the reed is naturally weak and short; if the reeds are made large enough to produce the amount of tone required, the action will not start them, unless it be a picking or snapping action, and such a one would not repeat; there it would be impracticable.

IV. The bar fixed on both ends has not been tried enough yet to warrant any conclusion in regard to it. The mechanical difficulties in constructing a piano on that principle are such as to deter any inventor almost from venturing on that track. Such an instrument could never be cheap. To judge from experiments, it would be very much like an instrument made from steel tongues. The coiled spring wire, fastened on both ends, is only a modification of this principle.

Cincinnati, Ohio. H. DREWER.

Paine's Motor.

To the Editor of the Scientific American:

Having read the articles *pro* and *con* upon Paine's electro-motor, I am in doubt which to be most astonished at, Paine's impudence or your patience.

Under the date of July 8th, you print a letter from H. A. Rowland, giving an account of a visit to examine the Paine engine. I, as well as probably most of your readers, do not know Mr. Rowland, and do not remember of ever hearing of him before; but his letter contains a plain, straightforward, and apparently truthful statement of what he observed and heard.

Some of the "great inventor's" friends utter doleful complaints of that letter, and protest against the inference he naturally draws; but not one contradictory statement do they or he make against the truthfulness of the facts given therein.

Under the circumstances, an impartial reader of the articles cannot help more than suspecting Mr. Paine of wilful deception; and that they do so is his own fault, for, to say nothing about his theories, if his assertions and statements in regard to the power of his machine are true, it would be very easy for him to satisfy the public of the fact, and until he does so, I am confident a majority of your readers will agree with me in thinking that he and his friends have occupied about enough of the valuable space of the SCIENTIFIC AMERICAN with elucidating (?) their side of the question.

The letter of B. D. in your last number I must say caps the climax for absurdity and nonsense. A. F. KELLY.

Slatersville, R. I.

Psychic Force.

To the Editor of the Scientific American:

I hope that Professor Crookes and his associates will push their "psychic force" investigations with that thoroughness and energy for which they are noted, until they arrive at something more satisfactory than that reported in the SCIENTIFIC AMERICAN of August 12th, and until mankind shall know about all there is to be known of this mystery.

I have witnessed many phenomena of this nature within the last twenty years, some of which were, as evidences of mysterious power, far more startling and conclusive than those related by Professor Crookes. But much that I have seen has been under conditions which seriously impaired its value as proof of mysterious agency.

The experiments of Professor Crookes and his friends with the medium Home were of course conducted with the utmost fairness and with a simple eye to truth.

But why must the accordion be caged up beneath a table? Surely the cage and table can have no agency in playing the instrument; why cannot Mr. Home play the accordion just as well if held in the same way at arm's length out of the cage and away from the table, and in such a position that all of the investigators may see at the same time?

If the cage is needed for the battery experiment, let it be used for that alone.

Investigators of these mysteries should not allow themselves to be hampered with senseless conditions.

Worcester. F. G. W.

The Darwinian Theory.

To the Editor of the Scientific American:

In your able article entitled "Objections to Darwinism," in your last week's issue, there is, I think, a misconception of the meaning of the term "stronger," as connected with "survival and persistence." Mr. Howorth has fallen into the same error in his letter to the editor of *Nature*, published in the number of that periodical dated July 13th.

It will be admitted on all hands that fertility is seldom united with a repleted body; and that accidental or intentional deprivation of the sexual powers leads to increased size, and to increased volume of flesh. But "strength" in this connection does not mean size nor even muscular strength, but vitality.

The vitality of an animal is assuredly diminished by inability to perpetuate his race; and all medical officers of assurance companies are well acquainted with the correlative truth that the disqualification is a good ground for believing that the life of the subject will not be prolonged to the average duration. And we must all be aware that luxury of diet, and the inactive life of the over civilized nations, and its concomitant vices, may contribute to much flesh and blood, but are anything but conducive to muscular power, and are destructive of vitality. The Indian savage, poorly fed and clothed, has more vitality than enough, till he acquires the vices of civilization, a term paradoxical in appearance, but lamentably a proper one to use.

The power of living a long time, and of perpetuating the race that it may survive his own generation, are the best proofs of the existence of vitality in an animal, and therefore the survival or persistence of the strongest, is not a theory, but an axiom.

The pruning a tree or the castration of a colt directs the vital power from one channel to another. The first operation diverts it from the increasing of size to the organs of fecundation; the latter has a reverse effect. But in neither is there a decrease of strength. In the case of the tree there is an increase of vitality, as I understand it; in the other case, the vitality is seriously interfered with for the purpose of increasing the flesh forming power of the animal. The superior muscular strength of the bull over the ox is not to be denied, although, as I have before stated, it is no proof of the superior vitality of the animal; and the increased flesh positively diminishes both muscular strength and vitality.

It is admittedly true that the most prolific people are frequently the shortest lived; and this proves that vitality or strength of a race may be dissociated from vitality or strength of an individual. And indeed there is good reason to believe that the absence of the excessive flesh and blood originated by high living is directly contributory to the efficiency of the generative organs. But these facts, interesting and important as they are, must not be construed as contradictory of the doctrine of the "survival of the strongest." They are, if I understand Mr. Darwin aright, additional evidence of the truth of the old adage, that, in races as well as in individuals, "the weakest go to the wall," which is Darwinism in six words. D. B.

New York city.

Cure of Rheumatism in Horses.

To the Editor of the Scientific American:

I give you the following recipe for rheumatism in horses; and I will preface it by saying that I am indebted to an Englishman (Mr. R. Jackson) for the same; also, that I have used the recipe upon my horse (whose age is fifteen years) with perfect success—driving him, daily, twelve miles, in all sorts of weather (thermometer from 10° below 0° Fahr. in the winter, to 104° in the shade, in summer), rain or snow. About two months ago, he was so stiff he could not walk; now he is as active as a cat. The recipe is:

Crude coal oil, 1 pint; strong vinegar, ½ pint; turpentine, ½ pint, mixed, and well shaken. To be rubbed on mornings and nights.

If you think this will be any benefit to your numerous readers, you can publish the same.

MACKLOT THOMPSON.

St. Louis, Mo.

Tanning in Vacuo.

This invention of William Masek, of Nashville, Tenn., consists in an improved mode of operation by means of an oscillating rack in an air tight tanning box having a pump for withdrawing the air, a vat for supplying the liquid on the top by opening a valve, and a liquid distributing apparatus inside. The box is also provided with openings, closed air tight by glass, for watching the progress, and a vacuum gage for indicating the vacuum.

The air being pumped out of the box opens the pores of the skins, whereby they are prepared to be most thoroughly saturated with the liquid, which, being let in upon the hides in this condition in a distributed way, is, together with the agitation of the hides in the liquid by the oscillating frame, calculated to very greatly accelerate the work. This the inventor claims to have demonstrated by practical tests, in which sheep skins were completely tanned in six hours; calf skins in twenty-four hours; cow hides in thirty-six, and ox hides in sixty hours. Moreover, the quick saturation of the hides with the liquid, is claimed to make the leather more even in quality inside and out. The quality is also improved; for the fibers on the outside are not damaged by the too great action of the tanning liquid, as in the old and slow process, in which it is necessary to expose the outside too long in order that the liquid may penetrate to the interior

THE more out door air and cheery sunshine we have, the longer will we live.

OCCASIONAL NOTES.

BY G. E. H.

LONDON CITY RAILWAYS.

London, July, 1871.

While New Yorkers are arranging themselves either for underground "quick transit," or quick transit overground—warmly discussing the respective merits of Smith's ingenious "combination" of *one* third coal tar to two thirds ashes *versus* Brown's patented proportion of "*two* thirds coal tar and one third ashes," "as described and explained" for the "coming" universal pavement, or anathematizing their jolting horse cars—conservative old London, brushing centuries of dust from her ancient spectacles, is thoroughly testing the many facilities which modern engineering affords for transporting her millions of population, between the limits of her city walls and the immense outlying suburbs, by rail, tram and road.

The "Metropolitan" underground railway has lately extended its southern arm nearly to the portals of the "Old Lady of Threadneedle Street," thus giving still further convenience of rapid and cheap transit for the "city" man of which our "down town" *habitué* of the New York overcrowded tramways, traversing the "blocked" line of Church or Chatham Streets, can form scarcely an idea.

This completion of what may be termed the "inner circle" of railway communication between the suburbs and the heart of the city of London, was duly commemorated by an "official opening," and one of those liberal and magnificent banquets peculiar to "city" feasts, at the Mansion House Station, which was largely attended by many of the prominent and influential members of the parliamentary, civic, social, and engineering world.

The station was tastefully decorated for the occasion, though one could but notice the unfinished condition of the walls through the hangings, which the hasty erection of the building, within three weeks, readily excused.

This last extension of the line from "Blackfriars" has not only been the most expensive, but of a difficult character, unprecedented even in metropolitan railway experience. To the courtesy of the resident engineer we have been often indebted, and, from the facilities afforded by him, are enabled to present a condensed description of the work.

The station itself is principally built under the new "Queen Victoria" street; and as the space under that street had been devoted by the "Board of Works" to the construction of vaults 12 ft. in depth, and two 8 by 8 ft. subways with sewers (of 3 ft. 6 in.) under the subways, the railway works had to be adapted to their conditions.

This was effected by keeping the railway below the vaults and subways, carrying these works on a tier of heavy wrought iron girders, and the street itself on another tier above the subways. As additional to these enormous weights, that of a portion of the buildings to be erected on the southern side of the street will rest on the girders. They are sustained upon massive wrought iron columns, built of square section, under the girders wherever practicable, each column calculated to a breaking weight of 4,000,000 pounds.

Wrought iron columns were adopted in order to lessen the risk of accident should a train leave the metals, though as a further precaution a heavy brick and timber buttress surrounds each column, three feet high.

In extending the railway under the church of St. Nicholas, the process adopted was to sink narrow shafts at intervals in front and under the church wall, and to fill in with solid brick work in cement to a depth of 40 feet and below the railway level. A tall chimney stack on the opposite side, and several immense warehouses, were similarly proceeded with.

At one point, while passing through the old Lutheran chapel burial ground, the soil to a depth of eighteen feet consisted of little else than skulls and bones; while at the eastern end of the station a very perfect pointed arch passage of the 14th century was discovered, twenty feet wide, and quite large enough to swallow up the houses of the unsuspicious inhabitants above.

Within 280 yards from the terminus, 150,000 tuns of earthwork have been carried away, and 50,000 tuns of new material brought on the ground, within three months, by 2,000 workmen employed night and day.

An estimate of passengers for the year 1871 exceeds 65,000,000, which can only be accommodated by the running of 25 to 30 trains per hour. This the "block" telegraph system allows with perfect safety.

The Metropolitan Railways have been constructed under the direction of John Fowler, Engineer-in-chief, ably seconded by Mr. Baker and Mr. Cooper; and to these gentlemen we are indebted for many favors and much information regarding the works.

In the general railway world, the narrow gage system of from 2 ft. 7 in. to 3 ft. 6 in. is promising a revolution in railway practice; and much credit is due Mr. Fairlie for his strenuous advocacy of the 3 feet gage, and the invention of the locomotive, which bears his name, to profitably work the system. Let him have due credit.

Again, after a long rest, has the "Euphrates Valley" route been revived in Parliament, and seems likely to be ordered. This railway, rivaling the Pacific in its capital of $40,000,000, and intended to shorten the route between England and her Indian possessions by 1,000 miles, is to connect the Mediterranean Sea and Persian Gulf by crossing Asia Minor, and linking in its iron chain many of those ancient cities most familiar to our ears from Bible history, or the "Arabian Nights Entertainments."

But "all aboard" for Babylon, and "this way for accommodation train for Bagdad and Bussorah," will soon lose its novelty; and our children traveling "express" in "Pullman" cars past the cradle of human history, Chaldea, Mesopotamia, Nineveh, shall rest themselves on the site of Paradise, and daughters of Eve discuss the latest Paris fashion on the very spot where their mother's curiosity cost them and us so much.

We have just passed through a tramway struggle, in which American conveniences, having assiduously approached the city limits, have recently failed in their attempts to push their way into the crowded retail streets of the West end; and while the English tramway, with its neat grooved rail, sunk flush with the road, giving the minimum of obstruction to passing vehicles, and the rule which forbids carrying more passengers than can be easily accommodated with seats, are model points which should be rendered as imperative in America, yet we agree with the outcry which objects to those "old men of the sea" from establishing a "right of way," such as their New York prototypes have assumed.

The success of the London tramways has brought out companies with aggregate capital of $7,500,000 for extending their beneficies to those cities of the old and new world not yet provided with such luxuries. But this is not to be regarded so much in the light of overwhelming evidence of their advantages as that of the present speculative mania which is capitalizing every thing, from a silver mine in Utah to a bonded warehouse on the Thames.

The battle of the Asphaltes still goes bravely on. The "Val de Travers" or Swiss Company have laid the "Poultry," "Cheapside," "Old Broad," and "Gracechurch" streets; and although, as a rule, the work is well done, yet its surface is not even, and a slight shower renders it so slippery that many horses are thrown.

The "Limmer" Company, last year, laid a heavy traffic street in the "Borough" which has worked admirably, and have lately completed Lombard street with their material, which is procured from the German States. The process of paving with the "Limmer" is simpler, and does not necessitate the employment of "expert" workmen like the Swiss to "lay" a street. The German Company claim, moreover, that the surface is more even, that no mastic is used, no joints are visible, and that it is not slippery in wet weather; and a company has been formed to monopolize all the asphalte mines in Germany, which is to work the mines, and supply the mineral to the "Limmer" and other concerns.

The relief from the noise and roar of the stone pavements is such, that every street in the city is petitioning for asphalte; and that it will be the "coming" pavement, there can be no doubt.

The feeling here in regard to town travel is, that all the city streets should be laid with asphalte, which gives a smooth, noiseless tramway for all vehicles, while the monopolizing rail tramway should only be allowed to run from the suburbs to the verge of the crowded thoroughfares; which, as combining the maximum of general convenience with a minimum of monopoly, is recommended to the earnest attention of the American citizens.

Information regarding Canals.

There having been many inquiries relative to the dimensions, number of locks, etc., of the Erie and Oswego Canals, we append the following table:

DIMENSIONS OF THE ERIE AND OSWEGO CANALS AND THEIR STRUCTURES.

CANALS.

Length of Erie Canal	351·78 miles
Length of Oswego Canal	38 "
Width at surface of water	70 feet.
Width at bottom:	
With Slope Wall, 1 to 1	56 "
With Slope Wall, 1½ to 1	52½ "
With Bench Wall	42 "
Depth of water	7 "

LOCKS.

No. of Locks on the Erie Canal: Double, 57; Single 15	72
No. of Locks on the Oswego Canal	18
Length of Locks, 110 feet between hollow quoins, admitting the passage of boats 96 feet in length.	
Width at surface of water of lower level	18 feet.
Width on botom	17 feet 4½ inches.

Experiments made in 1848 and 1849, with a single enlarged lock in good repair, and with full attendance, demonstrated that lockages could be m de as follows:

For boat to enter lock, snub and shut the gates	1½ minutes.
To open valves and empty the lock	1 "
To open the gates and get the boat out	1½ "
Total average time consumed	4 minutes.

BRIDGES.

Hight in clear above water line	12 feet.

AQUEDUCTS.

Width about	50 feet.

The light weight of first class boats navigating the canals is from 60 to 65 tuns.

By the regulations of the Canal Board, no boat drawing more than six feet of water shall be cleared after the first day of June, 1864, by any collector on the Erie, Oswego, and Cayuga and Seneca Canals; and it is the duty of every collector, superintendent, inspector and weighmaster, to cause every boat found violating the regulation on this subject, to be so far unloaded as to bring it within the prescribed limits; and in every case where a boat s so unloaded, the fact must be entered on her clearance, with a statement of the portion of cargo taken off; and in every case where a boat shall be found drawing more water than six feet, the master or owner is subjected to a penalty of twenty-five dollars, to be imposed and collected by any and every collector, superintendent, inspector and weighmaster, who may at different times and places detect such overdraft, and it is the duty of every collector to enter upon the clearance the draft of water of every boat at the time of such clearance.

No boat or other craft whose hight or distance from the water line exceeds eleven feet and three inches, and no loaded boat or other craft whose cargo, or any part thereof, is so arranged or placed on such boat or craft, that the top or extreme hight of the same exceeds eleven feet and three inches from the water line; and no steamboat, tug or other craft propelled by steam, whose hight, from the top of the deck, machinery, fixtures or other apparatus exceeds eleven feet and three inches, is allowed to navigate the Erie, Oswego, and Cayuga and Seneca Canals.

All boats propelled or drawn by steam, together with the boats in tow thereof, have preference at the locks over other boats and floats, except as otherwise provided by statute.

A Gift to the People of England.

Mr. John Ruskin, author and art amateur, of Denmark Hill, near London, has recently given a sum of five thousand dollars to the public. Of the many thousand admirers of this gentleman's works, there can scarcely be any who will not predict that his donation was announced in terms remarkable for beauty and originality (perhaps eccentricity), with a strong coloring of Utopian imaginative powers. Mr. Ruskin, moreover, hopes to receive contributions for the prosecution of his idea, from other wealthy and generous men. We give the eminent critic's own words, extracted from the last number of his serial work, *Fors Clavigera:*

"I will tell you a little more of what we are to do with this money as it increases. First, let whoever gives us any be clear in their minds that it is a gift. It is not an investment. It is a frank and simple gift to the British people; nothing of it is to come back to the giver. But, also, nothing is to be lost. This money is not to be spent in feeding Woolwich Infants with gunpowder. It is to be spent in dressing the earth and keeping it—in feeding human lips, in clothing human bodies, in kindling human souls. First of all, I say, in dressing the earth. As soon as the fund reaches any sufficient amount, the trustees shall buy with it any kind of land offered them at a just price in Britain. Rock, moor, marsh, or sea-shore—it matters not what, so it be English ground, and secured to us. Then, we will ascertain the absolute best that can be made of every acre. We will first examine what flowers and herbs it naturally bears; every wholesome flower that it will grow shall be sown in its wild places, and every kind of fruit tree that can prosper; and arable and pasture land extended by every expedient of tillage, with humble and simple cottage dwellings under faultless sanitary regulation. Whatever piece of land we begin work upon, we shall treat thoroughly at once, putting unlimited manual labor on it, until we have every foot of it under as strict a care as a flower garden; and the laborers shall be paid sufficient, unchanging wages; and their children educated compulsorily in agricultural schools inland, and naval schools by the sea, the first indispensable condition of such education being that the boys learn either to ride or to sail; the girls to spin, weave and sew, and at a proper age to cook all ordinary food exquisitely; the youth of both sexes to be disciplined daily in the strictest practice of vocal music; and for morality, to be taught gentleness to all brute creatures, finished courtesy to each other, to speak truth with rigid care, and to obey orders with the precision of slaves. Then, as they get older, they are to learn the natural history of the place they live in—to know Latin, boys and girl both—and the history of five cities: Athens, Rome, Venice, Florence and London. Now, to what extent I may be able to carry this plan into execution I know not; but to some visible extent, with my own single hand, I can and will, if I live."

This is a beautiful picture of an ideal colony, and might be well attempted on a larger scale that even the generous gift of Mr. Ruskin, largely as it may be augmented, will admit. We hope the donor will live to see at least part of the realization of his dream; for all who know him and his books will be sure that it would be the due reward of a man of goodness and genius.

Durable Sensitive Photographic Paper.

At a recent meeting of the Berlin Photographic Society, the President exhibited a specimen of silvered albuminized paper, the advantages of which are here explained.

In six ounces of distilled water is dissolved one ounce of nitrate of silver (free from acid), and in another similar quantity of water one ounce of chemically pure citric acid. When both compounds are completely dissolved in their respective liquids, the latter is poured into the former, the combined solution being well shaken, and subsequently filtered. Finally, one ounce of alcohol is added.

It is quite sufficient if the paper is allowed to float upon the liquid for the space of a minute, or, at any rate, until it swims evenly upon the surface in all parts. Coagulated paper presents more brilliancy, when printed and finished, than that which is not coagulated.

Upon the purity of the citric acid depends the clearness of the bath, for if the acid is at all impure, a grayish precipitate is formed—probably citrate of silver. At the same time, if this precipitate is filtered off, the results obtained are still of a favorable character. The bath will remain perfectly clear and transparent, even after considerable use.

The durability of the sensitive albuminized paper produced in this manner appears to be quite unlimited, for some sheets of the material which were prepared some nine months back are as white and fresh now as when first sensitized.

The advantages entailed by the employment of the citrate-silver bath are not to be despised, for besides the convenience of always having sensitive paper ready at hand, there is obviously less chance of loss from the paper becoming yellow and useless during a lengthened period of unfavorable weather.

Lubricator for Cylinders of Steam Engines.

In the use of tallow or oil in large quantities, more especially tallow, which is often rancid, it is well known that piston heads, followers, and other internal parts of steam engines are more or less corroded, and often are changed into a state resembling plumbago in physical character, from the combination of carbon, from the decomposed grease, with the iron work. The best oils for this purpose are lard, castor, sea-elephant, and walrus oils; but even with these least objectionable lubricating substances, it is very desirable to have some means by which they can be fed economically, uniformly, and sparingly to the interior of the cylinder.

These desiderata are, it is claimed, secured by the use of the invention we illustrate herewith, the essential parts of which are lettered in the engraving as follows:

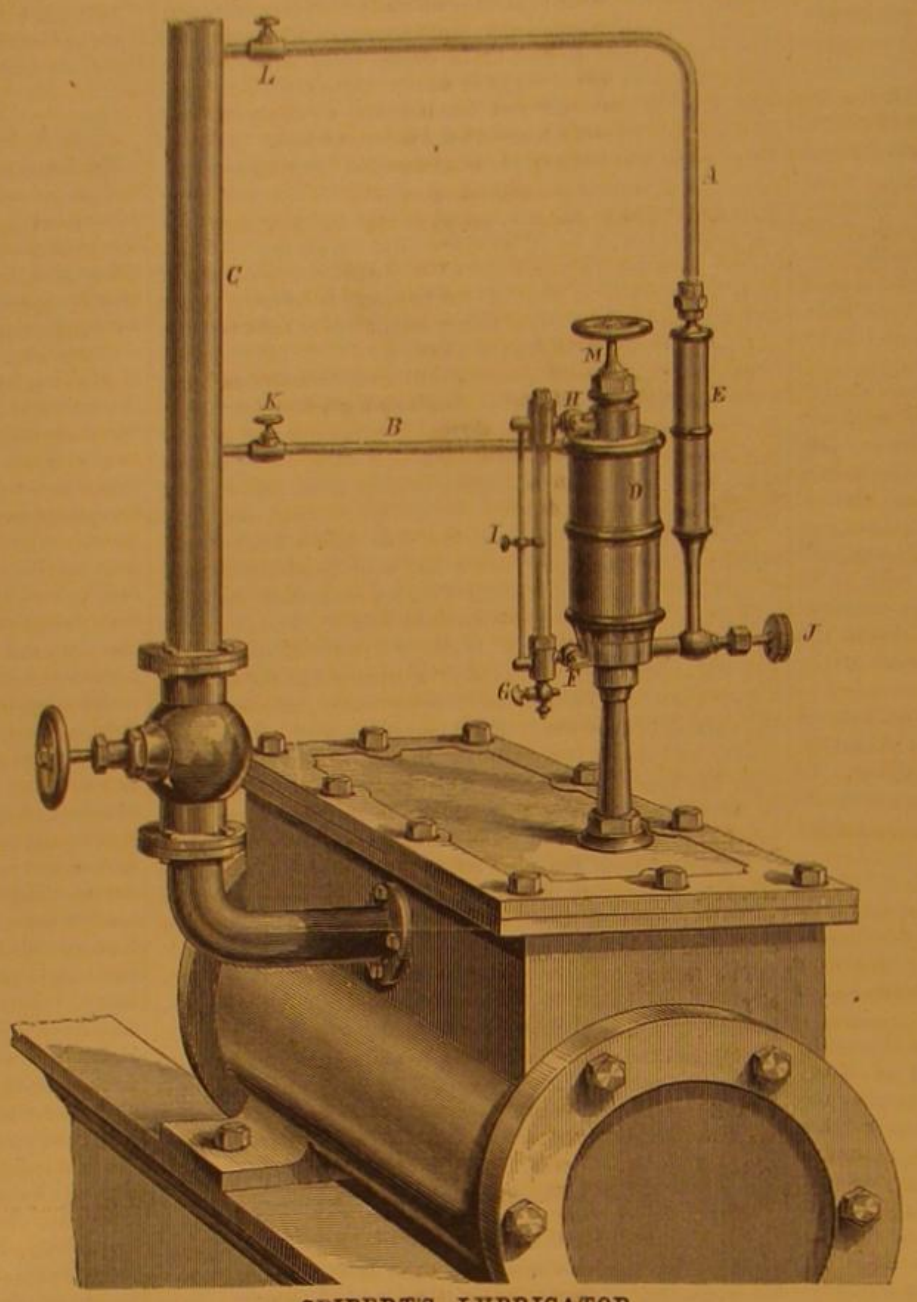
A is the condensing pipe; B the discharge pipe; C the steam pipe from the boiler; D the oil cup; E the reservoir; F a stopcock; G the waste cock used in cleaning the glass tube and removing residuum from the oil cup; H a stopcock; I the sliding gage on the glass tube; J the feed valve; K the valve to shut off the supply of oil when the engine is stopped; L the valve to admit steam into the condensing pipe; and M the valve through which oil is supplied to the cup. There is also a check valve, not shown, on the discharge pipe, B, to prevent steam from entering the cup.

The action of this arrangement is as follows: When the condensing pipe, A, and discharging pipe, B, are connected with the steam pipe, C, the pressure in both the first named pipes is equal; but the condensing pipe has a perpendicular hight above the discharge pipe, and contains a column of water which gives the pressure to force the oil out of the cup, B.

This lubricator is suitable for any engine, either high or low pressure, large or small. In all cases the oil should be discharged in the steam pipe above all the valves. The directions given by the manufacturers for putting up and operating the instrument, are to "stand the cup, where convenient, no matter at what distance from the steam pipe or engine (unless in cold climates, when it is best near the engine). Make the connections as seen in the annexed engraving, as near as circumstances will permit If the steam pipe is copper, punch a small hole—then enlarge it with a tapering punch to receive the tap. The perpendicular pipe on the reservoir, E, must not be less than ten inches above the discharge pipe, and as much higher as may be convenient; when too high, it requires the feed too fine, and when too low, there is not pressure enough to force the oil out of the cup. It takes three inches of water above the check valve to balance it. The best hight is one foot above the reservoir. Care should be taken to make tight joints, as a leak here and there would be enough to oil the engine. The joints where the cup and pipes couple should be sheet lead. If the cup is to be used as soon as put up, fill the reservoir with clean water, also put a little in the cup, enough to show in the glass tube; shut the feed valve to keep the water in the reservoir; put in the oil, and screw down the plug; open the valve to admit steam in the condensing pipe, then start the feed valve, J, a very little, and next the discharge valve, K. It is not necessary to open any of the valves much; the less they are worked the longer the packing will last, and the feed valve need not be open more than just a mere leak. Care must be taken not to feed too fast, as that would force all the water out of the reservoir, E, and it would not work properly; the reservoir and part of the condensing pipe must contain water; feed about one sixteenth of an inch per hour, more or less, by the glass tube. If at any time the oil in the glass tube does not seem to rise, it would indicate that the passage from the glass to the cup was stopped, and should be cleaned out by taking out the cap above the glass tube. Care must be taken, when put back, to hold a wrench in the left hand, against the pressure, while screwing in with the right, so as not to break off the tube arm.

By means of the glass tube the engineer can at all times see just how fast he is consuming oil, and thus is enabled to control the action of the instrument perfectly. The advantages of this method must be so obvious to engineers as to render their enumeration superfluous.

Patented, Feb. 14, 1871, by N. Seibert, whom address, for further information, San Francisco, Cal.



SEIBERT'S LUBRICATOR.

Quiet Ebullition of Liquids.

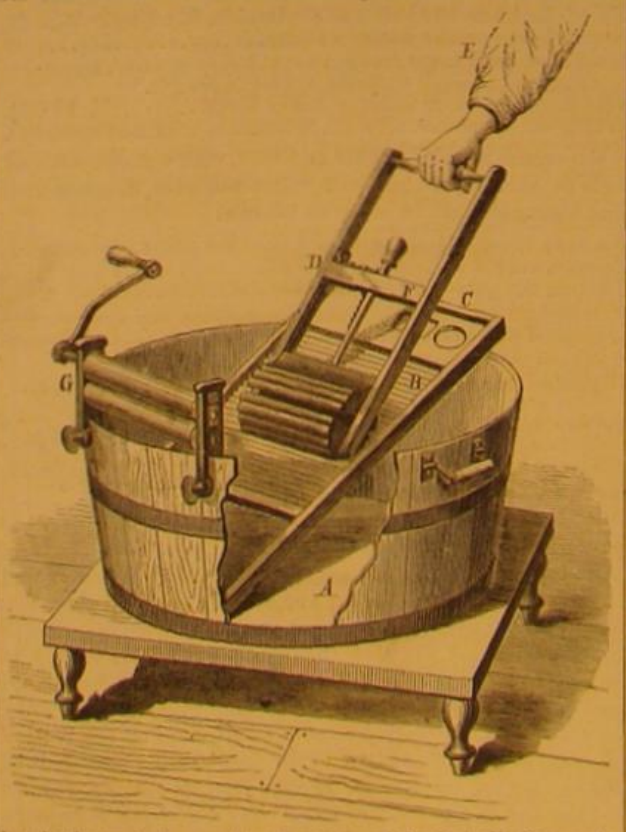
It is of great importance in many analytical and technical processes, that the liquids with which one is operating should boil quietly and with regularity, without that fitfulness and bumping with which all are familiar. It is in this connection that attention is directed to a communication of Th. Schumann, according to which this object may be accomplished in most cases by the following method:

A glass tube about ¼ inch in diameter is taken; this is melted shut at one end, and bent into the form of a hook, while the other end is left open. The tube, which should be about an inch shorter than the distance from the stopper to the bottom of the retort, is then hung by a string from the tubulure. As the liquid is heated, the air in the tube expanding gives rise to bubbles, which regularly ascend; and when the boiling point is reached, vapor of the tension of the atmosphere is formed at the open end of the tube, and the process of ebullition is carried on for days with regularity and quietness. When an operation is interrupted, or the retort filled with fresh material, it is necessary to remove the tube from the liquid, and then to introduce it afresh.

C. Wilkelhofer recommends for the same object that an artificial generation of gas should be kept up in the liquid during the operation, which he accomplishes by passing a galvanic current through it. The action of one of Bunsen's elements, of ordinary size, is said to be sufficient for the purpose, the wires being of copper or of platinum, as the nature of the boiling liquid may require. It is plain, however, that this plan can have but a limited application in practice.

DUGDALE'S UNIVERSAL CLOTHES WASHER.

This device is calculated to do away with that disagreeable concomitant of clothes washing, the excoriation of the hands through the combined action of the hot alkaline suds and friction. As it also allows much hotter suds to be employed than can be used in ordinary hand rubbing, it reduces the amount of rubbing necessary, and thereby lessens the wear upon the fabric. These advantages are important, and are practically secured by the (if we may so describe it) substitution of artificial for natural hands.



The clothes are held during the process of rubbing between the two ribbed portions of a rubber, which, when brought together by the action of the hand screw, F, hold the clothes securely, and present a rounded contour, between which and the washboard, B, the clothes are rubbed, without the necessity of placing the hands in the suds.

The board, B, is attached to the tub, A, by a screw at C. The frame, D, which carries the rubber, is grasped by the hand in the manner shown at E.

A wringer, G, may be attached to the tub as shown, and then this simple apparatus is complete.

Perhaps an even more important advantage than either of the above named is the avoidance of the danger to health arising from the overheating of the arms and hands, and their sudden exposure to cold in hanging out clothes to dry. This sudden and violent change is a fruitful cause of disease which the employment of the device described would wholly obviate.

Patented through the Scientific American Patent Agency, January 18, 1870, by James Dugdale, who may be addressed for further information, or to whom orders may be sent, at Whitewater, Ind.

The Author's Rage for Titles.

The following remarks from the *Indiana Journal of Medicine*, will apply to authors in general, but more especially to all technical authors, as well as to writers on medical subjects.

"In modern times the Pacha of many tales has given place to the many-tailed Doctor; for if the latter writes a book or an article for publication, he generally appends a long announcement of fellowships, memberships, professorships, and lectureships in various societies and colleges, winding up the tiresome task by writing *etcætera, etcætera*, at the end, as if to imply that he could tell us more if he only would, or had the time and breath. We see no reason why a physician should do this *unless he means it as an advertisement of his specialty*, for it certainly cannot lend any value to a book that the author was Toe-nail Extractor-Extraordinary to His Majesty the King of the Cannibal Islands; nor does it add to the intrinsic merit of the work that it was written by one who is a member of the Society for the Restoration to an Upright Posture of Accidentally Overturned Tumble-bugs.

Testing by means of the Blowpipe.

According to the *Chemical News*, M. F. Jean states that sulphuret of sodium is one of the best blowpipe tests, if used in the following manner:—First, a bead is made with borax and the substance to be tested, and this bead, having been made very fluid within the reduction flame, there is added to it some dry and pulverized polysulphuret of sodium, and the bead again heated in the reduction flame. If the substance under investigation can form a sulpho-acid, there will be formed a soluble sulphosalt and a clear bead; but when no such salt can be formed, with lead, for instance, an opaque bead will be formed. Iron, lead, bismuth, nickel, cobalt, palladium, thallium, silver, copper, uranium, &c., fused in a bead of borax, to which, afterwards, sulphuret of sodium is added, will yield a black or brown colored opaque bead; zinc yields a white opaque bead; cadmium, while yet hot, scarlet red, and yellow after cooling; manganese, a dirty chestnut brown; gold and platinum, a clear, transparent, mahogany brown bead; tin, a clear, transparent, yellowish brown bead; chromium, a green bead; arsenic and antimony, colorless clear beads; vanadium and iridium, blood red beads; a slight excess of the sulphuret of sodium is required, and the bead should be heated carefully, but steadily, and with a good blast in the reduction flame.

Orange Wood.

Mr. George W. Moody, of Waxahachie, Texas, has obligingly sent us a specimen of orange wood, sometimes called *Bois d'arc*. He informs us that it is indigenous to Texas, and is there valued highly for carriage and wagon building. Changes of weather never affect it, and wheels made of it have been in use for ten or fifteen years without needing repair, while other wheels in the same locality require to have the tires shrunk once a year. Vehicles built of this wood command higher prices by thirty per cent than those of ordinary timber. Land with this timber growing on it can be bought for from three to five dollars per acre. The wood yields a beautiful orange dye, for which the sawdust, now valueless, can no doubt be used. Mr. Moody anticipates that, when railroads are extended to his section of the country, one stick of this timber will be of more value than an acre of the land is now.

MR. J. L. DENNEY, of Christiana, Pa., has had struck an artistic medal for patentees. An engraving of the exact size and shape of it may be seen in advertising page. The emblems are appropriate, and the whole design is artistic.

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Contents:

(Illustrated articles are marked with an asterisk.)

Acoustics 148
A Gift to the People of England... 149
*Anchor Beam Support for Brick Walls 146
Answers to Correspondents 154
Applications for the Extension of Patents 155
Artistic Medal 150
A Spontaneous Explosive 145
Business and Personal 153
Cure of Rheumatism in Horses.... 148
*Dugdale's Universal Clothes Washer 150
Durable Sensitive Photographic Paper 149
Editorial Summary 153
Hardening Rails 153
Information Regarding Canals.... 149
Inventions Patented in England by Americans 155
Is the World Round or Flat? 151
Lace Manufacture in Brooklyn.... 144
*Lubricator for Cylinders of Steam Engines 150
Medicine and Medical Practice in China 147
Mr. Crookes on the "Psychic" Force 144
New Books and Publications 153
New York Police Inspection of Boilers 151
Occasional Notes 149
Official List of Patents 155
Oil proof Rubber for steam packing 146
Orange Wood 150
Paine's Motor 148
Plaster of Paris Manufacture 144
Psychic Force 148
Quiet Ebullition of Liquids 150
Queries 154
Recent American and Foreign Patents 155
Rejected Correspondence 155
Scientific Intelligence 152
Stanislas Sorel 151
Steam Boiler Inspection 148
Steam Boiler Legislation in England 151
Tanning in Vacuo 148
Tea and Milk 147
Teeth 145
Testing by Means of the Blowpipe 150
The Author's Rage for Titles 150
*The Burdict Bolt Heading Machine 143
The Dangers of Sewage Irrigation 143
The Darwinian Theory 148
The Grahamite Asphalt Pavement 152
*The New Hotel, Cairo, Egypt.... 147
The Preparation of Fancy Soaps.. 146
*The Road Steamer and Omnibus. 146
Water power of St. Anthony's Falls, Minn 145

STANISLAS SOREL.

With characteristic modesty, Sir Walter Scott, when at the zenith of his literary fame, distinctly assigned to literature a lower place than that occupied by science. He once wrote to Joanna Baillie that "men like Watt, or whose genius strongly tends to invent and execute those wonderful combinations which extend in such an incalculable degree the human force and command over the physical world, do not come within ordinary rules."

One of these men passed away from earth on the 18th of last March, the very day the Communist insurrection began to rage in Paris. His name was Stanislas Sorel; and few men have more completely filled the terms of Scott's definition, as quoted above, than he. His inventions for saving life, for simplifying and facilitating labor, and, in fine, for "extending the human force and command over the physical world" have given him an honorable place among the world's benefactors.

Stanislas Sorel, the son of a poor clock maker at Putanges, in the department of Orne, France, was born in 1803. He received no education, but at an early age began to toil at the paternal trade. Under the discouragements of ignorance and the indifference to intellectual and material progress which characterized the community of which he was a member, his native genius asserted itself, and he early won a local fame as an ingenious and skillful artisan. He married, at the age of twenty-one, a young woman of his native town, and assiduously labored at his bench until 1829, when, no longer able to endure the restraints of his seclusion, he boldly set out for Paris.

Friendless and almost penniless he entered the great city, and for several years endured such hardships as only the strongest natures are able to survive. Obliged, in order to gain a bare subsistence for his family—a wife and two children—to toil steadily at his trade, he yet found opportunities of gathering knowledge, and of unconsciously fitting himself for his grand career. He attended lectures on scientific subjects, experimented as he could, and finally produced some inventions which may be said to have foreshadowed his subsequent achievements. Among the most important were the solar lamp and thermostatic siphon.

In 1838, he discovered and perfected in detail the process of galvanizing iron, and his invention was cordially recognized by the Society for the Encouragement of National Industry, which awarded him a gold medal. From this success his advance was rapid and brilliant. Not a year passed in which he did not produce some original discovery or some important improvement in practical science.

He invented the alarm whistle attached to the safety apparatus of steam boilers; improvement in the manufacture of oxide of zinc, now generally adopted; the waterproofing of woven fabrics; the oxychloride of zinc cement, the cheap filling for teeth now used by dentists under various names, but which for general purposes was superseded by his last, and, as M. Sorel always claimed, greatest discovery, the oxychloride of magnesium cement. And it was upon the multitudinous applications of this new and wonderful compound that he was engaged when overtaken by death.

For those inventions and discoveries he received a score of prizes, gold and silver medals, the Montyon prize twice, the decoration of the Legion of Honor, and the "Marquis of Argenteuil Prize" of 12,000 francs, or $2,400 in gold, which prize is given by the Academy of Sciences for discoveries only of the greatest value, and which had been awarded to but two persons before, Messrs. Vicat and Chevreul.

The names of these discoveries will suffice to indicate to the intelligent reader the extent and value of his services to the world.

So numerous and varied are the articles made from galvanized iron that it has ceased to be a novelty. Doubtless in a few years the same will be true of magnesium cement, to which we called attention in connection with the articles made by the Union Stone Company, of Boston, in the SCIENTIFIC AMERICAN of October 22, 1870, and April 29, 1871.

M. Sorel, dying amid the distractions of a terrible civil war, lacked those grateful tributes of honor which in happier times his great services to science and humanity would have elicited; but it is not too late for America, who, in common with, France has shared his benefactions, to revive and freshen the memory of his genius and his works.

NEW YORK POLICE INSPECTION OF BOILERS.

The public alarm, caused by the *Westfield* explosion, has aroused the sanitary police to activity, and five engineers are now employed in the examination of boilers throughout the city. Up to the 23rd August, they had, according to report, inspected one hundred and twenty-six boilers, and had pronounced seventeen defective. The steam gage was defective in ten, the safety valve in three. Two boilers were totally condemned. Both these boilers were under ground, one in a cellar, and another in a vault. Various other defects were found; flues, steam drums, and shells leaking, etc., etc. We trust these inspectors are doing thorough work. They certainly are proceeding in hot haste. They have averaged at least twenty-five boilers apiece in twenty-three days, according to this report, counting in Sundays.

In view of the explosion of the boiler of the steam tug *Starbuck*, which had only a few days previous been inspected, the public is not satisfied with merely the announcement that inspection is going on with rapidity. We wish to know whether the inspectors go inside of the boilers, or whether they are too fat to get in. We wish to know whether the sitting down to a champagne supper, or being asked to step behind the cabin door a moment, constitutes an inspection or not. We wish to know whether an old boiler well greased over till it shines is passed for a new one, when there are private reasons for so doing. We all "want to know, you know," and intend to be troublesome unless we get the information we seek. Let the "Tite Barnacles" heed the fact that people are thoroughly aroused upon this subject, and are not to be satisfied with fables.

The facts relative to the explosion upon the *Starbuck* are these:

In towing three canal boats from Port Johnson, N. J., to this city on Saturday, August 19th, she exploded her boiler when in the channel separating Staten Island and New Jersey, and about half way between Port Johnson and New Brighton. There were five persons on the tug at the time. The fireman was standing directly in front of the furnace when the boiler gave way, and was so badly scalded by the hot water and the steam that he died in a few minutes. The engineer was talking with the deck hand, outside the engine room, when the noise of escaping steam was heard. They ran aft, but the deck hand returned, and succeeded in reaching the lever by which the boat was stopped. The captain, in the meantime, sprang upon another boat. No one but the fireman was injured.

As we have said, this boiler had been recently inspected: that is, it had undergone the ceremony usually styled inspection, but which the public is resolved shall no longer be called by that name.

In the testimony taken by the coroner, it was sworn by Mr. McMurray, whose testimony in the *Westfield* case we published last week, that there were only two sound stays in the boiler; that in some places the boiler was only one sixty-fourth of an inch in thickness, that the steam gage indicated ten pounds too much, and that the safety valve was set at seventy-two pounds; also that the boiler was patched to an unusual extent. According to Captain Roder's testimony, the inspection occupied only from one half to three fourths of an hour. Mr. McMurray also testified to the worn out condition of the furnace.

The jury rendered the following

VERDICT.

We find that George Williams was scalded to death by the bursting of the boiler of the steamtug H. G. Starbuck, on the 19th of August, 1871.

We find the United States Inspector, E. Platt Stratton, and the Engineer, Charles H. Mills, guilty of manslaughter in the third degree; and censure the owners of the steamtug for carelessness in running said vessel while in an unfit condition, and also Inspector Matthews, for granting a certificate as engineer to said Charles H. Mills.

A few more such verdicts as this, and inspectors will find the people are in earnest.

STEAM BOILER LEGISLATION IN ENGLAND.

The management of steam boilers is, for reasons sufficiently obvious and painful, the question of the day with us; and the report of a select committee of the British House of Commons, just issued from the press, will be interesting to all our readers. Its chief noticeable features may be described as follows: The numerous voluntary associations for the inspection of steam boilers are highly spoken of by the committee as being useful in preventing explosions. But the difficulty in inducing many obstinate and ignorant boiler owners to join these associations, combined with the facts that many boilers are placed in cellars, under doorways, in the midst of crowded dwellings on public thoroughfares, and with the notorious truths that many of these boilers are most faulty in design, construction, and equipment, and are run by men ignorant of this special work, and untrustworthy in their characters, indicates the necessity for stringent legislation on this most important subject.

Evidence was given before the Committee to the effect that there are at least 100,000 boilers in the United Kingdom, in use for generating steam for stationary and agricultural engines; the enormous number of locomotives, marine engines on vessels in the harbors, and boilers for heating purposes, etc., worked at a pressure, are omitted from this estimate. The average number of boiler explosions is fifty per annum, and of lives lost from these causes, seventy-five. The majority of these calamities are due to carelessness, either in original construction, as to repairs, or to inattention on the part of users and their servants. The Committee admits that many explosions take place from causes, the existence of which cannot be detected by inspection; and does not recommend compulsory inspection, as it would tend to "lessen the responsibility of owners, who are best able to ascertain the condition of their boilers, and the competency of men employed to work them." The Committee puts its views into a practical shape by the following recommendations;

"That it be distinctly laid down by statute that the steam user is responsible for the efficiency of his boilers and machinery, and for employing competent men to work them; that, in the event of an explosion, the *onus* of proof of efficiency should rest on the steam user; that in order to raise *primâ facie* proof, it shall be sufficient to show that the boiler was at the time of the explosion under the management of the owner or user or his servant, and such *primâ facie* proof shall only be rebutted by proof that the accident arose from some cause beyond the control of such owner or user; and that it shall be no defence in an action by a servant against such owner or user being his master, that the damage arose from the negligence of a fellow servant.

"That whenever an explosion happens to a boiler, whether such explosion is or is not attended with loss of life or injury to person or damage to property, it shall be the duty of the user to report the same to the coroner of the district; and the coroner to whom the accident is reported, or in failure of such report, on the fact coming to his knowledge, shall hold an inquiry, and apply to the Board of Trade, and the Board of Trade shall thereupon direct one of their competent practical surveyors of boilers, or some other practical person, to assist the coroner in the investigation."

The objection to compulsory inspection is reasonable, apart from the well known English dislike to government meddling with trade and commerce. The recommendation to make the owner of an exploded boiler personally responsible, to throw on him the *onus probandi* as to the entire efficiency of the boiler in all particulars, and to make him pecuniarily liable for damages, even when the disaster is caused by the acts of his servants, cannot be too highly commended. No action of any government will do so much to raise the quality of steam boilers, or the average of knowledge of engineers and firemen, as the conviction, forced upon the boiler owners and steam users, that a faulty utensil and an incapable servant are the most dangerous possessions to have in a factory, as the evil they do touches the vital part of all commercial existences—the pocket.

IS THE WORLD ROUND OR FLAT?

About a year ago, an eccentric philosopher of London, England, named John Hampden, having convinced himself beyond all peradventure that the world was flat, not round, as commonly supposed, undertook the arduous missionary work of converting mankind to his way of belief. Not making much progress by following the ordinary methods of private preaching, he resorted to the expedient of offering a bet upon the subject. He made a public announcement, offering to stake $2,500 against $2,500, to be put up by any scientific man, that he could prove that the earth was flat, and not round, as every body else believed.

No one appears to have taken immediate notice of this absurd offer, whereupon Hampden came out with another announcement, in which he boldly declared that scientific men knew they were guilty of an imposition in propounding the round theory, and that, in consequence, they were afraid to take up his challenge, and stake $2,500 as he proposed.

But the challenge having come to the notice of Mr. Alfred Russel Wallace, a gentleman of high reputation, and a member of several scientific societies, he accepted the conditions, and put up his $2,500. This amount, together with a similar sum put up by Hampden, was deposited, subject to the order of the referee, Mr. Walsh, editor of the *Field* newspaper, who was to pay over the $5,000 to the winning man.

The mode adopted for settling the question was planned by Hampden, the advocate of the flat theory, and the experiment appears to have been conducted in all respects as he desired. The ground selected was a six mile level, on the Bedford Canal. Three long poles of equal length were provided, and planted at equal depths, and at distances of three miles apart. A telescope was then employed, through which it was clearly and unmistakeably perceived that the central pole was five feet above the level line of the telescope, which at once proved that the earth was not flat but rotund. Mr. Hampden expressed himself satisfied that he had lost the bet, and the money was accordingly paid over by the referee to the winner, Mr. Wallace.

The experiment and the telescope were level, but not so the head of Hampden. He that's convinced against his will, is of the same opinion still. It was not long before Hampden woke up to the mortifying conclusion that he had made a blunder, or that in some way he had been befogged. His reason told him that the earth was still *flat*, not round, as

that lying telescope and those fibbing poles had affirmed. He concluded, also, that Wallace was a thimble rigger, a pickpocket, a liar, and a swindler, and went about proclaiming these libels in the most unblushing manner. This so annoyed Wallace that he brought suit for libel against Hampden, and the jury lately mulcted him in $3,000 damages, making a sum total of $5,500 cash paid out on account of his theory that the earth is flat. Poor Hampden is indeed a martyr to science.

THE GRAHAMITE ASPHALT PAVEMENT.

Near the "Battery," at the lower part of the city of New York, a piece of pavement has recently been laid, which, only four inches in thickness, resists remarkably the wear to which it is exposed from very heavy trucking, omnibuses, and lighter traffic combined. The location is a trying one for any roadway, and the fact that the pavement referred to is a new claimant for public favor, has attracted our attention. We visited it, and tested the quality of its surface, as we have all the other kinds of pavement laid in the city, and found our interest so much hightened by our experiments that we have taken the pains to gather all the facts we could concerning it. We now, as a matter of great public importance, lay these facts before our readers.

This pavement is now being laid in Central Park, the ease and facility with which it can be put down permitting it to progress at the rate of from six hundred to eight hundred yards per diem. It is here that its beauty is shown most perspicuously, and where its history as a successful pavement may be said to have fairly begun. While in the Park it will not be put to as severe a test as it receives at the Battery, it will attract the attention of the thousands who visit that celebrated place of resort, and will add much to the attractions of the place.

Let the reader imagine an entire avenue evenly graded and covered with a single slightly and gracefully arched wrought slab of dark gray slate, and he will gain some idea of the appearance of this pavement as laid in the Park. To imagine its texture to be like the slate it resembles in color, would, however, be very erroneous, for the material used is not only slightly flexible and elastic, but if we use a hammer to batter its surface, we discover that we may indent it a little as we might a slab of lead, and also that by hammering about the indentation we may smooth and fill the little hollow again so that it is not noticeable. We may say, therefore, that this material is malleable. We find, also, that by taking a small piece of the material, and brushing the surface of the roadway clean, we may, by hammering, weld the fragment to the surface. This tough plastic character is one of the most valuable qualities of the pavement. The surface indents just enough to give the requisite foothold for horses and these indentations are continually filled by the action of the wheels of vehicles so that the surface integrity is constantly maintained.

The ease and facility with which the pavement is laid has already been alluded to. We may add, that in an hour or so after the material has been put down, the surface is ready for travel. It may be swept as easily as a stone slab, and will dry when washed even quicker than stone, as it does not absorb water in the least, and has little or no adhesive attraction for moisture. As a consequence, after heavy rains the sun is no sooner out than the road is dry. So that ladies might walk upon it with the thinnest slippers, without danger to health. The advantage of this in the employment of the new pavement for walks in pleasure grounds, footways in streets, etc., need not be dwelt upon.

The objection made to most water tight pavements that they kill shade trees in streets through the exclusion of water and air from the roots, does not obtain in this case, as during the summer months, when the roots need moisture and air, an opening of suitable size can be cut out about such trees, and sealed during the fall rains and frosts of winter, if necessary, in soils liable to upheave in freezing. The opening may be cut out without difficulty and closed at a trifling expense.

In short, while affording the requisite resistance to wear, and to softening by heat, the material is altogether the most tractable and manageable of anything we are acquainted with except the Seyssel Asphalt, of which the celebrated drives of Paris are constructed. While it has all the valuable properties of the last named material, it will not soften in a sun heat of from 100° to 120° Fahr., as the Seyssel asphalt roads do. In fact, by suitable tempering, any requisite degree of hardness may be attained, so that it will resist even a temperature of 800° Fahr. without fusing.

The reader will by this time be impatient to know what this remarkable material is. When first discovered it was thought to be coal, and was analyzed as such by Dr. Doremus of this city. Subsequent examination by Professor Wurtz, editor of the *American Gas Light Journal*, showed that it was completely soluble in various well known *menstrua*, and he pronounced it a mineral resin. Professor E. J. De Smedt claims that it is in character similar to the Seyssel asphalt, but that it contains a larger proportion of asphaltene, which is difficultly fusible, and a very bad conductor of heat. He therefore in a communication to the SCIENTIFIC AMERICAN of March 5, 1870, called it the "*American Asphalt*," and pronounced it far superior to the Seyssel asphalt for road making.

The extensive and almost inexhaustible deposit of this material was discovered in Ritchie county, West Virginia, in 1857 or 1858. The title of this property became ultimately chiefly vested in Messrs. James Lorimer Graham of New York, and John A. Graham of Maryland; and the mineral has been introduced to the scientific world by Prof. Wurtz under the name of Grahamite, in honor of the gentlemen who have done so much to develope its utility.

A wealthy company has been formed to use this valuable substance, either alone or in combination with other asphalts, in paving walks and streets, but this application is only one of many to which Grahamite is adapted. For the present, however, the proprietors are bending their energies to combat the prejudices begotten by the humbug pavements of the period, and to demonstrate to the American public that the "coming pavement" has come. This company, named "THE GRAHAMITE ASPHALT COMPANY," has an office at Brown Brothers' building, Wall street, New York, room No. 6; Mr. James Lorimer Graham is President. The company now laying the pavement described is known as the Grahamite Asphalt Pavement Co., of the city of New York, and the office is at 229 Broadway; Gen. W. W. Averell is the President. This company acts under license from the one above mentioned.

The raw material undergoes a process of preparation for road making, in which a valuable oil is extracted. About 14 per cent of the prepared asphalt is then mixed with sand and put down hot in a layer of from one and one half to four inches in thickness, according to the nature of the service to be exacted. This feature is secured by letters patent in this country and abroad. Very simple implements are employed of a similar character to those illustrated and described by us for laying the French roads, in our issue of February 12, 1870. The road is as easily taken up and repaired as the French asphalt roads, and is undoubtedly superior to the latter in several respects.

In conclusion, we may add that the opinion we expressed in the article last referred to, seems to be verified, and the possibility of a composition combining the advantages of the Seyssel asphalt, without its defects, demonstrated.

SCIENTIFIC INTELLIGENCE.

OXYGEN FROM THE ATMOSPHERE.

The economical preparation of oxygen gas on a large scale, for use in the arts, has long attracted the attention of chemists, and several ingenious suggestions have been made looking to a solution of the difficulty; among the most recent of which is the one by Mallet, in Paris, who has devised a plan for obtaining the gas from the atmosphere by taking advantage of the greater solubility of nitrogen in water than oxygen. If air be passed through water, more of the oxygen is absorbed than nitrogen; and it is only necessary to repeat this operation a number of times to arrive at an atmosphere from which nearly all of the nitrogen has been eliminated. It is difficult, without the aid of wood cuts, to convey an idea of the apparatus which has been constructed for accomplishing this result, but it is chiefly composed of a series of cylinders, to each of which is attached a force pump for drawing in the air and passing it from one vessel to another. The moment the pressure is removed from the water, the gas escapes just as it does from a soda fountain. The following table gives the results of careful comparative experiments, which were made to test the accuracy of the method:

Common air is composed of	Composition after passing through 8 Cylinders.							
	1	2	3	4	5	6	7	8
Nitrogen..79	66·67	52·5	37·5	25	15	9	5	2.7
Oxygen..21	33·33	47·5	62·5	75	85	91	95	97·3

This exhibit shows that after the air has been passed through eight cylinders, there remains less than three per cent of nitrogen—a quantity which may be disregarded in most technical operations. Mallet's method may be called the mechanical to distinguish it from the chemical process of Tessié du Motay. Not half the noise has been made about it as there has been in reference to the latter process, and yet it seems likely to supersede all others.

There are many metallurgical operations in which powerful blasts of air are employed to increase the force of combustion, where experiments ought to be instituted to ascertain if the quantity of oxygen could not be increased by the intervention of a drum or some kind of receiver for water. If this could be done without interfering with the requisite supply of air, it is probable that greater heat, with a large saving of fuel would be the result.

LEAD FOIL FOR BANDAGES.

Doctor Burggraefe, of Geneva, recommends thin lead foil bandages, in cases of wounds and broken limbs. The sheets of lead are kept in place by adhesive plaster, and are said to offer the following advantages: 1. The lead remains soft and cool in contact with the wounds. 2. It enables the physician to dispense with lint, which is the constant occasion of heat and infection. 3. The sulphur compounds which form prevent the decomposition of the parts and growth of organisms. 4. After the bandage is made, the wound can be washed and refreshed with cold water without removing it. It would be well to have a supply of this foil on hand in machine shops where large numbers of workman are employed.

PRINTING ROLLERS FOR PHOTOGRAPHERS.

Soft and elastic rollers suitable for photographers use, can be prepared as follows:

Three parts of common glue are left to soften in cold water for two days, the pieces then removed and wiped with a dry cloth, then melted at gentle heat without any further addition of water, and one part of sirup, previously boiled, added, and the mixture well boiled; and when ready poured into a polished copper mold, the interior of which has been oiled, and in which is a wooden axle with handles on the ends, around which the glue will set. After it is removed from the mold, it is washed with alcohol and left a few days to dry in the open air, then laid into a solution of tannic acid, rinsed with water, and again dried; the roller is then ready for use.

OXIDATION OF AMMONIA.

To exhibit the rapid oxidation of ammonia, Hoffmann puts a tuft of platinized asbestos in the middle of a combustion tube, places red litmus paper before and blue paper behind it, and conducts a current of air impregnated with ammonia over the heated point. The formation of nitrates and nitrites is immediately shown by the reddening of the blue litmus paper, and in the cool part of the tube, white fumes of salts are deposited. If the operation be continued for some time it is easy to fill a flask with the ammoniacal nitrates.

AUTUMNAL FOLIAGE.

The micro-spectroscope enables us to test coloring principles in mixtures without the necessity of isolating them. The coloring matters of leaves may be studied in this way, and can be appropriately divided into five groups:—*chlorophyll*, *xanthophyll*, *erythrophyll*, *chrysophyll*, and *phaiophyll*. The first two are insoluble in water, but soluble in alcohol and bisulphide of carbon, the last three are soluble in water but insoluble in bisulphide of carbon. Leaves generally contain colors belonging to several groups, and frequently more than one of the same group. Green leaves are colored mainly by chlorophyll, the tint of which is modified by the presence of members of the xanthophyll and chrysophyll groups. The change of color which takes place in autumn foliage is due to the disappearance of the chlorophyll, rendering the remaining colors visible; most frequently these are yellow. When the leaves turn red, it is indicative of diminished vitality, and by stopping the growth of the plant, the intensity of the red color is increased. The gold and green tint may be considered characteristic of the complete vitality and growth of leaves, the red and yellow of low vitality and change, and the brown is the *humus* of death and decomposition. Tender leaves, creeping vines, half girdled trees, and exposed foliage are the first to change their tints as the cold weather approaches, and the first acts upon the coloring principle; and the gradual change from the green through yellow, red, and brown, at once indicates the progress of the decay. We are indebted to Dr. Sorby for valuable researches with the micro-spectroscope, some of the results of which are given above.

ANHYDRO-SULPHURIC ACID.

The compounds of Nordhausen sulphuric acid may be considered as salts of a peculiar acid, to be called anhydro-sulphuric acid, and to which, under the new system, may be assigned the formula of $H_2S_2O_7$. Only the salts of the alkali metals have been known up to the present time, but recently Schultz-Sellack has succeeded in preparing the corresponding barium and silver compounds. The silver salt affords colorless crystals, and the barium compound hisses when water is added to it.

The solvent properties of the mixture of oil of vitriol and anhydrous sulphuric acid have long been applied to the solution of indigo, but further than that the subject has not been sufficiently studied. It is probable that the salts of silver and barium now first made by Schultz-Sellack may ultimately prove of value in the arts, and increase the use of anhydro-sulphuric acid.

TO RENDER FABRICS UNINFLAMMABLE.

The best ingredients for this purpose are a mixture of borax and sulphate of magnesia, or a mixture of sulphate of ammonia and sulphate of lime.

UTILIZATION OF FURNACE SLAG.

Numerous propositions have been made for the utilization of iron slag, but they have generally proved unavailable, in consequence of the cost of working them. It seems a pity, however, that something should not be done to avoid the enormous waste that may be seen at any time near our large blast furnaces; and it appears to us that metallurgists devote too little attention to the subject. One reason why so little progress has been made is manifestly to be traced to the fact that very few chemists are to be found connected with blast furnaces, who might be supposed to be possessed of sufficient knowledge to enable them to analyze the slag, and point out the purposes for which it is best adapted. Where the ore to be smelted requires the employment of an aluminous flux, we have a slag which is capable of being worked up into alum; it is also admirably adapted to the preparation of cements. Where limestone is used as a flux, the slag is an impure glass capable of being employed in the construction of buildings, walls, and roads. Instead of allowing the cinder or slag to run away in rivulets, it would be possible to have it cast in iron molds of any required size, and after gradual cooling, by which it is annealed, it could be piled up ready for transportation. We have seen in Germany the gardens near a blast furnace, and even farm lands, surrounded by walls laid up of rectangular blocks of slag, which were thus cast at the mouth of the furnace; and there was another application of these blocks which we have never witnessed in this country, namely, as soon as the casting was made, the mold was put upon an iron wheelbarrow and hastily wheeled to the kitchen by one of the workmen, where it was dumped upon the hearth, and served for heating the house and cooking the dinner. Each workman was entitled to a certain number of these blocks, and after they were cool they were either used in making a wall around his garden or in constructing a house. The rectangular iron molds were placed in the track of the overflowing lava, and there appeared to be no practical difficulty in thus economizing the heat of the cooling mass, and of subsequently employing the blocks as indicated above. We suggest to some of our iron masters an imitation of this operation.

THE DIAMOND DISTRICTS OF THE CAPE OF GOOD HOPE.

Mr. Warrington Smyth has recently paid a visit to the diamond bearing districts of the Cape of Good Hope, an account of which he has submitted to the Geological Society of Lon-

don. The geological structure of the country between Cradock and Middleburg is very uniform, showing few traces of upheavals. The rocks are chiefly sandstones of various degrees of fineness, with alternating beds of red or blue marl. Near Hope Town there are immense tracts of sand, and it is here that an active trade in diamonds is carried on. The tract of country between the Orange river and Vaal river, called Albania, is very barren of geological interest, being chiefly a sandy waste with a few low hills, dykes of green stone, trap, etc., and occasionally an outcrop of hard blue schist. The true diamond district was at the Griqua Mission Station. Here was observed the outcrop of a hard conglomerate, sometimes assuming the aspect of a *breccia*, composed of angular and rounded pebbles and blocks of quartz and jasper of all sizes; overlying this was a highly ferruginous soil containing numerous pebbles of quartz, jasper, and iron ore in which the diamonds had been found. A great deal of unstratified limestone was observed, in which diamonds were said to have been found with limestone adhering to them. Beneath this limestone, when cleaned away, a ferruginous clay makes its appearance, and is searched by the natives for diamonds. The diamonds were everywhere obtained from the ferruginous soil, and the spots which had been searched were always near the river. As many as 500 diamonds were seen in the possession of one person, some weighing as much as fifty carats. There was one fragment of a stone which must have originally been at least as large as the Koh-i-noor. Mr. Smyth considers that the reports of the number of diamonds found have been greatly exaggerated.

Hardening Rails.

Want of room at Demitoff's rail mill, at Salda Nischne, caused, some years ago, a lot of red hot rails to be removed to outside of the building where the ground was covered with snow, when it was found that the iron had been wonderfully hardened by the sudden cooling process it had undergone. A government commission, by careful examination, satisfied itself on this point, and since that time all the Russian mills have adopted the plan of suddenly cooling the rails by means of water. The rails are plunged into cold water immediately on leaving the saws, except at the works of Von Patilow, near St. Petersburg, where rails with heads of mild puddled steel are allowed to cool sufficiently to lose their luminosity before receiving the cold bath. Rails so treated are found to be perfectly reliable in the severe winters of Russia, so that there can be no question of their service in other and less rigorous climates. "The degree of fracture in good hardened rails depends," says a cotemporary, "obviously on the degree of hardness, and this depends not only on the amount of carbon present in steely irons, but on the temperature at which the hardening is effected; and there can scarcely be any tenable ground why rails should not be hardened while many other articles are, in which fracture is equally to be feared. The hardening effected by sudden cooling is indisputably less dangerous than that imparted by phosphorus; and, in case of iron free from impurities, when we compare rails hardened on the one hand by the addition of carbon (approaching steel in composition), and on the other by sudden cooling, the advantage of safety would undoubtedly be in favor of the latter—to say nothing of the expense of manufacture.

EDITORIAL SUMMARY.

THE *Phrenological Journal* gives an account of the case of James T. Anderson, whose body, by a severe injury to the cervical region of the spine, has become entirely useless to him, except for purposes of digestion, while his brain retains its normal force and capability. Unable to move or to act except with his head, and with the increase of activity of the mind that his helpless condition has induced, Mr. Anderson has already become proficient in the art of writing by holding the pen in his mouth, and is even practicing drawing by the same means. The case is a remarkable one, being a proof that injury to the cervix may extend, from its seat, in the direction of the body, without traveling in the other direction, towards the brain. Some of our physiologist readers may be able to explain a fact so much at variance with current belief.

A HUGH ELECTRO-MAGNET.—Wallace & Sons, of Ansonia, Connecticut, have just delivered to the Stevens Institute of Technology a magnet which weighs in all about 1600 pounds The coils are wound on eight brass spools, each 9¼ inches high by 11¼ inches external diameter. About 400 pounds of copper wire, ½ inch thick, are wound on these spools, which are of course split and filled in with vulcanite. The cores are hollow, and six inches in diameter by 3 feet 3 inches in length. The lifting force of this magnet is estimated at between 30 and 50 tuns. It will be five times as powerful as the one used by Faraday and Tyndall in their famous researches.

DECORATION OF METALS.—Dr. Puscher recommends a solution composed of a mixture of 3 parts of hyposulphite of soda and 1 of acetate of lead, for the purpose of decorating metallic surfaces. When heated to about 100° C., this solution deposits a layer of sulphide of lead upon any metallic surface in contact with it—the effect of the peculiar color of the metal beneath being to produce a great variety of tint.

THE commencement of a systematic traffic through the Mont Cenis tunnel is announced for September 15th, on which day a formal inauguration of the colossal work will take place.

MR. T. W. WOODWARD, of Winnsborough, South Carolina, writes to us, with a few suggestions as to a method of causing the descent of rain at will. Stimulated by necessity (the district in which he lives suffering from a very severe drought), and having observed that heavy cannonading during war has brought down rain, he suggests that a keg of nitro-glycerin or gunpowder should be exploded, to arrest the moisture which the clouds are carrying away to some more favored region, and to bring it down to the thirsty fields and gardens amidst which he lives. The idea is a good one, and can very easily be tried at a small cost.

GALLEIN, A NEW DYE.—The crystals of gallein are first produced, and these are converted into gallin by means of zinc and dilute sulphuric acid. On subsequently treating the gallin with concentrated sulphuric acid at 200° C., a substance named cörulein is obtained. This dissolved in anilin forms a rich indigo blue, and with alkalies it gives a fine green, while, if mordanted with iron compounds, a fine brown is imparted to the goods. These colors are readily imparted to cloth, and are of considerable permanence, resisting the action of soap.

THE works of the Belcher sugar refinery, of St. Louis, occupy a frontage of upwards of 1,400 feet, covering nearly four squares of the city, the buildings being from six to ten stories in hight; and where streets intervene they are connected by tunnels under the street or bridges overhead. To show the rapid and continual growth of the business of this establishment, we may state that the amount of refined sugar sold by Belcher's refining company in 1864 was 7,000,000 pounds, while in 1870 it had increased to 25,500,000 pounds.

IT is intended to make a tunnel through the mountains of Nevada, to serve the double purpose of the Pacific Railroad and the Lake Tahoe Water Company. The latter corporation intends conveying the water from Tahoe lake in the mountains, and have agreed with the railroad company for the making of the tunnel, which will be five miles long, through a granite rock. The water company has charge of the execution of the work.

Examples for the Ladies.

Mrs. M. Leary reports her earnings with a Wheeler & Wilson Machine $700 a year for shop-work, and $340 more for custom work, besides her family sewing for 6 persons.

NEW BOOKS AND PUBLICATIONS.

THE ROAD MASTER'S ASSISTANT, AND SECTION MASTER'S GUIDE. A Manual of Reference for all having to do with the Permanent Way of American Railroads, and containing the Best Results of Experience, and Minute Directions for Track Laying, Ballasting, and Keeping the Track in Good Repair. By William S. Huntington. Railroad Gazette Series. Chicago: A. N. Kellogg, 110 and 112 Madison Street.

This is a timely and useful little treatise; one which, as a practical guide, leaves little to be desired. It should be carried in the pocket of every Road and Section Master in the country.

PHRENOLOGICAL JOURNAL. Published by Samuel R. Wells, 389 Broadway, New York.

The number of this highly popular magazine for September has a table of unusually interesting contents. Among the most readable is an article entitled "Life in a Head Only:" an autobiographical account of a remarkable case wherein a blow being received upon the back of the neck, all use of the body below the point of injury was lost, yet the mental faculties were retained, the injured person learning to write with a pencil held in the teeth. A fac-simile of this mouth writing is given with the article.

SCRIBNER'S MONTHLY. Published by Scribner & Co., 654 Broadway, New York.

The number for September is remarkable for the beauty of its engravings. Its contents are also rich and varied. "Pictures from Canada," illustrated; "Mercator, the Path Finder of the Seas," with a fine engraving of Mercator; "The Co-Education of the Sexes," are the articles that have most interest for us; but there is variety enough to suit the popular taste, and altogether the number is one of the best that has yet appeared.

ECLECTIC MAGAZINE. Published by E. R. Pelton, 108 Fulton street, New York.

This always entertaining and highly instructive Magazine is out, and presents, as its frontispiece, a splendid portrait of the distinguished scholar scholar, thinker, and author, Max Muller. These portraits are a distinguishing feature of this magazine, and one of great value. We can hardly say too much in praise of its contents. The selections are admirable.

LIPPINCOTT'S MAGAZINE. Published by J. B. Lippincott & Co., 715 and 717 Market street, Philadelphia, Pa.

The September number of this Magazine is more than ordinarily good. The poem by Howard Glyndon is an exquisite piece of word painting, rarely excelled in American literature. "Scrambles among the Alps" is pleasant, and "Shall we Throw Physic to the Dogs," profitable reading. There are many other good things, which we have not space to name.

THE ATLANTIC MONTHLY. Published by J. R. Osgood & Co., Boston.

The number for September will not compare favorably with some of the former recent issues of this periodical. Still, there is enough to repay the reader for its price and the time spent in the perusal of some of its articles. We advise the reader to skip the weak story, "Twin Love," by Bayard Taylor, and the still weaker "Encylicals of a Traveler," which has little humor and less wit, and scarcely enough of readable description to fill a paragraph of moderate length.

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.

Whitcomb's Asthma Remedy.—"Nothing so successful."—THEO. METCALF, Apothecary, Boston.

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.

SCIENTIFIC AMERICAN.—Back numbers and volumes for sale at low prices. Theo. Tusch, Scientific Book Agency, 37 Park Row, New York.

$1200 will buy the patent of the best Hames Clip ever invented. For description, address Joseph S. Hays, Po. Box 2611, Williamsport, Pa.

d'Heureuse's Patent Air Treatment in the quick, cheap, and perfect manufacture of wine, cider, spirits, sugar, oils, etc. Rights for sale. For particulars, apply to R. d'Heureuse, P.O. Box 6,344 New York.

No end to demand for reversible sash illustrated July 22. M'f'rs Sash, Builders' Hardware, etc., secure your territory now at low rates. Wm. P. Nelson, 618 N. Main street, St. Louis, Mo.

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.

Die Sinkers, see advertisement on page 156.

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

See advertisement of Wilkinson's Combination Pocket Tool.

For circular describing the best and cheapest combined Punch, Shears, and Tire-Upsetter, ever invented, just patented, Agents wanted, address R. M. Mansur, Augusta, Maine.

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

Wanted—A first class Pattern Maker; also, Boiler Makers. Address Waynesboro' Steam Engine Works, Waynesboro', Franklin Co., Pa.

Capitalists and Manufacturers are requested to examine Goodchild's Clamps. See last week's paper, 1st page. Circulars on application. W. H. Goodchild, 98 Liberty St., N. Y.

To Brass Founders and Steam Fitters. For sale—A valuable Patent Right. Address Isaac W. Brown, Canton, Baltimore, Md.

Cast Steel Castings, made of any size to pattern, may be worked and tempered same as tool steel. Van Zandt Bro's, Agents, 4 Dey street.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Power Punching and Shearing Machines. For car builders, smith shops, rail mills, boiler makers, etc. Greenleaf Machine Works, Indianapolis, Ind.

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

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

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 of Waltham Watches. All prices reduced since February 1st.

Quinn's Patent Ferrule makes good all leaky boiler tubes. Address P. Quinn, South Newmarket, N. H.

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.

Makers of 4 in. light Cast Iron Pipe, address E. Whiteley, 61 Charlestown Street, Boston.

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 374, Pittsburgh, Pa.

Wanted—To employ a competent man having a thorough knowledge of all the details connected with building Mowing and Reaping Machines. Address, with reference, Lock Box 23, Wheeling, W. Va.

Fire Arms—We would call attention to the advertisement in another column of our paper under the above heading.

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

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.

"Among the live and progressive Institutions of the day is Geo. P. Rowell & Co.'s Advertising Agency, No. 40 Park Row, New York. The establishment is so systematized, and their facilities are so ample, that the public is sure of being served in the most complete manner."—*Boston Post.*

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.

QUEEN BEES.—In reply to query 6, in your issue of the 12th inst., I would say that, during the swarming season, a number of queen bees are hatched, while probably only one is needed. When several are hatched at the same time, which is frequently the case, a royal war is at once commenced, and all the queens except one are dispatched, and the survivor then reigns supreme.—J. P. C.

WATER FOR AQUARIA.—In answer to G. W. G., in No. 7, page 107, query 3, I would say I have used both hard and soft water from wells in my aquaria, in which I kept our native and other fish, and they did well. The water never needs changing, if the aquarium be properly fitted up.—A. L. C., of Md.

CARBON AND COPPER IN BATTERY.—In answer to "Neutral," query 7, page 122, I would say: A carbon plate of equal surface gives nearly double the "intensity," and about the same "quantity" as a copper plate in bichromate solution. To put it more correctly, the electromotive force is increased while the internal resistance is not materially altered. The electropoion fluid of commerce is the same as the bichromate solution referred to. It is best made by dissolving two parts (weight) of bichromate of potash in ten parts water, moderately heated. When cool, add one part good sulphuric acid. It gives off no injurious fumes, except when exhausted by too long continued action without renewal.—F. L. P., of N. Y.

LEATHER POROUS CELL.—A. B., query 16, page 122, can use a porous cell made of soft leather, which will answer well, provided the seams are made tight.—F. L. P., of N. Y.

EXPANSION GEAR.—A. H. G.: If you use an eccentric of less throw, your steam ports will not open as much as they do now. Consequently your engine would "wire draw," and instead of making a saving, you would create a loss; for wire drawing steam is something like loading a horse, and then trying to force him to run, and holding him so as to force him only to walk, thereby making a double resistance. There is but one way to do it and do it right. If you have room enough in your steam chest between the steam ports and the ends of the steam chest, to use more lap on your valves, place an eccentric of more throw, instead of less. If you had stated in your query the lap now on your valve, and the distance from steam ports to ends of steam chest, I could tell you just how much more lap and throw of eccentric you could use. Some engines cannot be altered as there is no room.—G. A. T., of N. Y.

GEAR WHEELS.—I do not suppose you wish to cut anything but whole threads. My rule is very simple: Multiply the screw on your lathe, and the thread you wish to cut, by a given number. Say you wish ten threads to the inch, and the lathe screw is four threads to the inch; multiply by 8; 8 x 4 = 32 (driver), and 8 x 10 = 80 (screw). You can cut fractional threads by this rule without further explanation.—G. A. T., of N. Y.

SONOROUS STONE.—Let me inform W. S. R. that the musical property of stone is not unfrequently met with. Any substance that has very slight flexibility combined with tenacity will have regular and definite vibrations if struck, and these are the cause of musical sounds. That the stone loses this characteristic if removed from the spot is, I fear, a local tradition; it is certainly not to be accounted for by any book on acoustics that I have read.—D. B., of N. Y.

TURNING STEEL AXLES.—In answer to D. D. D., I would say he can turn his steel axles smooth with a square nosed tool whetted to a smooth edge, and adjusted so that the front corner only will cut; but the hind corner must only clear the work by the least possible distance. Run the lathe slowly. Better use no back gear, and put oil on the work. If careful, no polishing will be needed. I make them run this way to 4,000 revolutions per minute. Our principal business is making saw arbors of different kinds and planing machines, and I never allow a file to be put on a journal. I considered it very bad work to do so. Should D. D. D. want to turn iron he can run his lathe faster, and use water instead of oil.—W. W. T., of N. Y.

COMBUSTION IN BOILER FURNACE.—A. H. G. can improve combustion so that he can save tuns of fuel a year; and to explain the mode, I will describe how I do it. My ash pit is square; I fitted some ⅝ pipe to the shape of the ash pit with one piece through the center of the square; then I bored 1-16 holes, one inch apart, all along the pipe, connected it to a steam pipe, and just let enough steam pass through it to be visible. A. H. G. will be astonished at the result, and will burn his coal to ashes, and have a fine combustion.—G. A. T., of N. Y.

CUTTING TEETH OF WHEELS.—Let "Gear Wheels," query 4, page 107, multiply the number of threads per inch on the lead screw of his lathe, and the number of threads desired to be cut by the same number. The products will be the number of teeth in the two gears. Example: Lead screw is 4 threads to the inch, and it is desired to cut 13 threads to the inch. Take 6 for multiplier, and we have 4 x 6 = 24 teeth for spindle and 13 x 6 = 78 teeth for screw. Suppose it be desired to cut 3 threads to the inch: 4 x 12 = 48 teeth for spindle, and 3 x 12 = 36 teeth for screw. This is the simplest rule I have known—have used it in practice for 16 years. Easy to remember, and sure.—A. S. A., of Mass.

SETTING BOILERS.—To W. E. H.—It will be dangerous to place a two flue boiler alongside of tubular boilers, as the water in the latter would heat more rapidly and flow into the former, often overfilling it, and leaving the tubular boilers quite empty. Boilers working together should be of the same denomination and the fire as evenly under each as possible. Heating one boiler above the other creates the greater pressure in the boiler most heated, no matter how the steam drum is connected; this pressure will force the water into the boiler that has the least pressure.—J. E. E., of N. J.

VESSEL FOR COOKING TOMATOES.—I find a kettle lined with earthenware or porcelain the best for this purpose. Every hardware dealer keeps them.—J. E. E., of N. J.

TABLE CUTLERY.—To R. S. S. H.—Hot roasts and steaks will draw the temper on the edge of a carver. Hot water will not draw the temper of any tool; it has no effect on the razor though it may be constantly dipped in hot water for years, in shaving. I have dipped my razor in boiling water for years. Very highly carbonized steel is less liable to become softened in cutting hot meat.—J. E. E., of N. J.

SAND AND EMERY BELTS.—Use canvas belts strongly sewed or tied together at the ends. The threads may be so tied together as to leave the face on emery side of the belt perfectly smooth and level. Size the belt with a coating of thin glue and let it dry. Then hand the belt over two pulleys, so that it can be easily turned. Use the best of glue, about the consistency for glueing wood. Put it on hot with a brush, sifting on the sand or emery after the brush. Go around the belt as quickly as possible; then lay it on a smooth plank, and roll the sand or emery into the glue as hard as possible (an iron pulley loose on a mandrel is best); then hang up the belt to dry.—J. E. E., of N. J.

DRESSING SKINS WITH THE HAIR ON.—In answer to T. S. F.'s query 3, Aug. 19: Let him first soak the skin in cold water, so as to loosen the flesh; then break it on a fleshing beam until all the meat is removed. Then dissolve alum and salt in water, apply strongly and warm on the flesh side of the skin; then finish the same as white leather is done.—J. H. S., of N. Y.

E. F., of —.—Can you not see that if the circumference of a circle is not accurately determined, all calculations based upon it must be inaccurate? To measure a line by the application of some other assumed as a standard is enough for practice, but that is not a mathematical operation. The problem of squaring the circle is to determine *mathematically* the ratio between radius and circumference.

O. M. D., of N. J.—The same amount of dead pressure without shock will strain a boiler equally, whether the pressure be derived from hydrostatic or steam pressure. In the usual way of testing boilers by forcing water thereinto by a force pump, there is more or less shock which tries the boiler more than steady pressure would.

D. L. H. of Ky.—The opinions you express concerning the explosion of steam boilers have already been published in substance in the SCIENTIFIC AMERICAN.

W. S., of —.—Your query cannot be answered without diagrams, and is not of sufficient importance to warrant them. You should apply to a practical plumber.

S. S. M., of Mo.—A succession of electric sparks following each other with extreme rapidity will give the effect of continuous light light like that of the sun. A single spark would not illumine a moving object long enough to enable the eye to observe the motion of the body, unless the latter was moving with great rapidity.

F. G. W., of N. Y.—It is immaterial to which end of the right hand lever you attach the connecting rod of your steam cylinder. The power will be the same in either case.

E. F., of N. H.—If we understand your statement of the case, the check valve spoken of is necessary.

J. K. J., of Ark.—Your device will not work. Don't waste money upon it.

G. A. T., of N. Y.—Shall be glad to hear from you on the subject of lubricating oils for heavy shafting.

COLD IRON FLOATING ON MOLTEN IRON.—Is it not possible that cold iron floats on molten iron because it contains absorbed gases? Palladium is known to possess the property of absorbing hydrogen, and silver oxygen, and iron, may have a similar property.—H. R. R.

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.—ARTIST'S CANVAS.—Will some of the numerous readers of the SCIENTIFIC AMERICAN inform me how to prepare a good but cheap canvas for artist's use? Also how to stretch it on the stretcher, etc. ?—J. F. McC.

2.—HORSE POWER OF ENGINES.—What amount of horse power does a boiler develop when supplying a steam engine, sixteen inch cylinder, twenty-four inch stroke, making 100 revolutions per minute, with a pressure of ninety pounds to the square inch?—W. A. B.

3.—CONDENSATION OF STEAM IN LONG PIPES.—It is contended that steam passing through a horizontal pipe, the same being fully protected by a nonconductor of heat, will lose about one pound of pressure for every ten feet; therefore, steam of fifty pounds pressure through a pipe 500 feet long would be entirely condensed. Also that steam passed through a pipe downwards, under the same conditions, will nearly double this reduction of pressure, or drop out as condensed water at 250 feet. Please state if there is any or how much truth in the statement.—Y. S.

4.—DIMENSIONS OF A RIGHT-ANGLED TRIANGLE.—Can any reader give a rule for the solution of the following problem: 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.—C. E. C.

5.—FORCE OF FALLING BODIES.—Will some reader please inform me, through the columns of the SCIENTIFIC AMERICAN, what force will be exerted by a weight of one pound falling through a space of two feet, or give me a formula for finding the force of a given weight falling through a given space?—J. E.

6.—SUBSTITUTE FOR BORAX IN WELDING.—Does any one know of anything that will take a welding heat better than borax, on fourteen gage steel plate and thirteen gage iron?—J. B. McM.

7.—WEISS BIER.—Will some reader communicate a good, reliable formula for the manufacture of Weiss bier? I have got one recipe, but it does not give satisfaction.—H. H.

8. -SUBSTITUTE FOR BRASS.—Is there any metal or composition that will equal brass in strength and toughness, and can be melted in an iron ladle over a common coal fire, for casting?—F. W.

9.—BURNING BRICK.—Will some of your readers inform me about how much wood is required per thousand for burning brick in a kiln of ordinary size, and the best kinds of wood to use?—S. M., Jr.

10.—CLEANSING COTTON WASTE.—Will some of your readers give me the process of cleansing olley cotton waste in such a manner as to preserve the oils contained therein, and leave the waste in a condition to be used again?—F. O. B.

11.—DYEING STRAW HATS.—Can any of your readers tell me how to color straw hats the deep color which the best ones are made to assume? And how is the dye made?—O. P.

12.—REMOVING STAINS OF HAIR DYE.—Can any of your readers inform me what will remove stains of hair dye from shirts, etc.? I have tried oxalic acid and salts of tartar without success.—L. D.

13.—HARDENING VISE JAWS.—I should like to know the usual method of hardening vise jaws.—P. D.

14.—WEIGHT OF GAS FOR BALLOONS.—What quantity of the gas usually used in balloons is required to raise a pound weight?—T. J. W.

15.—GREEN PAINT FOR TINWARE.—What is the best and cheapest method of preparing green paint or varnish for tinware, and how should it be applied? Does it require to be dried in a furnace or oven?—W. C.

16.—MAD STONE.—What is a "mad stone?" How is it obtained, and will it cure bites of a mad dog, or of a snake?—G. W. M.

17.—COPPER SPIRAL SPRINGS.—In making springs for sofas, beds, etc., of copper wire, I find that in annealing the ends of the wire to prevent them becoming brittle, the copper turns black. Can any one tell me how to restore the color?—E. S. B.

18.—PLATED GOODS.—I want to know the best method of polishing plated goods, and the materials to be used. Any hints from a practical man on this subject will be gladly received.—PLATER.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

Is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had ome experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller, if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

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Declined.

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

ARTIFICIAL BUTTER—C. W.
AURORA BOREALIS—C. E. S.
CARBOXYGEN—C. W.
EXPLOSION OF STEAM BOILERS—D. L. H., J. E E.
FORMATION OF OZONE BY RESIN OILS—C. W.
FREEZING POINT OF GLYCERIN AND WATER—C. W.
MACHINIST'S TRADE—W. G. S.
MENSURATION OF CIRCLES—C. E. M.
POWER OF ELECTRICITY—J. E. W.
PROPULSION ON CANALS—W. J. M.
REAGENT FOR THE DETECTION OF BLOOD STAINS—C. W.
RESEARCHES ON THE FORMATION OF GALLIC ACID—C. W.
ANSWERS TO CORRESPONDENTS.—A. F. L.—G. B. D.
QUERIES.—A. S.—C. D. I.—C. D. K.—C. W.—D.—D. P.—F. E. H.—J. F. M.—J. H. R., Jr.—J. L. I.—M. B.—O. J. S.—S.

Recent American and Foreign Patents.

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

BILLIARD MARKER.—William Henry Newell, of Hudson city, New Jersey.—This invention consists, first, in arranging two pointers opposite to each other and directed towards the same line of figures or notations, so that, by moving the hindmost pointer at each count, and not touching the other, one party may always see exactly what has been last counted by the other, as well as the aggregate of game, which his opponent has made up to any point of time. Second, in combining a double U-shaped pointer with a two faced marking plate, so that the game must be counted simultaneously on both sides of the marking plate. It is a very neat and efficient device for this purpose.

FUNNEL.—Norman L. Price, of Lynchburgh, Va.—This invention consists in having a top or cover on the funnel with holes adapted for supporting the different measures used, bottom up, with the open ends entering said holes to drain and exclude flies and other insects and dirt.

ELEVATOR CUP.—Alfred A. Vitt, of Union, Missouri.—This is an improved elevator cup which shall be so constructed and attached to the belt that its rear side may have a smooth inner surface, and that it may be conveniently and quickly attached to and detached from the belt when desired, without disturbing the said belt. It consists of a hook shaped extension of the back of the cup to adapt it for detachable attachment to the back.

FENCE POST.—Charles Ayers, Farmington Center, Wis.—This invention is a new post for wire, board, or picket fences, and consists in casting the same of metal with a continuous flange, retaining rib, and of peculiar form, all with the object of making it light, strong, and inexpensive. The lower end of the post has the shape of a spear head. A flange serves to hold the fence rails or boards, if such are used, laterally in place, and is perforated to receive the fastening pins or the wires for a wire fence. The spur shaped lower end of the post enters the ground entirely, and serves to properly steady it in every direction. A projecting rib is formed on the face of the post between the flange on the spear, to add to the strength and stability of the device.

SPRING BED BOTTOM.—George Brownlee, Princeton, Ind.—This invention relates to a new and useful improvement in spring bottoms for beds; and consists in the use of side springs arranged to operate in connection with the slats of the bottom. The slats are supported by the end rails, or run lengthwise of the bed. Springs are attached to the side rails, or parallel with the slats; but the slats and the springs may be differently arranged and made to run transversely if preferred. The springs are attached at their middle to the rails of the bedstead in any suitable manner, and operate the same as an archer's bow. A cord connects the two springs together, and forms a medium by which the elasticity of the springs is imparted to the slats.

AXLE LUBRICATOR.—Henry S. Weaver, Irwin Station, Pa.—This invention relates to an improvement in a device for lubricating the axles or journals of loose wheels, designed more especially for wheeled vehicles, as wagons, carriages, etc., but applicable to other purposes; and it consists in a box or oil reservoir placed between the spokes or in connection with the hub of the wheel, so that the oil will pass from the reservoir to the axle or journal.

OMNIBUS BRAKE.—This is the invention of Henry Bothe, of St. Louis, Missouri, and it consists in a combination of levers and links, in connection with a foot lever, by which means the brake shoes are forced against the hind wheels with great power, and released very quickly at the will of the operator.

UTERINE SUPPORTER.—This is a new instrument intended not only to support the womb, but to act as a support to the abdomen and spine also. William S. Van Cleve, M.D., of Centralia, Ill., is the inventor.

COMBINED CULTIVATOR, MARKER, AND COVERER.—This is a simple combination of adjustable parts and devices, whereby the implement may be used for either of the purposes named. It is claimed to do its work well and thoroughly, and looks like a useful invention.

PROPELLER WHEEL.—Daniel S. Darling, of Brooklyn, N. Y.—Between the paddles of an ordinary side wheel propeller are placed plates of the same width as the paddles, but so placed as to enclose a rhombic space, the rhomb shaped compartment diminishing somewhat toward the center, the degree of diminution depending upon the diameter of the wheel. The inventor claims that this construction gives the wheel greater propelling power, while it obviates lateral currents and swells, making the wheel peculiarly adapted to use on canals.

PIPE COUPLING.—Joseph Andrews, of Nashua, N. H., is the inventor of this coupling. One end of the pipe is grooved annularly, and the groove is recessed at the bottom. A hole is then drilled from the outside of the pipe to communicate with the recess at the bottom of the groove, and provided with a screw plug. The opposite pipe end is formed with an annular rib or tongue made to fit the groove above described, except that it does not fill the annular recess at the bottom of the groove. The counterparts of pipe sections being placed together, the screw plug is removed, and through the opening liquid cement, melted lead, or other material, is poured. The screw plug is then replaced.

STEAM BOILER.—This is a water tube boiler, the tubes being connected with a steam dome and mud drum. The tubes are placed at an inclination so that sediment may flow down to the mud drum. Through each tube passes an endless chain, the chain also passing over the axles of crank shafts, which pass out of the sides of the steam dome and mud drum. Turning the cranks draws the chains through the tubes, and, it is claimed, thereby prevents their becoming clogged with scale and sediment. T. J. Lovegrove, of Philadelphia, Pa., assignor to himself and George H. Meyers, of the same place, is the inventor.

LAMP CHIMNEY CLEANER.—Cullen B. Clark, of Armada, Mich.—This invention relates to improvements in lamp chimney cleaners of the class in which plate springs are used to press the material employed in cleaning against the inside of the chimney, and are attached to a rotary shaft or spindle. The invention consists in the arrangement of springs and cleaning pads in connection with a spindle. The spindle is, by gearing, connected with a driving shaft which is turned by hand, so that the pads attached to the end of the spindle will be rotated very rapidly in the chimney to clean the same.

BROOM.—Robert E. Copson, of Hamburg, Iowa.—This invention has for its object to furnish an improved broom, in which the outer or circumference wire shall be so arranged and secured that, should the tack that fastens said wire work out or the wire be broken, the said wire will still be held in its place, securely confining the brush. It consists in the combination of extra braided wires with the outer or circumference wire.

BILLIARD CUSHION.—Matthew Delaney, New York city.—This invention relates to improvements on a billiard cushion for which letters patent were granted November 23, 1869. It has for its object to improve the mechanism for stretching the wire or cord to increase the elasticity of the cushion and provide an elastic end for pocket billiards. The invention consists in two improvements upon the patent referred to. The first consists in combining with the ordinary elastic cushion an auxiliary piece of a different character at the pockets. This is a substance which will not admit of the reaction and rebound of the ordinary rubber, but which at the same time will not be rigid and unyielding as the brass specified in the said former patent. Brass, wood, or any other substance which is practically unyielding causes a very rapid wear of the expensive cloth used upon billiard tables. Especially is this the case on the sharp angle of the pocket. To avoid this difficulty, a hard rubber block is placed at the pocket. The second improvement consists in arranging the tension spindle in a way to produce a valuable effect. In the old patent a tension spindle is placed within the rail; but it has been found, in practice, extremely inconvenient to take off the rail whenever it is desired to tighten the wire. This difficulty is overcome by arranging the spindle so that it can be operated without removing the rail.

LOOP FOR HARNESS.—Addison M. Osborn, of Girard, Pa.—This invention has for its object to furnish an improved loop for hame straps, which shall be so constructed as to hold the strap securely in place without any sewing, and which is simple in construction, convenient in use, and inexpensive in manufacture. It consists in a triple loop, constructed in a peculiar manner to accomplish the purpose set forth.

EGG AND FRUIT CARRIER.—Joseph Taylor Cornforth, of Kansas City, Mo.—A box (made without bottom or top) contains the cells or compartments. There may be holes through the sides or ends of the case, and also through the cell walls for ventilating the case. The cells are formed of one or more strips of paper, cardboard, or any other material which may be bent to the required shape, of a width to correspond with the width of the sides of the case. Each cell is formed of two semicircles, and each row of two corrugated lengths of the strips. It may be of wood with the corrugation formed in a mold. The inventor does not, however, confine himself to making all the cells of a case of a single piece, yet it may readily be done with paper board, so that the cells will retain their shape and be sufficiently rigid to retain the contents. In packing and transporting the cases, he commences on a platform or bottom, and places the cases on top of each other with a plate or sheet of stiff paper board or of wood between the boxes. No weight is allowed to bear upon the fruit or other articles contained in the cells. These division plates may be perforated with holes, so that there may be a circulation of air upward through the cases. By this mode of packing, each egg or piece of fruit or other article is kept separate from the rest and subject to no pressure.

BREECH LOADING FIRE ARMS.—Joseph Manton, of Montreal, Canada.—The operation of this fire arm may be described as follows: A breech block descends in a vertical slot in the breech, being thus moved by a lever forming the trigger guard, which has a downward movement and is put in motion by a thumb piece. The breech block in its descent in the slot, carries down one arm of a short lever, which works freely in a cavity in the breech block. The other end of this short lever in its rise presses upon the tumbler cam and forces the dog upward. When the breech block is at its lowest point, the trigger springs into a notch in the tumbler, and the dog remains fixed at full cock. The cartridge is inserted in the barrel, over the breech block, which is then raised by drawing the lever guard upward. The trigger being pressed in the ordinary way trips the pointed end out of the notch in the tumbler and the dog head descends, pushed by the main spring, which expands and regains its original form, out of which it had been bent and confined by the action of the short lever, raising the end of the tumbler cam. A piston or striker is inclosed in the breech block; the dog head in its descent strikes the head of the piston and drives the point of the same against the cap at the base of the cartridge and explodes it. The cartridge is extracted in the descent of the breech block by an angled extractor, one arm of which is caught by the descending breech block and the other arm forced against the rim of the cartridge, ejecting it rearward. The arrangement of the cam and lever with the hammer admits of raising the hammer to half or full cock at the option of the operator. It also admits of raising the hammer by hand and letting it fall independently of the breech block. When the hammer is at full cock the breech block may be worked independently of it. A feature of this gun is the fewness and simplicity of the parts employed to effect the result in the manner described. The pieces can all be made strong and durable, and the arrangement seems not liable to get out of order.

HARVESTER DROPPER.—J. J. Barnhill and D. N. Barnhill, of Vincennes, Ind.—This invention has for its object to improve the construction of J. F. Seiberling's patent dropper or self-raking attachment for reapers, so as to make it more satisfactory and effective in operation, saving a large amount of grain that would otherwise be lost by falling through the spaces between the slats; and it consists in so constructing and arranging the slats of the dropper that they may be partially revolved by means hereinafter described. In these droppers, when a sufficient quantity of grain has been received to form a gavel, the dropper is lowered so that the stubble may pass through the spaces between the slats and hold the grain while the said slats are being withdrawn from beneath it. The dropper is then raised to again receive the grain for another gavel. Removing the grain in this way requires that the spaces between the slats should be at least an inch and a half or two inches wide, to allow the stubble to pass through in sufficient quantity to hold or detain the grain. These wide spaces, when the grain is short, or thin, or straight, and without side blades, allow large quantities of the grain to drop through and be lost. To remedy this, the slats of the dropper are constructed so that, when raised to receive the grain, the adjacent edges of slats may be close together, forming a close platform, which will retain all the grain that may fall upon it; as the dropper is lowered to deposit the grain, and by the same operation, the slats are partially revolved or turned edgewise to form spaces of sufficient width for the stubble to pass through to detain the grain while the slats are being withdrawn from beneath it. As the dropper is again raised, the slats are again partially revolved or turned flatwise to form a close platform to again receive the grain.

BRAN DUSTER.—A wire gauze cylinder is arranged in a suitable frame between the two heads, which have large openings at the center—one for the admission of air, and the other for the air to escape, together with the fine particles of dust. Brushes, mounted on the radial arms of a shaft extending beyond the heads of the cylinder, and mounted in the adjustable bearings, revolve within the gauze cylinder. The arms of this shaft are intended to be made adjustable lengthwise to regulate the pressure of the brushes on the wire cloth. The shaft is rotated by a band and pulley, and carries a fan in a fan case attached to one of the heads, and provided with a discharge spout. This fan draws the air through the wire cylinder, taking the fine particles which do not need grinding again with it, and leaving the coarse particles to escape through the meshes to the hopper below in a better condition for grinding than when mixed with the fine particles. The suction may also be applied to fan dusters, either at the end for taking the fine particles through the escape hole, the bran being discharged through another spout at the end of the cylinder, while the coarse particles pass through the same, or the fan may be applied to the spout from the hopper to draw the fine particles through the wire cylinder and leave the bran to escape at the end. A heavy bolt or rod is arranged in the end of the case to be forced in by a spring acting on a lever, to strike the end of the wire screen and keep it from clogging. John Damp, of Ashland, Ohio, is the inventor.

SUSPENDING WINDOW SASHES.—Thomas Morton, of New York city.—A chain is connected with the sash by means of a slotted tube or plate, or piece of metal, or other suitable material, placed in a recess or cavity at the end of the chain groove, the said slotted tube, plate, or other fastening being so formed that the chain will slip with the slot and be held by the enlarged end of the link when the chain is cut to the required length. The shank of the weight hook is constructed so as to receive the chain by means of a slot. The chain is thus slipped into a circular eye or semicircular shank, and may be held in any manner by the enlarged end of the link. For connecting the chain either to the sash or the weight the chain is not drilled or altered in any manner. It is only cut to the required length, and is then ready to be connected. This is the main feature of the invention.

BROOM.—Edward Americus Anderson, of Danville, Texas.—This invention consists in securing the corn brush to the handle by the employment of a conical or flat tapered thin sheet metal ferrule, and a correspondingly shaped end of the handle, but smaller, the brush being packed in the ferrule as much as the required amount, and then separated by a tapered mandrel and spreading it to the shape of the said ferrule, being driven in from the tops of the brush, the butt ends being packed in the ferrules to make room for the handle, which is then driven in after the mandrel is removed and secured by nails or screws.

SMUT MILL.—This is a new and useful combination of spreader plate arranged in the grain passage, between the scouring cylinder and separator, with adjustable springs, a gate and conduit, and other well known devices used in machines of this character. The combination is claimed to prevent the diffusion of dust in a mill, and otherwise facilitate the operation of clearing grain from smut.

BUSH FOR MILL SPINDLE.—Herman W. Vitt, of Union, Missouri.—This invention furnishes an improved bush for mill spindles and other vertical shafting, which is simple in construction, easily and conveniently operated whether the spindle or shaft be running or not, will not get the spindle out of tram, and which will exactly center the spindle, it being impossible to move one of the followers without moving them all. It consists in a combination of parts by which the followers are all moved together.

DROP GRATE FOR FURNACE.—William Shepherd, of New York city.—This invention has for its object to provide a solid support for the grate, to prevent the occurrence of warping, and permit the rapid and convenient dropping of the grate and the ready removal and replacing of single bars. The invention consists in the arrangement of an air chamber around and on the same plane with the grate, so that a continuous supply of cool air is carried to the grate bars, and in a new manner of hanging, securing, and holding the pivoted grate bars.

EGG BEATER.—Daniel B. Clayton, of Columbia, S. C.—This consists in a suitable vessel and beater operating devices, in which the blades, which are caused to move very rapidly, are arranged to cut edgewise against the egg in a way to separate it into very fine particles, and introduce the air, it is claimed, more thoroughly than can be done by the beaters now in use.

APPLICATIONS FOR EXTENSION OF PATENTS.

CANDLE SNUFFERS.—Orson W. Stow, Plantsville, and Augustus Barnes Southington, Conn., have petitioned for an extension of the above patent. Day of hearing, November 8, 1871.

FLY FRAMES OF PRINTING PRESSES.—Richard M. Hoe, West Farms, N. Y., has petitioned for an extension of the above patent. Day of hearing, November 1, 1871.

SAFETY LAMPS.—William Pratt, New York city, has petitioned for an extension of the above patent. Day of hearing, November 8, 1871.

TRUSSES.—J. W. Riggs, Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing, November 8, 1871.

STEAM ENGINES.—Edward D. Barrett, New Haven, Conn., has petitioned for an extension of the above patent. Day of hearing, January 3, 1872.

LONG TRUNKS FOR CLEANING COTTON.—Isaac Hayden, Lawrence, Mass., has petitioned for an extension of the above patent. Date of hearing, November 15, 1871.

Inventions Patented in England by Americans.

August 1st to August 7th, inclusive.

[Compiled from the Commissioners of Patents' Journal.

ALARUM PUMP.—E. Hoskell, New Hampshire.
ANCHOR FOR PLOUGH.—A. Campbell and R. Clark, Sacramento, Cal.
GAME BOARD.—W. Hearne, New York city.
RAILWAY VEHICLES.—J. B. Calkins, Pacific, Mo.
REFRIGERATOR, ETC.—K. Goddard, Richmond, and J. P. Adams, Brooklyn, N. Y.
SEWING MACHINE.—E. Moreau and W. B. Isaacs, San Francisco, Cal.
SEWING MACHINE.—Howe Machine Company, Bridgeport, Conn.
SHOVELS, ETC.—F. Alsip, North McGregor, Iowa.

Foreign Patents.

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Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING AUGUST 22, 1871.

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118,177.—PAPER PULP.—J. M. Allen, Marion, Mass.
118,178.—TWIST DRILL.—B. Arnold, East Greenwich, R. I.
118,179.—TWIST DRILL.—B. Arnold, East Greenwich, R. I.
118,180.—READING CASE, ETC.—W. F. Baade, Buffalo, N. Y.
118,181.—TILT HAMMER.—H. Baines, Toronto, Canada.
118,182.—PRINTING PRESS.—W. L. Balch, Boston, Mass.
118,183.—EXHAUST CHAMBER, ETC.—J. Becker, Chickies, Pa
118,184.—COUPLING.—W. C. Bibb, Morgan county, Ga.
118,185.—SHOE SOLE.—E. Blaney, Marblehead, Mass.
118,186.—CULTIVATOR.—B. C. Blomsten, Waupaca, Wis.
118,187.—DESK, ETC.—A. M. Bodwell, Ann Harbor, Mich.
118,188.—CORN CRUSHER.—A. Bolander, Akron, Ohio.
118,189.—MOLE TRAP.—D. Boswell, Greencastle, Ind.
118,190.—SHUTTER WORKER.—C. M. Brown, Chicago, Ill
118,191.—AI-ARM.—H. L. Brower, New York city.

118,192.—VAPOR BURNER.—C. B. Brown, Placerville, Cal.
118,193.—LAMP BURNER.—G. E. Brush, Danbury, Conn.
118,194.—OIL CAN.—J. Burson, Yates County, Ill.
118,195.—FURNACE.—F. E. Chatard, Jr., Baltimore, Md.
118,196.—AUGER.—A. R. Clark, Albia, Iowa.
118,197.—STEAM GENERATOR.—O. Clark, Rockford, Ill.
118,198.—CROSSCUT SAW.—W. Clemson, Middletown, N. Y.
118,199.—ALARM.—G. E. Cock, J. H. Guest, New York city.
118,200.—GOVERNOR VALVE.—W.A.Cogswell, Rochester, N.Y.
118,201.—BOOT, ETC.—O. Collier, Sacramento, Cal.
118,202.—SLED BRAKE.—J. E. Coutant, Rondout, N. Y.
118,203.—BOOT HEEL.—A. O. Crane, Boston, Mass.
118,204.—BANK CHECK.—S. Crane, Dalton, Mass.
118,205.—LATH BOLT.—T. Crispin, Bay City, Mich.
118,206.—PUMP.—E. S. Crowell, Augusta, Me.
118,207.—HARVESTER.—T. E. Curtiss, Titusville, Pa.
118,208.—CULTIVATOR.—L. Daley, Minaville, N. Y.
118,209.—CHLORINE.—H. Deacon, Widnes, England.
118,210.—BLEACHING POWDER.—H. Deacon, Widnes, Eng.
118,211.—CHLORINE.—H. Deacon, Widnes, England.
118,212.—TREATING GASES.—H. Deacon, Widnes, England.
118,213.—HAT CONES.—F. Degen, E. R. Parsil, Newark, N. J.
118,214.—CARPET STRETCHER.—J. H. de Poe, Booneton, N. J.
118,215.—STAVE JOINTER.—F. P. Deuel, Tecumseh, Mich.
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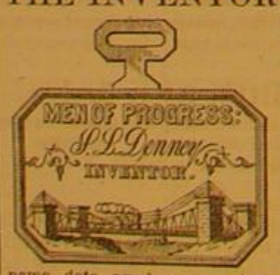

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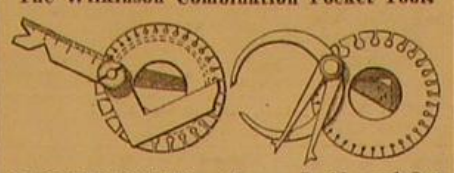

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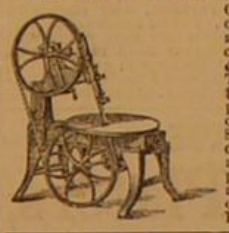

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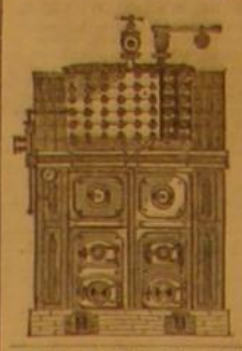

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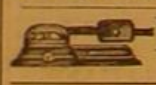

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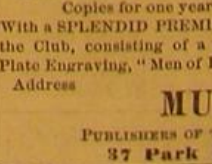

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES

Vol. XXV.--No. 11. [NEW SERIES.] NEW YORK, SEPTEMBER 9, 1871. $3 per Annum. [IN ADVANCE.]

Portable Gas Generator.

The proprietors claim for the gas generator, illustrated in the accompanying engravings, which they style the "Columbia Portable Gas Generator," that it is superior in cheapness, safety, economy, and durability, to any apparatus heretofore offered to the public. The machine is now on exhibition at 708 Broadway, and will, we understand, be exhibited at the coming Fair of the American Institute, commencing in the early part of September.

The machine has certainly the merit of simplicity, and we are told works well even in cold weather, without the aid of heat, consuming gasoline of the density of 85°, without condensation. In warm weather much heavier fluid may be used.

The machine consists essentially of two parts, an air compresser or forcing apparatus, and an apparatus for charging the air with the hydrocarbon vapor.

A barrel or case, A. Fig. 1, is divided by a diaphragm, B, Fig. 2, into two compartments or chambers, which communicate with each other by means of the pipe, C. The fluid is put into the case through a supply cock, not shown, and rises to a common level in both compartments. In operation this fluid circulates more or less through the pipe, C, between the compartment containing the carburizing apparatus to the chamber containing the air-forcing apparatus. The denser portions of the fluid are, by revolving drums, D, E, Fig. 2, kept constantly stirred up, mingled and vaporized with the lighter portions.

The drum, lettered E, is the air-forcing drum. It consists of a set of buckets extending spirally as shown in Fig. 3, from the hollow shaft, F, Fig. 2. It rotates in the reverse direction from that of an overshot water wheel, and in so doing carries the air which enters the chamber through the pipe, G, under the surface of the fluid. Thence the air passes through the perforations in the hollow shaft and through the shaft into the carburizing chamber, passing out of perforations in the shaft into the buckets of the carburizing drum.

This drum is similar in construction to the other, but it is smaller and has a less number of buckets. In the hollows of these buckets is placed felt, wool, or other capillary and absorbent material, which is kept constantly saturated in passing through the hydrocarbon liquid, and the air in passing out through this material becomes charged with illuminating vapor, or gas. In this state it is passed through the pipe, H, into the chamber, I, whence it is passed to the service. The chamber, I, acts as a storage for the gas, so that enough will be kept therein to supply the burners when winding up the machine.

The carburizing drum has its buckets placed in a reverse position on the shaft to those of the forcing drum or compresser.

The power used to drive the machine is a weight and cord, acting through a shaft, pulleys, and belt. The weight is wound up in the usual manner.

Patented January 1, 1870. For further information address J. C. Dial, President Columbia Portable Gas Light Company, Columbia, S. C., or E. C. Plumer, 708 Broadway, New York city.

Fig. 1

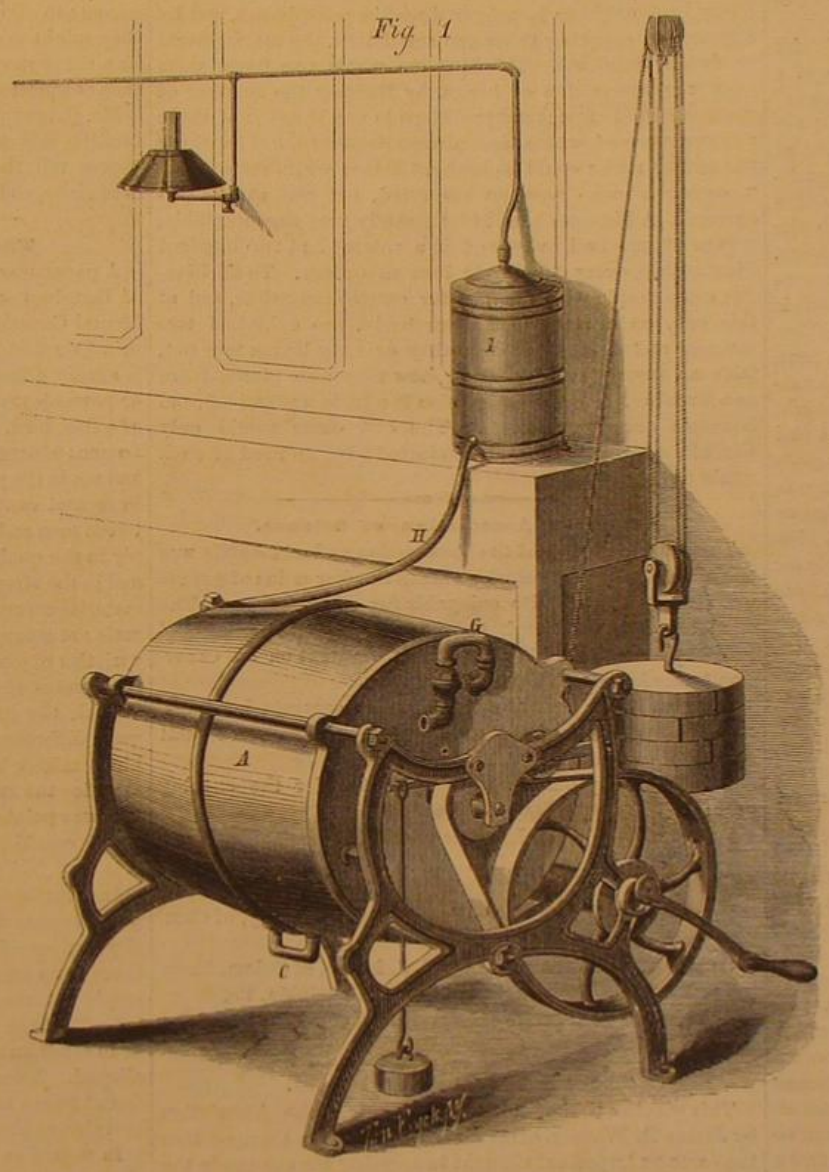
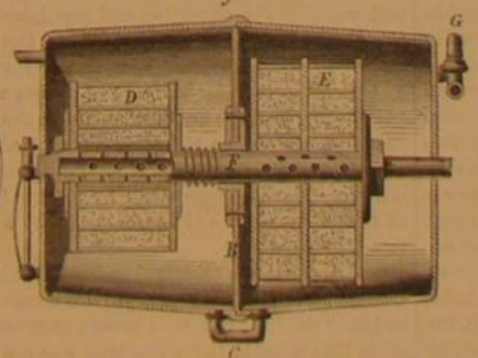


Fig. 3

Fig. 2



RICHARD AND PLUMER'S PORTABLE GAS GENERATOR.

Bleaching Shellac.

The bleaching of shellac is generally effected on a large scale by chlorine or some of its compounds, or by sulphuric acid; the bleached article costs more than twice as much as the unbleached. The bleached shellac is frequently dissolved in spirits of wine for use as a varnish by cabinet makers. This varnish is apt to stain any inlaid metallic ornament upon the furniture, or any metal attached to it, in consequence of the varnish retaining a small proportion of the bleaching compound in solution. Another process of bleaching may be adopted which renders the varnish free from this objection, and very much reduces the cost of the bleached shellac or seed lac. This process consists in the use of animal charcoal as a bleaching powder. It is prepared in the following manner:—Any quantity of yellow shellac, previously broken in small pieces, is conveyed into a flask, alcohol of 0.83 sp. gr. poured upon it, and the whole heated on the hob, or, in the summer, in the sun, until the shellac is dissolved; upon this so much coarsely powdered animal charcoal is added to the solution that the whole forms a thin paste; the flask is closed, not quite air tight, and left so for some time, exposed to the sun; and in eight to fourteen days a small sample is filtered, sufficient to ascertain whether it has acquired a light yellowish brown colour, and whether it yields a clear, pure polish on light coloured woods. If this be the case, it is filtered through coarse blotting paper, for which purpose it is best to employ a tin funnel with double sides, similar to those employed in filtering spirituous solutions of soaps, opodeldoc, etc. The portion which first passes through the filter may be preserved separately, and used as a ground or first polish. Then some more spirit is poured over the charcoal upon the filter, and the solution used as a last coating. The solution of shellac purified by animal charcoal has a brown yellow colour, but it is perfectly clear and transparent; when diluted with alcohol, the colour is so slight that it may be used in this state for polishing perfectly white wood, such as maple, pine, etc., without the wood acquiring the least tint of yellow.

"Nothing New under the Sun."

Photography only adds another instance to the many on record which prove the truth of Solomon's saying: "The thing that hath been is that which shall be, and there is no new thing under the sun."

Humboldt, in his *Cosmos*, states that the Chinese had magnetic carriages with which to guide themselves across the great plains of Tartary, one thousand years before our era, on the principle of the compass. The prototype of the steam engine has been traced to the æolipyle of Hero of Alexandria. The Romans used movable types to mark their pottery and indorse their books. Mr. Layard found in Nineveh a magnifying lens of rock crystal, which Sir D. Brewster considers a true optical lens, and the origin of the microscope. The principle of the stereoscope, invented by Professor Wheatstone, was known to Euclid, described by Galen fifteen hundred years ago, and more fully in 1599 A. D., in the works of Baptista Porta. The Thames Tunnel, thought such a novelty, was anticipated by that under the Euphrates at Babylon; and the ancient Egyptians had a Suez Canal. Such examples might be indefinitely multiplied, but we turn to photography. M. Jobard, in his "*Nouvelles Inventions aux Expositions Universelles*," 1857, says a translation from German was discovered in Russia, three hundred years old, which contains a clear explanation of photography. The old alchemists understood the properties of chloride of silver in relation to light, and its photographic action is explained by Fabricius in "*De Rebus Metallicis*," 1566. The daguerreotype process was anticipated by De la Roche in his "*Giphantie*," 1760, thought it was only the statement of a dreamer.

In Dr. Hooper's Rational Recreations," 1774 is the following method of writing on glass by the rays of the sun. "Dissolve chalk in aquafortis to the consistence of milk, and add to that a strong dissolution of silver. Keep this liquor in a glass decanter, well stopped. Then cut out from a paper the letters you would have appear, and paste the paper on the decanter, which you are to place in the sun, in such a manner that its rays may pass through the spaces cut out of the paper, and fall on the surface of the liquor. The part of the glass through which the rays pass will turn black, and that under the paper will remain white."

In 1802, Thomas Wedgewood and Sir Humphry Davy contributed to the *Journal of the Royal Institution* a paper on "An Account of a Method of Copying Paintings upon Glass, and of making Profiles by the Agency of Light upon Nitrate of Silver." Let us take an extract or two from this paper, first reminding our readers that Daguerre did not announce his invention till 1839. "White paper or white leather," says the memoir, "moistened with solution of nitrate of silver, undergoes no change when kept in a dark place; but on being exposed to the daylight speedily changes color, and, after passing through different shades of gray and brown, becomes at length nearly black. The alterations of color take place more speedily in proportion as the light is intense. When the shadow of any figure is thrown upon the prepared surface, the part concealed by it remains white, and the other parts speedily become dark. For copying paintings on glass, the solution should be applied on leather; and in this case it is more readily acted on than when paper is used. The copy of a painting, or the profile, immediately after being taken, must be kept in an obscure place." The instruments Wedgewood and Davy used were the camera obscura and the solar microscope; the images produced, however, by the former, were "found too faint to produce in any moderate time an effect upon the nitrate of silver." Davy says: "Nothing but a method of preventing the unshaded parts of the delineations from being colored by exposure to the day is wanting, to render this process as useful as it is elegant."—*Eclectic for September.*

Boiler Explosion.

The boiler of a steam tug, the *Carrie*, went off on the 11th instant, scalding the engineer severely. On inspection, it was found that a soft patch had been inserted, that the iron was quite rotten, and in many places corroded down to a sixteenth of an inch in thickness.

The unusual capability of this boiler, as a means of scattering death and destruction, will be obvious to our readers; and they will feel sure that it had been declared safe by a government inspector. This was the fact; the examination took place in August, 1870, and the boiler was certified as being capable of carrying sixty pounds of steam. This is an additional testimonial to the value of our system of boiler inspection, and to the capability and knowledge of the inspectors. A few more such occurrences will convince the New York public that the question is really worthy of consideration and attention.

The Reading Room of the British Museum.

[Condensed from *All the Year Round.*]

Over the entrance of the great reading room of the British Museum is appropriately placed the bust of the late Mr. Panizzi—the founder, as he may be called. The huge domed hall behind him, his work and monument, is one of the wonders of Europe, now reaching to a considerable number.

The entrance to this hall is beset with difficulties. At the gate of the museum, on a day when the reading room only is open, the policeman and warders challenge the visitor with a "Reader, sir?" Allowed to pass, he crosses the open space, ascends the steps, enters under the portico, and finds himself at the great hall, with more police and warders. Any signs of indecision, and he is sure to be challenged, "Reader?" If he crosses boldly, and makes for the glass door, where there is another janitor with a list, he is stopped once more, and made to show his passport, unless he have what is called at the theatres "a face admission." Down the long passage he goes, gives up great coat, stick, umbrella, parcels; passes through glass swinging doors, past other detectives, and finds himself in the monstrous cathedral dedicated to learning, and, as some say, also to idleness.

It would be hard to give an idea of the first *coup d'œil;* for there is literally nothing like it. It has the look nearly of a cathedral, with all the comfortable, furnished air of a "snug" library. Coloring for the sides is furnished by rows of the books themselves, which run round the walls to a hight of some forty or fifty feet, and are reached by two light galleries. In the center of the room is a round counter, within which sit the officials, and which communicates with the library outside by a long avenue shut in by glass screens. Outside this counter is another, which holds the enormous catalogue, reaching to some hundred volumes; and from this second counter radiate the desks for the readers. Nothing more comfortable or convenient can be conceived. You have a choice in seats even: hard smooth mahogany or softly cushioned; both gliding smoothly on castors. In the upright back of the desk is a little recess for ink and pens, steel and quill; and on each side a leathern handle. One of these pulls out a reading desk, which comes well forward, and swings in any direction, or at any hight: the other forms a ledge on which books can be piled up and be out of the way. A blotting pad, paper knife, and convenient pegs under the table for putting away hats, etc., complete the conveniences. There are over five hundred of these, each having a number and letter. There are, besides, a number of what might be called "research" tables—small, low, flat, and broad, which an antiquarian may have all to himself; and the lid of which lifting up, he finds a convenient repository, where he can store away all his papers, notes, and books until he returns the next day. Some of the more retired of the long benches are reserved "for ladies only;" but they do not seem very much to care for such seclusion.

Round the room, and within easy reach, is a sort of free library, where every one can help himself. This, as will be imagined, consists of books of general reference, and is very judiciously chosen. It comprises dictionaries of all languages, the best, newest; encyclopædias of every conceivable sort; long lists of the old magazines, like the "Gentleman's," "Annual Register," etc.; ambitious collections of universal science and knowledge, such as the "*Panthéon Litteraire,*" and "Didoret's Encyclopædia;" histories of towns and counties in profusion, and the best and most favorite text books in the respective classes of law, theology, medicine, mathematics, physiology, etc. The only weak place is the class of English *belles lettres* and biography, which is ordered after a very random and arbitrary fashion, comprising such poor books as "Beattie's Life of Campbell," but not "Moore's Life of Sheridan," having "Twiss's Life of Eldon," and no "Life of Sterne," and being without Mrs. Oliphant's remarkable "Life of Irving." In fact, it would be hard to say on what principle the choice is made.

Having chosen a seat—and if you come late in the day you have to take a long, long walk seeking one—go to the catalogue for your book. And here we may pause to survey this wonderful catalogue, a library of folios in itself Every volume is stoutly bound in solid blue calf, with its lower edges faced with zinc, to save wear and tear from the violent shoving in of the volumes to their places. On every page are pasted about a dozen neatly lithographed entries, and between the pages are guards, so as to allow fresh leaves to be put in, as the catalogue increases. As the guards are filled up, the volume is taken and rebound with fresh guards, so it becomes an illustration of the famous Cutler stocking, with this difference, that the stocking is gradually increasing in size. Nothing can be fuller than the arrangements for this catalogue, as it even refers you for a biographical notice of a well known man to some of those little meagre accounts prefixed to collections of their poems, and to biographical notices and reviews. It also, to a great extent, helps the student to the real names of those who have written under assumed ones. This is the new catalogue, but there is an old one partly in print and partly in manuscript, and both must be consulted if you wish to make your search exhaustive. Periodical publications make a department in themselves under the letter P, filling some twenty folio volumes, to which there is an index, also in many folio volumes. London has nearly one folio to itself, Great Britain and France each several. Every entry is complete, title in full, date, place of publication, and a press mark, such as $\frac{645 \text{ a } 10,}{3}$ which is to be copied on a little form containing the rules to be observed, with blanks for name of book, date, etc.

Having given in the ticket, the reader may return to his place, certain of having to wait at least half an hour, and he may amuse himself by watching the smooth running carts laden with volumes, which arrive every moment, and the attendants who are seen hurrying along through the glass screen, each with his pile of books, with their labels fluttering. Considering that some of these have to walk three quarters of a mile along passages and up steep stairs to fetch some remote book, and that often the forms are imperfectly filled, the delay is not surprising. A more intelligent, willing, and obliging class of men cannot be conceived, always ready to volunteer assistance, even outside their special duty. It is pleasant to see how they exert themselves for novices, or for certain old veterans, filling up their forms for them.

The readers are a very singular and motley class. And here it is that some reform is wanting. A great deal of the time and trouble of the staff is taken up with supplying the wants of young boys and girls, and general idlers, who come to read novels and poetry, and take up the places of others who have real business. It cannot be supposed that the nation meant to pay for books and attendants, merely to wait on this useless class. A reform in the way of classification would be useful, the putting these drones in a department of their own, and with one attendant only to wait on them all. Every book ought to be procured within ten minutes, and by a system of speaking tubes and small lifts, the matter could be much simplified. The Museum would run fewer risks from the abstraction of books, by limiting the number of readers. There are many traditions in the Museum of these robbers, some of whom were always suspected, but to whom the matter never could be brought home: while there was a "gentleman" who was not suspected, but was at last discovered. A Museum book is fortunately very unmarketable, it is so stamped all over; and if a volume had two hundred illustrations, every one would bear this mark. To all libraries come people with a mania for cutting out prints, and at this one, on a stand made purposely, are exhibited two maimed and defaced books, thirty or forty leaves torn out, with an inscription explaining how they were placed there as a warning, etc. This exhibition is a little undignified, and it seems quite purposeless. The evil doers would only chuckle at it, while the well conducted have no need of such reminders.

American Association of Science.

The recent meeting of the Association at Indianapolis was one of considerable interest, so far as the discussion of papers was concerned, and quite enjoyable for other reasons. The members were very hospitably entertained by the citizens of Indianapolis. Some 250 of the members went on an excursion to the Mammoth Cave in Kentucky.

We give in our present number, under separate headings, an outline of some of the papers that were read, and shall from time to time present others.

The following officers were appointed for the ensuing year:

PRESIDENT—Prof. J. Lawrence Smith, of Louisville, Ky.

VICE PRESIDENT—Prof. Alex. Winchell, of Ann Arbor, Mich.

PERMANENT SECRETARY—Prof. Joseph Lovering, of Cambridge, Mass.

GENERAL SECRETARY—Prof. E. S. Morse, of Salem, Mass.

TREASURER—William S. Vaux, of Philadelphia, Pa.

AUDITING COMMITTEE—Messrs Eustis and Wheatland, of Massachusetts.

The Perturbation of Forces.

This was the title of a paper read before the Association by James D. Warner, of Brooklyn, N. Y. He thought that time was an important element in effecting the change in the character of force. The impact of bodies in motion, if little or no time was expended in changing the direction of that motion, changed its character instead, and made it heat. He believed that the attraction and repulsion of atoms were not the *plus* and *minus* of the same force, but two distinct forces having opposing lines of direction. Having explained how a continuous vibratory motion of atoms was obtained under his theory, he gave an opinion as to the change in those vibrations, which, he thought, brought about heat, light, or sound; and he considered that light was made manifest to the senses by a change made by the eye in the perturbations of force or vibration of atoms, whereby a motion is communicated to the nerves.

These views are criticised and opposed in a brief discussion. One member regarded the opinions advanced by Mr. Warner as being liable to the well known summary once made by a critic that what in them was true was not new, and what was new was not true. That the question whether motion should be resolved into heat in case of the impact of moving bodies had nothing to do with time; it was equally true of the slow heating of a railway axle and the instantaneous flash when a projectile struck an iron target. The question was, did the impact destroy cohesion in one of the striking bodies? If so, motion became heat.

Ancient Dentistry.

Dr. Reid, of Terre Haute, read a paper upon ancient dentistry. Among the ancients great success was obtained in this art. Casselius was a dentist in the reign of the Roman triumvirs, and gold was used for the filling. But nearly 500 B.C., gold was thus used, and gold wire was employed to hold artificial teeth in position, and it does not seem then to have been a new art. A fragment of the tenth of the Roman tables, 450 B.C., has reference to preventing the burial of any gold with the dead except that bound around the teeth. Herodotus declares that the Egyptians had a knowledge of the diseases of teeth and their treatment 2,000 B.C. In Martial, Casselius is mentioned as either filling or extracting teeth; but he specified that he would not polish false teeth with tooth powder. Lucian mentions an old maid that had but four teeth, and they were fastened in with gold. These facts cover a period of 600 years.

Intermarriage of Blood Relations.

Prof. Richard Owen, LL.D., A.M., of the Indiana State University, stated an important fact which cannot be too widely disseminated, namely: That the intermarriage of blood relations is a physiological error, and he might almost say, with our knowledge of such matters, a crime. Speaking from a close observation of this subject for many years of all the families of his acquaintance where close intermarriage had been permitted, the children were either deaf mutes or were afflicted by some deficiency. He knew a young man whose father was a physician, and who should have known better than to marry a double cousin, but the consequence was, as the last portion of the osseous system developed, the young man, from the intermarriage of those in whom the same material was deficient, was prevented from having a single tooth at any period. His sister had but two or three small stubs of teeth, and their brother was altogether deficient in his mental faculty. He insisted that it was a great crime for parents to allow their children to grow up with the idea that they might ever intermarry with blood relations. It should be a thing never to be thought of, the intermarriage with those connected by ties of consanguinity.

Mr. Ferguson knew of a case in Ohio where some thirty families had married and intermarried until they could no longer tell their relationship. Most of the progeny were deaf mute, and the remainder a little above idiotic.

The Mental Capacity of Races.

A paper was read. by the President, from Mr. Renas Davis, of Bennington, N. H., on the causes of the "Difference in Mental Capacity of Races." The hypothesis is this: 1. The principle that we call mind in contradistinction from matter is simply a force or power like electricity, etc. 2. This force or power is precisely the same, whether it runs the machinery of a fish, bird, monkey, or man. 3. The different mental phenomena of organized animal life are in the material or machine, and not in the power or force that operates it. 4. The difference in mental capacity between a high or low race of men, or between men and other animals, or between other animals, is simply in the quality of the material of which they are composed, and in the simplicity or complexity of organization which the material assumes. 3. The basis of the material of which animals are composed is plants. 6. As to the two million or more varieties of plants that grow on the earth, the rule holds that the greater the number of these plants represented in the animal, the greater his mental capacity; but as there is a great difference in the value of plant material, ten of some kinds might be worth more than 100 of others, and this modifies the rule.

It was pointed out that the motive power or force could not be considered as an intelligent identity, from the fact that it is very feeble in the commencement of life in each individual throughout the animal scale, and when the material part becomes diseased or enfeebled, the mental capacity usually declines; if the mental force were an intelligent identity, there is no apparent reason why a child one day old or a decrepid old man should be wanting in the intellect of maturity. That the intellectual force is the same in kind in men as in other animals is obvious from many reasons which were alleged. A contrary supposition would involve as many different forces as there are species of animals, and a system as complex as the Ptolemaic cycles and epicycles.

In regard to his theory of variety of plant food, Mr. Davis thought that in the geologic eras variety was unattainable and hence the forms of life were of a lower order. He exemplified the progress of various races *pari passu* with the increased variety of their food, a variety of animal food being equivalent to a variety of vegetable material to whatever extent the animals used for food were fed on a variety of plants. He believed that from ninety five to ninety-seven per cent of mental power was inherited, and that it was hence only on three to five per cent of mental force that changes were effected in the individual; hence the many generations required for improvement. He believed that civilization kept to the line of the grasses upon the earth's surface, and that its development was largely aided by beef and mutton; but it might have begun in a fruit bearing locality—a Garden of Eden; it would come to a standstill in a forest, in a desert, or a South Sea island.

Tremolo for Reed Organs.

This invention consists in the use of a rotary prism applied to organs or melodeons in such way that the sound waves can strike it at different angles, to be reflected in different directions, and thus produces the desired tremulous effect. If preferred, however, a quadrangular or rhombic prism may be used. It is made of thin wood or other light material, preferably hollow, so that it can be revolved with little power. Its ends have projecting pins which are hung in a stationary frame. One of the pins is provided with a crank or cam, whereby it is connected with the shaft of the wind wheel, which, when revolved, will impart rotary motion to the prism. The wind wheel is arranged and moved in the ordinary or other suitable manner. When the sound waves strike the revolving prism at different angles, they are reflected with greater or less force, according to the differences of angles, on the same principle as waves of light are reflected, and thus produce the desired tremulous effect. The prism is to be placed in a position where the sound waves can strike it directly after they leave the reeds. John R. Loman, of New Haven, Conn., assigner to B. Shoninger, of the same place, is the inventor of this improvement.

TORNADOES AND WATER SPOUTS.

Professor Whitfield gives in the *American Journal of Science* the following statements relative to tornadoes and water spouts:

One of the most remarkable accompaniments of the tornado is the black column or spout, extending from the cloud down to the surface. It precisely resembles a column of black smoke, such as pours from the pipes of a steamer burning pine wood; it is, in fact, condensed vapor or cloud, intensified in blackness by the dust and rubbish carried up from the ground.

The tornado is a shell or hollow cylinder of air, and all its energy lies in its rotating rim, which is powerfully compressed by two antagonistic forces, centrifugal and centrepetal. The rapid whirl draws the air from the center towards the circumference, where it is met and opposed by the inrushing winds. There is, consequently, a rarefaction, a great reduction of temperature by expansion, and condensation of vapor within the shell.

The spout does not hug the earth continuously, but rebounds or *ricochets* along the uneven surface, often skipping the valleys, but generally desolating the hills. It is disposed, however, at every recurrence to strike at the same points. It is not an established fact, but it is commonly believed, and with some reason, that the tornado does, in the course of years, return along its beaten path, and that it is unsafe to build where one has ever passed. A house in Pickens county stood on a hill from which a log cabin had been blown away some thirty years before. I witnessed the last of three which have passed along the same track. Near Hernando, Miss., three have followed an unvarying line. It is probable that there are some localities more favorable than others to the generation of these storms, and if this be true, then the law of direction, hereafter explained, accounts for their progress along the indicated path.

Such an opportunity, as fell to my lot, of witnessing the formation and course of a tornado is rarely enjoyed, and the phenomena observed on that occasion are of great value in illustrating the origin of these whirlwinds. On the 29th of April, 1267, at ten o'clock, A.M., I was approaching Tuscaloosa, on the Elyton road, the general direction being east and west. The weather was hot and oppressive, while a perfect calm prevailed both at the surface and in the upper regions, for the leaves were not stirred upon the trees, and the heavens were covered with fragmentary clouds, perfectly at rest. Occasional large drops of rain fell, and there was, now and then, lightning. The atmosphere was evidently surcharged with vapor, and in a condition of great electrical excitement. At the distance of three and a half miles from town, an elevated ridge, over which the road passed, afforded an extended view, and I saw a mass of black cloud detached and hanging over the western horizon. It appeared nearly circular in shape, with the exception of a slight angular projection, like an inverted cone, at its lower edge. I afterwards ascertained that it was at this time about five miles distant from me, and a calculation, based upon the estimated angles, fixed the elevation of its base above the surface at about fifteen hundred yards, and its diameter, considering it a sphere, at about six hundred. It was entirely at rest.

The first view of this cloud suggested to me the possibility of a tornado, and I watched it closely as I drove along in my buggy. While I was driving, leisurely, more than a quarter of a mile, it maintained its position and outline unchanged. At length a farm house with its shade trees intercepted the view for about a minute, and when I came again in sight of it, the projection beneath the ground appeared in violent commotion. There was now no longer any doubt of the character of the phenomenon about to be exhibited, and satisfied, from a knowledge of the general direction of tornadoes, that it must come near me, I leaped from the buggy and released the horse as quickly as possible, in order to give him a chance for his life. This did not occupy more than half a minute, and when I turned to look again, the black column was formed, reaching from the cloud to the ground. A few moments showed that it was rapidly approaching. I remember noticing small fragments of cloud moving toward it from the north, but there was no perceptible breeze where I stood. When about a mile distant I saw that it would go south of me, and at this time I first observed the surface drift, which appeared like an innumerable flock of birds, flying around the summit of the column, and here, too, the pine tree spoken of emerged from the vortex, and settled slowly to the earth. The column was now much shorter than when first formed; the cloud had descended much nearer the surface. It passed about three hundred yards south of my position, and at this point the first electric discharge took place. The lightning zigzagged down the column, shedding through it a lurid glare. The roar was deep toned and powerful. The gyratory motion was distinctly visible. When a little further on, it became so enveloped in clouds as to be no longer distinguishable, but I knew, by the now frequent peals of thunder, that it was increasing in violence and levelling all things in its path.

This tornado was formed about a mile and a half southwest of Tuscaloosa, over an extensive marshy flat, where an observer characterized it as a "big whirlwind." It was not destructive at first, but grew in energy as it progressed, and two miles from its starting point threw down a dilapidated building. About six miles from Tuscaloosa it struck a log cabin in which were sitting a woman and several children. Every log above the floor was carried away, while the occupants were left uninjured. Twelve miles further on it performed a similar feat, taking off every log of a house without the slightest hurt to any of the family, all of them having taken refuge within on its approach. This is remarkable, but there are other like instances well authenticated, and it is commonly believed that a log house is the safest retreat. The direction of this tornado was east by 20° north. After its passage the air was cool and pleasant, and at four o'clock in the afternoon heavy rain came from the north, followed, for the next few days, by clear weather with northwest winds.

The most remarkable fact disclosed by the phenomena of this storm is the inherent power of progression which it unquestionably possessed. After the gyration was established it began at once to travel eastward, not driven by any wind, but plowing its own way through the tranquil atmosphere with tremendous speed. Here is presented a problem, which, so far as I know, has not heretofore been propounded. Its solution is important to the science of meteorology. The fact that tornadoes invariably move from the southwest to the northeast is well established, as also the fact that, by an impulse acquired from the earth's rotation on its axis, they gyrate from north to west by south. This backward gyration is thus explained: all parallels of latitude decrease in diameter, and therefore in circumference, as we go toward the poles of the earth. As they all revolve in twenty-four hours, it follows that every one, approaching the pole on either side of the equator, moves around more slowly than the one preceding it. Therefore, a current moving southward, to the vortex of a tornado in the northern hemisphere, finds that vortex rotating eastward with a superior velocity, and is left behind, or projected to the west, while for the same reason, a current blowing northward to the vortex, finds it rotating with inferior velocity, and, preserving its own easterly momentum, is hurled forward or projected to the east. Thus the south half of the rim being impelled eastward, and the north half westward, the backward or left handed gyration is fixed and maintained. Just the reverse is true in the southern hemisphere of the earth, while on the equator the gyration would be free to take either direction.

Curious Meteorological Facts.

In the fourth meteorological Report by Professor J. P. Espy, of Washington, D. C., we find the following instructive generalizations:

1. The rain and snow storms, and even the moderate rains and snows, travel from the west toward the east in the United States, during the months of November, December, January, February, and March, which are the only months to which these generalizations apply.

2. The storms are accompanied with a depression of the barometer near the central line of the storm, and a rise of the barometer in the front and rear.

3. This central line of minimum pressure is generally of great length from north to south, and moves side foremost toward the east.

4. This line is sometimes nearly straight, but generally curved, and most frequently with its convex side toward the east.

5. The velocity of this line is such that it travels from the Mississippi to the Connecticut river in twenty-four hours, and from the Connecticut to St. John, Newfoundland, in nearly the same, or about thirty-six miles an hour.

6. When the barometer falls suddenly in the western part of New England, it rises at the same time in the valley of the Mississippi, and also at St. John, Newfoundland.

7. In great storms the wind for several hundred miles on both sides of the line of minimum pressure blows toward that line directly or obliquely.

8. The force of the wind is in proportion to the suddenness and greatness of the depression of the barometer.

9. In all great and sudden depressions of the barometer there is much rain or snow; and in all sudden great rains or snows there is a great depression of the barometer near the center of the storm, and rise beyond its borders.

10. Many storms are of great and unknown length from north to south, reaching beyond our observers on the Gulf of Mexico and on the northern lakes, while their east and west diameter is comparatively small. The storms therefore move side foremost.

11. Most storms commence in the "far west" beyond our most western observers, but some commence in the United States.

12. When a storm commences in the United States, the line of minimum pressure does not come from the "far west," but commences with the storm, and travels with it toward the eastward.

13. There is generally a lull of wind at the line of minimum pressure, and sometimes a calm.

14. When this line of minimum pressure passes an observer toward the east, the wind generally soon changes to the west, and the barometer begins to rise.

15. There is generally but little wind near the line of maximum pressure, and on each side of that line the winds are irregular, but tend outward from that line.

16. The fluctuations of the barometer are generally greater in the northern than in the southern parts of the United States.

17. The fluctuations of the barometer are generally greater in the eastern than in the western part of the United States.

18. In the northern parts of the United States, the wind, generally in great storms, sets in from the north of east and terminates from the north of west.

19. In the southern parts of the United States, the wind generally sets in from the south of east and terminates from the south of west.

20. During the passage of storms the wind generally changes from the eastward to the westward by the south, especially in the southern parts of the United States.

21. The northern part of the storm generally travels more rapidly toward the east than the southern part.

22. During the high barometer on the day preceding the storm it is generally clear and mild in temperature, especially if very cold weather preceded.

23. The temperature generally falls suddenly on the passage of the center *of* great storms, so that sometimes, when a storm is in the middle of the United States, the lowest temperature of the month will be in the west on the same day that the highest temperature is in the east.

Some of the storms, it is true, are contained entirely, for a time, within the bounds of my observers, and in that case the minimum barometer does not exhibit itself in a line of great length, extending from north to south, but it is confined to a region near the center of the storm, and travels with that center toward the eastward.

From these experiments it may safely be inferred, contrary to the general belief of scientific men, that vapor permeates the air from a high to a low dew point with extreme slowness, if, indeed, it permeates it at all; and in meteorology, it will hereafter be known that vapor rises into the regions where clouds are formed only by being carried up by ascending currents of air containing it.

The Coke Trade.

The western portion of Pennsylvania, says the *Protectionist*, is becoming quite celebrated for its extensive coke trade. The Pittsburg and Connellsville Railroad Company derives an enormous tunnage from the manufacture of coke, and every month it is increased by the addition of new ovens. Indeed the trade has assumed such vast proportions that the Pennsylvania Railroad Company is taking the preliminary steps to secure a portion of this important traffic. Surveys are making for a branch road from Greensburg to Connellsville—less than twenty-five miles—which, when completed, will be a paying institution from the commencement of business, for the reason that it will extend every facility to the coke men for their freights, and for the additional reason that the distance to Pittsburgh will be shorter than by the Pittsburgh and Connellsville road.

There are upwards of 900 coke ovens along the Pittsburgh and Connellsville road, and the Uniontown Branch and Bradford and Mount Pleasant Branch roads, and nearly 400 additional ones are being constructed. Some idea of the tunnage can be formed when it is known that the production largely exceeds 100,000 bushels, or about 5,000 tuns of coke per day, and falls far short of the demand.

The extension of the Hempfield railroad, east from Washington, Pa., to connect with the Pittsburgh and Connellsville railroad, is partially with a view to secure a portion of this tunnage. When built, the distance to Wheeling will be reduced some forty miles from Baltimore, and place that city within thirteen miles of the same distance from Baltimore that Pittsburgh is.

The enormous piles of "slack" or waste coal lying contiguous to the Westmoreland Coal Company's mines is to be utilized at last and turned into coke. The Messrs. Carregie, of Pittsburgh, and others, are constructing coke ovens along the Pennsylvania railroad for this purpose, and it is said they will be successful, having a process for desulphurizing the fine coal. The sulphur has heretofore prevented coke being made from the Westmoreland coal.

Lightning versus Gas Pipes.

Last summer the steeple of the Congregational church at Terre Haute, Ind., was struck by a bolt. From the description of it as given by an intelligent citizen of that place, the following facts are gathered: The bolt hurled the lightning rod into the street, then extending its force down and over the brick wall of the church, it seized upon the gas pipe in the wall, hurling the bricks outside at the point and the plastering inside; then passing down this pipe to the meter, it collapsed it and its lead connection pipes, and crumbled its dial plates; then it punched a hole an inch in diameter into the iron pipe that connects with the street main; passing along this connection to the street it ran along an iron main, of an inch bore, 650 feet, and along an iron main of four inches bore 350 feet, bursting the hubs of these mains along a distance of 1,600 feet before its projectile energy was dissipated.

The lead packing of these pipes partially insulated the iron at each joint, in consequence of the lead being a poorer conductor than iron by two and a half times, obstructing the moving force of the bolt, forcing the hubs of the pipes asunder for the distance above mentioned, causing a leakage of the gas and the discovery of the facts here detailed. Here, then, we find approximately the correlative amount of metal necessary to dissipate the energy of an ordinary bolt. Taking the outside of the pipes, we shall have about 1,400 square feet of metal surface; include the inside, and we have 2,800 feet, and this would be equivalent to about 300 ordinary lightning rods.

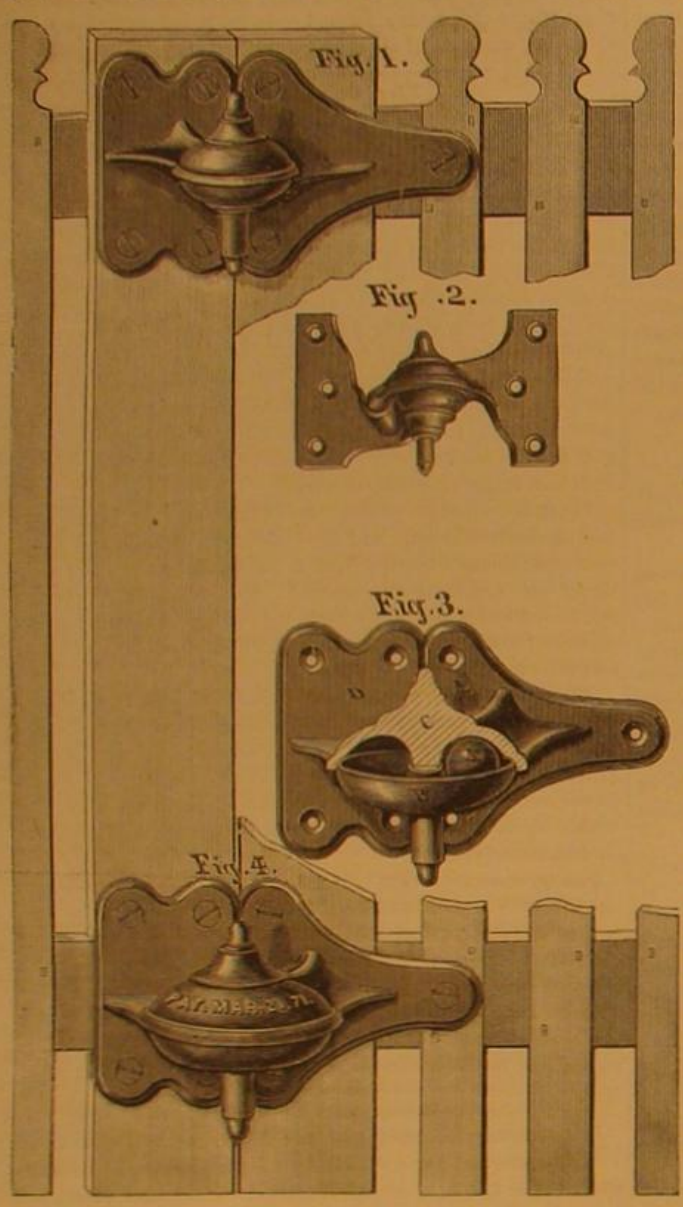
Now if it took 1,000 feet of six and four inch bore of iron pipe laid in the moist earth to dissipate a thunderbolt, and only dissipated it after an extraordinary amount of energy was neutralized in the breaking of the iron hubs, how much of a similar bolt would be dissipated by five or six feet of a lightning rod of three quarters of an inch in diameter, projecting into the ground, which is the case with most rods? I will leave electricians to answer the question.—*From a paper read to the Franklin Institute, by Professor J. Wise.*

If we would establish the habit of drinking water freely in the morning, soon after arising, commencing with small quantities, increasing gradually as we learn to relish it, until the chief portion taken during the day is before breakfast, it will promote the health to a much greater extent than it ordinarily does, eradicate disease from the system, and become a most decided luxury in time.

LEMMAN'S ANTI-FRICTION BALL GATE HINGE.

Perhaps there has been no greater source of petty annoyance to farmers than the sagging of gates and the loosening of their hinges. To remedy these evils, resulting in a great measure from excessive friction in the action of the hinge, and also to furnish a cheap and durable substitute for the hinges hitherto employed are the objects sought in the invention of M. R. Lemman, patented March 21, 1871, and illustrated herewith.

Figure 1 represents the upper hinge attached to the post and gate. Fig. 4 shows the lower hinge, in which the ball is placed which carries the weight of the gate, causing the latter to be opened very easily without friction. Fig. 3 shows a sectional view, a portion being broken away to show the groove and ball in place. Fig. 2 represents a shutter hinge of smaller size, and modified somewhat in form to adapt it to the purpose, but acting on the same principle.



The ball carries the weight of the gate around the pintle in an annular groove, forming a complete circle. The top part of the hinge, that goes on the gate below, has a groove, corresponding with its mate on the post that rests on the ball. When the gate is opened, the ball making its circle, takes all the friction from the hinge, saving the wear and breakage. The top part of the hinge protects the working parts from snow and ice completely, making a handsome ornamental hinge. On small gates the upper hinge is made smaller than the lower one, and the pintle being placed closer to the post, makes such gates self-closing.

For further information address the manufacturers, Lemman & Owens, Hamilton, Ohio.

Glueing.

Sherrard B. Barnaby, in the *Quarterly Journal of the Amateur Mechanical Society*, says:

The right sort of glue to use for ordinary work is "best Scotch" (inferior kinds are often adulterated with lime). This glue is sold at all good tool shops; but if it cannot be obtained choose the most transparent cakes. For fine work in light colored woods, Salisbury glue may be used; this is made in thin cakes, and is of a clear amber color.

PREPARATION OF THE GLUE.—Break it into small pieces with the hammer, and soak for at least twelve hours in sufficient water to keep it covered even when swollen by the water it absorbs; this water must be cold. It is no use attempting to melt glue by putting it into hot water; it will always be stringy, and give endless trouble. Put the pieces of soaked glue without any superfluous water into the glue pot, taking care that the outer vessel is kept full of water, which will prevent the glue in the inner vessel from burning; this is very important.

The glue will soon dissolve; it will be thin at first, but quite strong enough; subsequent boilings will, however, improve it, so long as it is never allowed to burn; indeed, as water is driven off by evaporation, more will have to be added. If stronger glue is required, it may be made with beer instead of water, and stronger still if linseed oil is added to it instead of water, as the original water in which it was dissolved is evaporated by boiling.

Cleanliness is very essential to the well being of glue; a wooden cover should therefore be provided for the pot, and if any dust or dirt is on the cold glue, it should be just washed off before putting the pot on the fire. A scum always rises as the glue boils; carpenters generally stir this in with the brush, I prefer to skim it off, and put it in a gallipot, where it accumulates and settles with waste scrapings, and much of it may be utilized afterwards.

A wire stretched across the pot is very useful to remove superfluous glue from the brushes; this is much better than pressing them against the edge of the pot, where quite enough glue is sure to accumulate and burn.

Never use any of that old dried up and burnt glue which may be generally found in the bottom of a glue pot kept in a kitchen; have the whole concern boiled out in a saucepan before you put your nice clean glue into the pot.

HOW TO USE THE GLUE.—It must not be supposed that the strength of a glue joint depends upon the quantity used; those joints hold the best in which the pieces of wood are brought closest together. The following is a brief description of the process to be pursued:—Have the glue as hot as possible, the glue pot within easy reach, a basin of hot water, and a bit of sponge on the bench. Cover quickly with hot glue both the surfaces to be united, and rub them together, pressing out all the glue that can be got rid of; let the motion of the one piece on the other be but slight; for instance, in a three foot joint the top piece need never move more than an inch or two beyond the other, which is fixed, it is supposed, in the bench screw; it will be soon felt that they are inclined to stick together, then they must be brought at once to that which is to be their final position, and not moved again. Superfluous glue may now be wiped off with the sponge when necessary, *i. e.*, when it is in an angle or an awkward place to get at afterwards; but as a general rule, and particularly in a long joint, it should be left on till cold, for it excludes the air, and goes a long way towards making a good permanent joint.

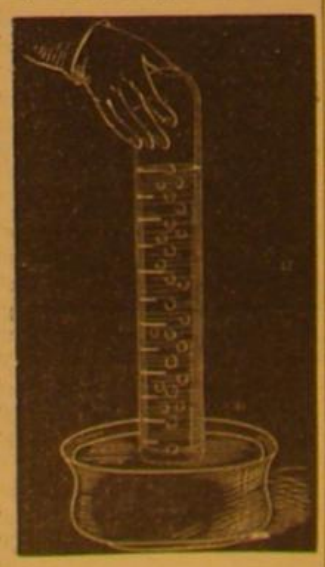
If the edges of two long boards have to be glued together, the job will require two hands. One board having been fixed in the bench screw, the other is rested against it, so that the edges meet obliquely, making a very blunt V. While one workman steadies this second board (with the help of a weight, or the jack planes on the bench to keep it from slipping), the other, holding the glue pot in his left hand, passes the brush, well loaded with glue, rapidly along the edges; he must not mind wasting his glue; there is no time now to be careful about spilling a drop or two. When the edges are quite covered, he takes one end of the loose board, his assistant the other, and they rub it up and down a time or two till it sticks, as with shorter pieces.

And here note that if you are not skillful enough to shoot a perfectly true edge on your board, make it slightly concave rather than convex; for the ends have a tendency to rise.

In glueing flat pieces of wood together, such as two or three thin pieces to make one thick, with the grain running two or three different ways, screw clamps are required. These are wonderfully useful things, for many purposes, very cheap, and not half enough used by amateurs.

NEW TEST FOR KEROSENE OILS.

At the recent meeting of the American Association, Professor Vander Weyde explained a new and excellent test for the safety of hydrocarbon oils. He takes a glass tube, closed at one end and open at the other, and fills it with the petroleum to be tested; then closing the open end with the finger, inverts it in a vessel with water, warmed to 110° by mixing hot and cold water, and keeping it at that temperature by occasionally adding hot water. If now any vapor be apparent, it will collect in the closed upper part of the tube, displacing the oil downward. The amount of this gas will be a comparative test of the different qualities of oil, and for this purpose the tube may be graduated in order to measure the amount of volatile liquid present in the same.



This method is not subject to the discrepancies found in the usual way of testing, in which an impure and dangerous quality of oil may be made to appear better than it is by slow and gradual heating; and which, if performed in a slight draft of air, will have the vapors carried off as soon as developed, so that it becomes impossible to ignite them. This new method gives freedom from the danger of using fire, more accuracy, a trustworthy means of measurement, and no chance for deception.

This test for petroleum is founded on the fact that all vapors given off by petroleum are combustible, and that if any kerosene, or other preparation from petroleum, gives off a vapor at the accepted standard temperature of 110°, it is not necessary to try whether it will burn, but sufficient to collect it in a proper vessel, by which we gain the additional advantage that we may measure the quantity of the vapor, while none of it can be lost by air currents incidentally passing over the surface of the liquid.

MASSEY'S DOUBLE COLUMN HIGH PRESSURE AND LOW WATER ALARM FOR STEAM BOILERS.

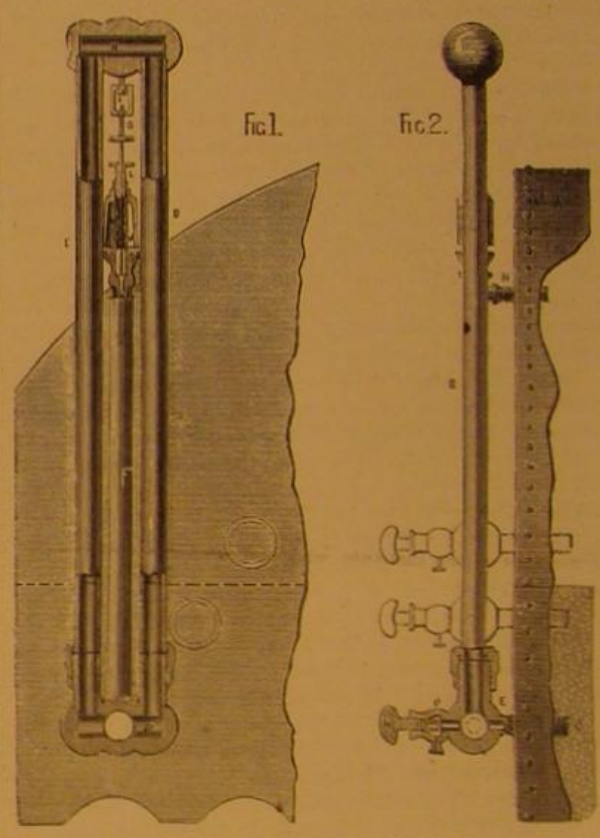
In a recent article on the *Westfield* explosion we took occasion to say that all boilers ought to be provided with both high pressure and low water alarms.

The engraving published herewith exhibits the construction of an instrument intended to perform the functions of the two instruments named, and it is claimed that it acts with unerring certainty, that it does not clog either by scums or sediment, that it is simple, easy of adjustment, and in every way free from defects that would tend to render it inoperative through the action of corrosion or any result of exposure in actual use.

We have been shown numerous certificates from proprietors and superintendents of extensive establishments, speaking in the highest terms of the superior qualities of this attachment, and vouching for its reliability under all circumstances.

Fig. 1 is a front view of the instrument as applied to a horizontal boiler, and Fig. 2 a side view, showing the gage cock and steam connections; B is a double tube: E a chamber or iron tube forming a steam and water connection with the boiler; N a steam connection with the whistle; J a hollow spindle through the whistle; K a spiral spring to hold the valve in its seat; L a screw for adjusting the steam whistle to any desired pressure; G the valve rod, and I the swivel for adjusting for low water.

When the water in the boiler and chamber is above the



lower gage cock, the communication with the detector is submerged, and both tubes filled with water, the temperature of which cannot exceed 212° Fahr.; at this temperature the detector is adjusted. When the water in the boiler descends below the lower gage cock, steam will enter one of the tubes, B, and almost instantly expel the water from the detector through the opposite tube, into the boiler, filling the space with steam, the increased heat of which will expand the tubes, raising the valve, and sounding the alarm. Over pressure of steam in the boiler may be indicated by adjusting the spring, K, to the desired pressure, by raising or lowering the screw, L. To adjust to high pressure, the safety valve is set to the desired maximum pressure, and steam raised until it blows off; the screw, L, is then raised or lowered at the top of the whistle, until steam escapes through the whistle at the moment the safety valve raises, or a few pounds higher if desired. It will be seen that when the pressure of steam exceeds the power of the spring as adjusted, the valve will be raised and the whistle sounded. To adjust for low water, the milled wheel attached to the valve rod, G, is held, and the swivel, I, turned until it rests firmly on the head of the screw, at its upper end, when the least expansion or lengthening of the tubes will raise the valve of the whistle against the power of the spring and sound an alarm.

After adjusting the detector for low water, the jam nut in the swivel is tightened, so that the adjustment may not be altered except by design.

An alarm being sounded, an examination of the gage cock will determine whether it was occasioned by high pressure or low water.

This ingenious invention was patented through the Scientific American Patent Agency, by Gideon B. Massey, of New York, Aug. 23, 1870, and another patent will issue Sept. 5th, of the present year. For further particulars address Massey Low Water Detector Company, 56 Broadway, New York city

A FORMATION, in ledges, of Labrador spar has been discovered in New Hampshire. This mineral was not previously known to exist in New England, although it is not uncommon in the Adirondack mountains. Professor C. H. Hitchcock, of the New Hampshire Geological Survey, brought the fact to light.

AN INCIDENT IN THE LIFE OF BARON LIEBIG.

BY PROFESSOR CHARLES A. JOY.

It was my good fortune, a few summers ago, to spend a week with Baron Liebig, at a quiet inn on the banks of Lake Geneva, in Switzerland, and to be his constant companion in his rambles through the vineyards and lovely walks of that enchanting spot; and one day, the conversation turning upon some of the incidents of his early life, I asked him to relate to me how he happened to devote his attention to chemistry, and to what circumstances he owed the kind interest bestowed upon him by Gay-Lussac.

The genial old man sat down upon a bench in a protected nook, and related to me the following incidents: He was the son of very poor parents, who could ill afford to keep him at school, and he had a narrow escape of being put at a trade; but, while yet a lad, having heard that the Minister of Instruction, in Darmstadt, had it in his power to aid meritorious children by a government stipend, he went to the palace, and after several failures, finally succeeded in obtaining an interview with this grand personage, and in securing sufficient assistance to enable him to go to the Gymnasium. The Director of the Gymnasium was in the habit of visiting the school on stated occasions, and of asking each boy what he purposed to make of himself, and of receiving the usual answers: "a musician," "a doctor," "a lawyer," etc.; and when he came to Liebig, the reply was always ready, "I mean to be a chemist, Sir;" to which the Director uniformly answered, "you stupid boy, there is no such profession as chemist." But Liebig persevered, and while at the University, was so fortunate as to make a very important discovery of some new cyanogen compounds, and with specimens of these preparations in his pockets, aided by some friends, he set out for Paris. He was then about twenty years of age. In Paris he sought out one of the members of the Institute, and showed him his specimens, and the Professor offered to exhibit them to the Institute, and to present the subject for discussion; but it was a long time before he fulfilled his promise, and poor Liebig went regularly to the Monday meetings of the Academy, hoping to hear his name mentioned, but always went away disappointed. One day, however, the subject was duly presented, and attracted great attention; and after the adjournment several members remained to talk to the boy, for he was still a boy, and to inquire into his history; among them was a kind man in the prime of life, who asked him to dine with him on the following Thursday to meet some of the chemists of Paris. The man who thus proposed to befriend the unknown chemist must have given his name and address, but Liebig was so embarrassed and flustered by the occasion that he forgot it entirely, and although he asked the janitor and several persons who were left in the room, he could obtain no clue, and so Thursday went and came, leaving Liebig in a state of desperation. A few days afterwards, meeting casually the member of the Institute who had presented his paper, the latter exclaimed at once, "Why did you not come to the dinner that Baron Von Humboldt gave for you on Thursday? He invited Arago, Gay-Lussac, Thénard, and several of the first chemists of the city, in order to interest them in you, and you did not come." Liebig did not wait to hear more, but rushed off to the residence of Von Humboldt, to apologize and to explain the occasion of his absence.

Von Humboldt took the matter good naturedly, and at once accompanied his young *protégé* to Gay-Lussac, who, to oblige his friend, took him as a pupil into his laboratory, and from this moment Liebig's career was secured.

The kind interest of Von Humboldt started him on the path which he has since pursued to the highest distinction; and when, a few years later, the famous book, "Agricultural Chemistry," was published, we find it dedicated to his great patron and friend, Alexander Von Humboldt. Liebig has not forgotten his obligations to the French, and we can understand with what eloquence of language and sincerity of emotion he uttered the following words at a recent meeting of the Royal Bavarian Academy of Sciences, in reference to the future relations of Germany and France:

"The Academy seizes this moment to declare openly that there exists no national hatred between the German and Latin races. The peculiar character of the Germans, their knowledge of languages, their acquaintance with foreign people, the past and present state of their civilization, all tend to make them just toward other peoples, even at the risk of often becoming unjust toward their own; and thus it is that we recognize how much we owe to the great philosophers, mathematicians, and naturalists of France, who have been in so many departments our masters and our models. I went forty-eight years ago to Paris to study chemistry; a fortuitous circumstance drew upon me the attention of Alexander Von Humboldt, and a single word of recommendation from him caused M. Gay-Lussac, one of the greatest chemists and physicists of his time, to make to me, a young man of twenty, the proposal to continue and finish, with his co-operation, an analysis which I had commenced; he introduced me as a pupil into his laboratory; my career was fixed after this. Never shall I forget the kindness with which Arago and Thénard received the German student; and how many compatriots, physicians, and others, could I not name, who, like myself, gratefully remember the efficacious assistance afforded to them by French men of science, in finishing their studies! An ardent sympathy for all that is noble and grand, as well as a disinterested hospitality, forms some of the most noble traits of the French character."

THE odor of the herb pennyroyal is shunned by fleas, and a few of the leaves will drive them away from any room or person. Other plants of the mint species are said to have the same useful characteristic.

Coal Holster and Conveyer.

Mr. Joseph Green, of New York City, assignor to himself and George Stancliff, also of New York, has recently patented an apparatus for hoisting and conveying coal in gas works, goods or shipping docks, etc., which is an ingenious piece of mechanism. We can at this time give only the outline of this invention, so that our readers may gain some idea of its working.

The bucket is self locking, and when filled is hoisted up to a truck running upon a slightly inclined railway. As soon as the bucket reaches the truck, it is automatically locked thereto, and, by the continual winding up of the rope, the truck and bucket are drawn along the track till they reach a pin placed in the side of the track, over the place where it is designed to drop the coal or other material. This pin trips a lever which unlocks the bucket, and allows it to discharge. The motion of the hoisting drum being then reversed, the truck carrying the bucket rolls back along the slightly inclined railway by virtue of their gravity; and when they reach the point at which the bucket must be lowered, the bucket is automatically unlocked from the truck and falls, to be again refilled, and so on. The apparatus works with great smoothness and uniformity, and is undoubtedly a valuable improvement.

PLUCKY SUSAN, OR LUCK AT LAST.—A LEAF FROM THE LIFE OF A WESTERN INVENTOR.

[From the Janesville (Wis.) Gazette.]

You think I'm nervous stranger? Well I am
If 'twa'n't for making silly people talk
I'd get right off this pokish train and walk
From here to where I'm going—Amsterdam.

That's where I live, you see. As for Lacrosse—
(Excuse me, neighbor, I must talk or bust)—
Since I've been there it's three years certain, just:
And now to laugh or cry is just a toss.

"Married?" Why, yes, that's where it is, you see;
I've telegraphed her I was strong and well,
And coming to her; but I didn't tell
That I was rich. I thought I'd let that be.

It's too good luck, this is, to last, you know
And, stranger, if I wasn't kind of rash,
I'd bet my bottom dollar that we smash
Before—but, shaw! excuse me, I'll go slow.

You see, when we were married, Sue and I,
I was a good mechanic, and not poor
Until I struck it, as I reckoned, sure,
In an invention I was working sly.

All I could make went into that concern;
And people called me crazy for it, too,
And said I'd better stick to what I knew;
But folks *will* talk, and have to live and learn.

In all this world I had but one friend then,
But she stood by me nobly, through and through,
And said 'twould come out right at last, she knew—
One woman stanch is worth a dozen men.

Twas tough sometimes, though, when a loaf of bread
Stood on the table—all the meal we had—
I should have gone, alone, quite to the bad;
But, through it all, my Susan kept her head.

'Twas her advice that sent me off at last—
She said she'd work her fingers to the bone
And live for twenty mortal years alone,
Rather than give it up—thank God, that's past

A hundred thousand and a royalty
Is what I've got for going far away;
She cheered me by her letters every day;
A million could not pay such loyalty!

She knows I'm coming; but she doesn't know
That I am rich; and she will be there, too,
Dressed in her best—her best, my poor, dear Sue
I'll bet a hundred 'twill be calico!

"*I'll* dress her now?" You bet it!—but go slow,
This luck's a heap too good to last, I fear;
I shan't believe it till I'm fairly there;
The train may smash up, easy, yet, you know.

The only reason, if it don't, will be
That I'm so strongly thinking that it will.
I'm nervous, say you? Just a little, still
The luck is none too good for Sue, you see.

Hello! we're here!—there's Sue, by all that's grand
Stranger, excuse me, sir, but would you n ind
To go ahead and tell her I'm behind?
I'm choking: see my eyes—you understand.

A New Steam Boiler.

This improvement is based upon the idea that uninterrupted circulation of the whole body of water in a boiler is a barrier to obtaining the best results in producing steam in such boiler. The introduction of diaphragms or partitions or their equivalents, which shall form separate water compartments in steam boilers, such compartments being so arranged that the heated gases and products of combustion, in their course from the fire box through tubes or in contact with surfaces to the "up take," shall come in contact with surfaces of a gradually decreasing temperature, the variations in temperature of such surfaces being caused by the division of the body of water within the boiler by means of the diaphragms or partitions or their equivalents, constitutes the general character of the invention.

The inventor states in this specification that, in adopting this principle, he is aware that he is running in direct opposition to the generally received theory, as the effort has heretofore been to produce just what he endeavors to prevent, a general circulation of the whole body of water from which the steam is generated. In locomotive boilers he employs three series of tubes, through which the heated gases pass in their course to the up take, by diaphragms or partitions. These series of tubes are separated. The diaphragms obstruct, if they do not entirely prevent, the circulation of the water, and the products of combustion will, in their course to the smoke box, pass over surfaces or through tubes of gradually diminishing temperature. The sediment naturally settles in a lower compartment from whence it may be readily removed by having a large man hole or two hand holes in the bottom of the shell. The water which fills the water legs of the boiler will consequently be nearly or quite pure. A flue, connected with the fire box, is made to divert a portion of the heat before it enters the flues of the water space, and conduct, it through the steam drum. By this means the steam is thoroughly dried and superheated before it is taken out of the drum for use.

A valve regulates the quantity of heat which enters the superheating flue. This valve is operated by the expansion and contraction of a rod (or upon the Thermostadt principle,) in the steam drum. A valve connected with this rod also regulates the draft, through the upper series of flues.

The heated gases and products of combustion which are allowed to pass through the steam drum are returned, and made to pass through the second series of fire tubes. A valve damper, by the opening of which a direct draft from the fire box to the stack is obtained, is also used. In starting fire in the fire box this arrangement is of much importance. Orifices through the diaphragms allow the feed water to pass upward from the lower to the upper series of tubes, and return chambers are placed intermediate between the sieres of tubes.

The inventor of this steam generator, Mr. Nathaniel M. Blanchard, of Spuyten Duyvil, New York, has thus boldly struck out a new path. The reasons which have led him to reject the principle of general circulation are not given in his specification, although in that connection they would certainly have been interesting.

A Patent Schemer Foiled.

A few days ago, says the *Washington Patriot*, Marcus P. Norton, of Troy, presented to Mr. Wilson, the clerk having charge of the records of patent assignments in the Patent Office, what purported to be a release of certain rights, held by F. J. Ransford and Peter Low, in an application for a patent for a "post office post marking stamp," which was rejected in 1859, and which Norton has recently been endeavoring to get permission from the office to renew.

This document was dated July 20, 1859, twelve years ago, but bore undoubtable evidence of being of much more recent origin. The paper was fresh, clear, and bright, and the folds were not even settled, but, as released from pressure, sprung open, like newly-folded paper. In addition to this, the writing of the body of the document, the signatures of the parties and the witnesses were all in one hand, slightly disguised, but recognized at once as Norton's. It is is said that even the color of the ink was not set, but that it grew blacker after the paper was filed in the office.

Mr. Wilson, of course, did not record such a document, but laid it before the Commissioner, who at once called upon Mr. Norton for an explanation. He admitted that it was not the genuine assignment, but claimed it to be a copy, of which he failed to produce the original.

Commissioner Leggett still holds the paper, but has taken no steps in the matter beyond issuing the following order:

UNITED STATES PATENT OFFICE,
WASHINGTON, August 23, 1871.

Until further orders Marcus P. Norton will not be permitted to examine any papers, look into any files, or transact any business in the Patent Office, except by and through some respectable and accredited attorney.

M. D. LEGGETT, Commissioner.

Re-appearance of Les Mondes.

The whole scientific world will rejoice at the re-appearance in Paris of Abbé Moigno's weekly journal *Les Mondes*, after its discontinuance pending the siege and the troublous times that followed. The good Abbé opens the new number with an address "To my dear readers," in which he casts some reproaches upon the scientific men of France who have set such a bad example to the Communists: "One of our greatest sorrows, our most poignant shame, was that all of the acts, of which we have been the witnesses and the victims, have been committed in the name of science under the command of monsters who knew not the first elements of science, not even of letters. What an odious spectacle to see a young doctor of 1867 making requisitions, by force and threats, of all the sulphur, phosphorus, bisulphide of carbon, petroleum, and other inflammable material!" The Abbé says that he was never in better health, and will be able to enter upon his weekly avocation with renewed vigor and "with entire confidence in the generous support of his readers."

We trust that no further interruption will occur in the publication of this valuable journal.

School for Engineers.

The East River Ferry Company, of this city, has established a school for the improvement of the engineers of the company. The school has a session twice in each week, and after the regular lessons are finished, a short time is devoted to the discussion of any matter pertaining to the steam engine or to steamboats, which may be suggested by a member of the class. All candidates for the position of engineer are in future required to undergo a searching examination. Employés of the company who are anxious for promotion have the privilege of attending the school. The institution is under the management of Superintendent Spears.

WATERMELONS are very injurious for debilitated and nervous people, but good for persons of full habits and torpid livers.

Correspondence.

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

The Westfield Explosion.---How they use Steam on the Mississippi.

To the Editor of the Scientific American:

Although somewhat late to communicate with you upon this subject, I wish to express my surprise that such a conclusion should have been arrived at by the coroner and his jury, as to have caused the President of the line and engineer of the boat to have been arrested as the parties responsible for the disaster.

The Government, in view of the ignorance, of steamboat engineers and the public generally, of the strength of boiler materials to withstand stationary and vibrating pressures, attempted to regulate matters by prescribing that hydrostatic tests and examinations be made by certain inspectors of more or less ability, and that the persons given charge of steamboat boilers be examined and licensed. In order to make assurance doubly sure, a system of compound levers, called a lock up safety valve, has of late years been required to be bolted to each boiler, as a sort of cast iron substitute for brains.

Now here is a boiler that is supposed to have passed the required test, and has cast iron brains furnished to it to prevent the pressure from exceeding the lawful amount, and the engineer duly licensed, and in spite of all this, it blows up and kills a good many people. Now, who is responsible? is what many wise men have been consulted for the purpose of ascertaining. Clearly, the Government, and no one else. The inspector takes all responsibility from the owners, and he, acting in accordance with the printed laws and instructions, shifts the responsibility to the makers of those instructions and laws, whose name is the same as that of the devils in the herd of swine, Legion—rather too many to shut up in the Tombs.

The whole system then is at fault; instead of requiring that all parts of boilers should be built to sustain six times their working pressure, or three times their tested pressure, they are usually tested up as high as they will bear for an instant, and the pressure instantly relieved; the working pressure is then certified to be two thirds the highest point reached by the index of the pressure gage. No wonder that boiler makers say that cold water tests are bad for boilers.

The evils of the present system were brought very clearly to my mind recently, when I had business in the West, requiring me to tempt Providence by traveling on a Mississippi river steamboat. The boat had four cylindric boilers forty inches diameter and twenty-six feet long, each having two flues fourteen inches diameter. The boilers had been tested at 188 pounds, and the limit of steam pressure was 125½ pounds. They were of one quarter inch iron, single riveted. Getting sight of the steam gage, I found it showing 160 pounds, but I was much pleased when the engineer informed me that it was twenty pounds out of the way, and the real pressure was only 140. One of those shapeless traps called a lock up safety valve was attached, which was so effectually locked up that no steam could issue from it. The other valve was raised by hand when required, which was rarely, as the blow through valve was mostly relied upon when the boat was stopped. I found upon inquiry that the inspector's rule for testing boilers paid no regard to the strength of the flue (although Fairbairn's experiments were published many years since), but were based entirely upon the diameter and thickness of the shell, with a strength (assumed) of 60,000 pounds per square inch in tension. At my first opportunity, I made the following figures: $60{,}000 \div 2 \div 2 \div 40 = 375$ = bursting pressure of fore and aft seam; and for the flue, applied the formula in Haswell's book $\frac{1^2 \times 93{,}000}{26 \times 14} = 187$ pounds pressure required to collapse the flue. Here then were these flues, that had been tested up to and beyond their calculated strength, and perhaps flattened in the operation, so they were ready to go at almost any time when the engineer should neglect to open his blow through valves. Should this article cause people to speculate more upon practical probabilities regarding boiler explosions, and learn that all boilers have a limit of strength that should not be exceeded, we may hope to see steam vessels made safe. H.

St. Louis, Mo.

Telegraphic Instrument for Learners.

To the Editor of the Scientific American:

In your paper of July 29th, in "Answers to Correspondents," I promised H. L. C. (who wanted to know how to construct an electrical engine) and T. G. B. (who wished directions for constructing instruments for learning telegraphy) that I would send them specifications and drawings gratis.

This I was prepared to do, but in addition to their letters I have received a score or more from other persons from nearly every State in the Union, and from Canada. I cannot write and send drawings to each separately, and as there seems to be so much interest manifested, I know of no better plan than to ask you to publish, for the benefit of all, a few remarks which I hope will be satisfactory.

As only H. L. C. has written about the electrical engine, and as I have answered him explicitly and fully, I will confine myself to the means of learning telegraphy without a battery or electromagnet.

It will save much time and space to simply state that the instrument which I propose is a slight modification of the Morse "register." I presume every one can obtain a sight of one of them. The modification is simply the removal of the electromagnet, and the addition of a "button" to the outer end of the pen lever, whereby it (the pen lever) is converted into a "key," and all manipulations thereof will be shown on the ribbon of paper as it passes between the rollers. In some registers both the down and back strokes are regulated by double nuts on the post at the outer extremity of the pen lever, but as this arrangement would interfere with the working of the key, two posts (adjustable) should be used; one at the outer end, to receive the down stroke and regulate the depth of the impression in the paper, and the other near the inner end to receive the back stroke and regulate the amount of motion.

Your readers will understand that this arrangement does not contemplate the transmission of signals to any distance, but simply a register of the manipulations of the learner, who will be able to correct errors which he would not recognize were he learning by sound. Two persons sitting at such an instrument can transmit messages to each other without having the disagreeable task of keeping a battery in working order; and after considerable practice the letters will be as readily distinguished by sound as by sight. I maintain that by the use of paper in learning, the learner acquires more exactness in the length of dots, dashes, and spaces than he otherwise would, and that if all the operators now employed had thus learned, very few if any of the egregious blunders constantly occurring would be made. The tailor's dying advice was "Always tie a knot in the end of your thread," and my advice to learners of telegraphy is, always space your letters and words as accurately as a good printer does Practice your letters j and k until the former is different from nn and the latter different from nt or ta. Give the dashes their full length, and shorten the dots as much as you choose, but above all space between your letters and words.

In regard to the learner being able to make his own instrument, if he is ingenious, skillful, and has the tools and material at hand, he can do so; but I would think it best to apply to some manufacturing electrician who, by the above description, could make exactly the right thing and furnish a roll of paper with it for about $20.

To those who prefer making their own, I would point out some difficulties and necessities, to wit; the pen lever must be hung so that the pen will accurately fit into the groove of the roller, and have not the slightest lateral motion. The rollers must be held together by springs or weights just sufficiently to firmly hold and draw the paper. Such an arrangement will allow the passage of irregularities, or a "splice" in the paper. The posts must be adjustable, by a perpendicular screw and check nut in their tops. If these conditions be complied with, the train of gearing working smoothly, no one will have any difficulty after a little experience in the working of the machine. M. L. BAXTER.

Aurora, Ill.

Brick Burning.

To the Editor of the Scientific American:

The answer to queries of D. H. S., Jr., August 26th, page 138, depends largely upon the method employed by him, whether he adopts the old fashioned way of building fires underneath and burning from below upwards, or resorts to a modern improvement where the fires are built in a separate furnace entirely outside the kiln proper, and where the products of combustion are carried into the top of a close room, while exhaustion is effected from the bottom, burning from above downwards, thus avoiding "benches" altogether, and improving the uniform quality of his stock.

Another important new feature is the construction of kilns so as to enable one to utilize the surplus heat remaining in the glowing mass of a newly burned chamber, by conducting it into an adjoining compartment filled with green material, instead of wasting it, as is done by the old method.

In the old fashioned way of burning, benches, of course, are unavoidable, and experience shows that three benches give better results than two, and where the clay (mud) is charged with coal dust, four benches are preferable.

The old way of burning takes about four cords of good hard wood to twenty-five thousand, that is, when coal dust is mixed with the clay, and about double that quantity when the coal dust is not used. Pine or other soft wood will not go so far.

On the North river, where the great bulk of our common brick for the New York market is made, coal dust is used almost universally, and the average expense for fuel (wood) slightly exceeds one dollar per thousand.

In Philadelphia and elsewhere, where a better grade of bricks is made and coal dust not used, the cost of fuel varies from $1.40 to $2 per thousand.

Bricks can "be well burned with the soft and sulphurous bituminous coal of Iowa and Illinois," or with any other combustible material, provided you avail yourself of the improvements recently made in this field.

The exact amount of coal required per thousand will depend very much upon the nature of the clay used, its manipulation, and also upon the method adopted in burning, whether you burn from below upwards in an open kiln, or from above downwards in a close kiln, and whether you utilize properly your surplus heat. A. R. MORGAN.

103 Fulton street, New York.

Canal Navigation.

To the Editor of the Scientific American:

As the articles in your paper, as far as they have come under my observation, in reference to canal propulsion, are based apparently on theory only, I can no longer forbear attempting to say something. The idea of producing an invention to propel more advantageously our present form of canal boats than by horses, is theoretical in the extreme, simply because the boats are adapted only for horse power. But why not use steam? Are there not boats already floating in every part of the habitable globe propelled by steam? If so, why not on canals? Some of the reasons, in my judgment, are as follows:

First, the boats now in use are not of the proper form. They must have a sharp bow, to prevent side swells. Mr. Hermance's idea of a screw propeller is correct to a certain extent, but his adjustable bow would be impracticable. Mr. A. S. Ellis's iron tug is equally impracticable. How can his tug form a bow to the vessel, unless the propeller be in front? And if it be, will not the water, forced from the propeller, strike against the tug and retard its motion, and also divide the swell and send it against each bank of the canal? Will it not be troublesome in getting it through the locks, etc., in detaching the ropes and fixtures for fastening the tug to the boat? Will it not take time? Is not time money?

Second, the boats must have more than one propeller to prevent side swells. Construct your boats with a sharp bow. Place a small screw propeller on each side near the stem, and one immediately behind, which can very easily be done; then you will have a plan that is practicable. But, you say, "it will cost more;" so it will; and "take more power to drive it;" true, it will, a little. But how can this be helped? Is a common cart suitable for a stage, omnibus, or gentleman's carriage? Will not the boat and machinery have to be adapted to what it is intended to do? Another may say, will not three propellers to produce the same power make a greater swell than only one? No. Will three waves upon the ocean, ten feet high, produce a greater surf upon the shore than one thirty feet? or will three waves three inches high injure the canal banks more than one nine inches? I think not.

Weissport, Pa. S. HAGAMAN.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections during the month of July, 1871.

There were 868 visits of inspection made during the month, by which 1778 boilers were examined—1489 externally, and 619 internally,—while 176 were tested by hydraulic pressure. The number of defects in all discovered was 665, of which 121 were regarded as dangerous. These defects in detail were as follows:

Furnaces out of shape, 33—6 dangerous; fractures in all, 40—19 dangerous; burned plates, 50—16 dangerous; blistered plates, 66—10 dangerous; cases of sediment and scale, 107—14 dangerous; incrustation, 116—14 dangerous; external corrosion, 34—8 dangerous; internal corrosion, 25—1 dangerous; cases internal grooving, 5; water gages out of order, 46—2 dangerous; blow out apparatus out of order, 5; safety valve overloaded, 18—6 dangerous; pressure gages out of order, 93—9 dangerous; boilers without gages, 4; cases of deficiency of water, 5—5 dangerous; broken braces and stays, 16—9 dangerous; boilers condemned as unsafe and beyond repair, 8.

In view of the defects which are revealed by the careful inspection of boilers, both internally and externally, we see no reason why boiler explosions should be attributed to "mysterious agencies." We must learn that boilers grow weak and deteriorate by use and age, and when this deterioration is hastened by poor setting, unreliable attachments, and bad management, is it any wonder that boilers explode? The work of corrosion is insidious, and its effect very dangerous. We have in this office a piece of iron less than $\frac{1}{30}$ of an inch thick, and the day before it was discovered, 80 pounds pressure to the square inch was used on the boiler from which it was taken. The boiler had been subjected to hydraulic pressure, and stood a test in excess of the stipulated pressure, but a slight blow of the hammer broke the iron entirely through. Inspection to be effective must be searching. It must be external, and internal, if possible, including attachments, feed, and blow apparatus, setting, and management of boiler. When careful examination reveals none of the defects enumerated above, we may look for comparative exemption from boiler explosions. If a boiler is weak in any particular spot, that spot will be more sensitive and affected by undue or over strain, than any other portion of the boiler, and this weakening process will go on to actual rupture, if not discovered and strengthened in season. When a boiler is under steam, with no outlets, a vast quantity of heat is stored up in the water, only waiting to assert its power when opportunity is presented. Steam is generated in a boiler from the fire surface and rises from the pressure of the cooler water above. This evolution of steam goes on until the pressure accumulated in the steam space over the water is so great that no more steam is evolved. This condition is called an equilibrium between temperature and pressure, but so long as the fires are kept up the water is storing up heat. Now suppose a sudden rupture releases this pressure in part, the potential energy stored up in the water immediately flashes into actual power, and the shock is sufficient to rend the strongest materials. If we consider heat as the source of power, and that the action of heat on matter is always attended by the production of power, we shall be enabled to form a tolerable idea of the force concealed in a large body of highly heated water.

HOME MADE CANDLES.—Many of our readers in the rural districts will find that candles can be made economically, by mixing a little melted beeswax with the tallow to give durability to the candle, and to prevent its "running." The light from a tallow candle can be improved in clearness and brilliancy by using small wicks which have been dipped in spirit of turpentine and thoroughly dried.

THOSE who use a plain, unstimulating diet, have little thirst.

TERRIBLE GUN COTTON EXPLOSION AT STOWMARKET, ENGLAND.

The wholesale destruction of life and property by explosive agents which characterizes the present time, may well lead to the inquiry whether this sacrifice is demanded by the exigencies of modern civilization. Steam, gunpowder, nitroglycerin, dynamite, gun cotton, lithofracteur, these are the powerful genii invention has summoned to obey human will. But they are latterly showing that they can disobey, and take every opportunity to disobey, unless constantly guarded by the most rigid surveillance. Some of these, indeed, have a habit of going off without any apparent neglect on the part of those who use them. What a chapter of horrors the last two years has furnished! and now from England comes another which has not only destroyed many lives and much property, but has taught that we really know little of the nature of explosions, since one of the explosions occurred in a manner supposed to have been proved impossible by a long series of Government experiments. From *Engineering* we gather the following facts:

A most lamentable explosion occurred at Stowmarket, England, on Friday, August 11. The works of the gun cotton manufacturing company, in which Messrs. Prentice are the principal partners, are situated on a stretch of meadows about three quarters of a mile from the town of Stowmarket, in a northeasterly direction. On this strip of land were the mixing or dipping, and the drying sheds, in which the cotton is passed through the chemical solutions and dried. At the southeastern end of the grounds stood three magazines, about 12 feet long, 10 feet deep, and 8 feet high. The sides were constructed of wood, lined with canvas and paper on the interior, and the roofs were lightly covered in with slate. The magazines were built on wooden piles, and were placed 14 feet from each other, and between them were 9 inch brick walls rising higher than their roofs. They had neither windows nor skylights, the only openings being the single door in each. They were used to store the finished gun cotton until sent away from the works. At the time of the explosion each magazine contained about five tuns of the material, part of an order which was being executed for the English Government. At the northeastern end of the works, and about 900 feet from the three magazines, is a building similar in character to them, used as a store for rifle cartridges. About 130 hands, men, women, and children, are employed in the establishment, and they had just resumed work after the dinner hour, when a fearful explosion occurred on the site of the three magazines to which we have alluded. To those on the works who are able to give any account of the occurrence, there appeared to be but one explosion, while in the town of Stowmarket, three distinct explosions were heard to follow each other in very rapid succession. The work people rushed from the tottering sheds around, only to be killed or injured by the falling *débris*.

Soon after the explosion, Mr. E. H. Prentice, one of the directors, and who is the manager of some neighboring chemical works, and Mr. W. R. Prentice, second son of Mr. Manning Prentice, were on the spot. They proceeded to collect the workmen, and with them set to work to save such of the buildings as still remained, but which had taken fire. Relying on the results of some experiments which had been carried out to prove the gun cotton, as now manufactured, to be non-explosive except by percussive fire, Mr. E. Prentice was engaged in removing boxes of cartridges from the flames, being assisted by his nephew. Although warned of danger, he still continued his fatal work, when one of the boxes exploded. This explosion completed the fearful work of destruction, and the remainder of the works was rendered an easy prey to the flames. The latest accounts place the number of persons killed by the disaster at 24, the number of wounded being 72, and it is possible that some names in the latter may go to swell the former list.

[For the Scientific American.]

THE SURF.

BY CHARLES MORRIS, OF PHILADELPHIA.

How many of the great army of pleasure seekers who have this summer wandered upon the sea beach, have seen any mystery in the breaking of the surf, or questioned the origin and character of the mighty force there displayed? Probably not one in a thousand has considered the subject worthy a thought, and not one in ten thousand has understood it. Of course, all have a general idea that the surf originates in the dashing of the wave upon the beach. But a wave is a simple elevation and depression of the surface of the water, without any permanent forward movement; the surf, on the contrary, is a permanent forward movement. The question arises, how the one condition is changed into the other.

The seeming forward motion in the waves is simply the progressive motion of the force that produces them. This force exerts itself on successive portions of the water, one rising as the other sinks to rest. Each particle of the water, after describing a vibratory or circling path under the impulse of this force, comes to rest at the center of its motion while the force, traveling onward, disturbs new particles. Thus the quantity of force remains permanent, while the locality constantly changes.

This force tends to produce motion in all directions, and moves forward from the fact that a continuation of the wave motion resists its backward movement. It has also an effect on the water below the surface, acting downward until the accumulated resistance balances the motive force; the effect of this resistance being aided by the greater facility of surface propagation.

It is this downward influence of the wave force to which the phenomenon of the surf is due. The wave, traveling shoreward, in time reaches water so shallow that the downward impulse of the force extends to the bottom. Thus the elastic resistance of water is exchanged for the rigid resistance of the solid bottom, and the force is reflected upward. It is this elastic reaction that lifts the water, the wave being prevented from having its full extension downward. As the water grows shallower this effect increases, so that the waves rapidly increase in hight.

But now the bottom of the wave is dragging, as it were, upon the sand. Thus a frictional resistance hinders the ready communication of force from particle to particle at the bottom, and the onward motion of the wave force is delayed. This resistance of friction has little or no effect on the surface particles, its influence continually decreasing upward. Hence the wave force is now moving onward more rapidly at the surface than at the bottom. The wave, in consequence, slants forward, eventually toppling over from the force of gravitation.

Now the motive force of the wave, which has hitherto been communicating itself regularly from particle to particle of the water, is prevented from doing so by this disturbance of the regular vibratory motion. It, therefore, acts with its full progressive vigor on the portion of water last affected, driving it bodily forward, until the force is balanced by the counter effects of gravitation and friction. The wave force thus eventually becomes changed into the heat of friction, or is partly employed in abrasion of the sands, and partly in producing the potential energy of lifted water.

The surf, where the wave breaks upon a bar, is similarly caused. But the water which is dashed forward by the propelling force, meeting deep water within, experiences an elastic resistance to its forward motion. It is thus brought to rest, and its movement communicated to the water in advance. Thus a continuous communication from particle to particle recommences, and the wave is reformed. Of course, the friction upon the bar employs a portion of the force, the quantity of which lost force depends upon the shallowness of the water. Hence the wave is always lower inside the bar.

In case the surface of the bar reaches very near the surface of the water, the friction uses up nearly all the propelling force of the wave, and the water within is nearly or quite smooth.

What an immense force is thus, day after day, and century after century, expended as friction upon the sea beaches of the world, employed in grinding solid rock into the huge accumulations of sand found every where throughout the earth!

The Effect of Sun on the London Asphalt Roads.

Should we be favoured with a continuance, or an accession in intensity of the summer heat, the watering cart or hose will be as necessary appendages for maintaining the solidity of our new roadways as they are in laying the dust on our old ones. A plastic asphalt surface is in no wise desiderated or coveted for vehicular traffic, and it would be an unfortunate event if, after all the cost, obstruction, and delay that have attended the introduction of our latest, and still most useful road material, to find it fail in the most useful essentials, namely, the retention of its hardness and body, under all conditions of the atmosphere. After all, the hot weather may not have come in vain, if it gives us a good and timely opportunity to benefit by its occurrence, in the improvement of our road construction, and in the better selection and manipulation of the present and similar material for the future. Experience teaches, it is said; but the right of way is often blocked by vested interests, which neither shower nor sunshine has been found to materially affect. In the present instance perhaps the power of the sun will turn men's minds nearer to a conviction of the truth than the power of the pen, and those who more immediately interested will improve and profit accordingly. We need scarcely say that our remarks are not made in disparagement of the asphalt pavement, but as a hint to further practical efforts for the direction of improvement.—*Builder*.

Manufacture of Telegraph Cables.

Mr. Henley's works at North Woolwich, Eng., cover fourteen acres in extent, employ at present only 1,100 to 1,200 hands—being rather slack—2,000 being the normal number, and can turn out at present some 100 miles of cable weekly, with prospective power of increasing that quantity to 250 miles; it thus will be seen that this is a factory of no ordinary kind or magnitude. In the core there are six copper wires stranded around a central one, making seven in all. These are tinned over, and completely sheathed with an insulating covering, varying in material and thickness, either simple or compound; in the former case being composed entirely of gutta percha in a solid mass, in the latter, of felted tape wound round the wire in two bands in opposite directions, and finally encased under compression by rollers, with a thin seamless sheathing of india rubber (or similar material). Of the two, the latter is by far the most perfect insulator or mode of insulation, whereas the former has hitherto had the preference, from considerations of cost; but now it is believed that the superior material, india rubber, can be brought into successful competition with its cheaper and inferior rival, even from a financial point of view. The core so prepared in either way, has then spun around it two successive yarn sheathings, in numerous strands, varying according to the purpose in view, which supply a bed for the true cable, in point of strength, as contrasted with the electric cable element, the core. Round the whole are spun or twisted stout galvanized iron wire strands, also of varying number and size, as may be required, over which again are wound, in opposite directions, two fine strands of jute yarn, firstly with a resinous compound containing silica, and ultimately with a seething tarry compound, cooled and hardened, by a stream of water, in the gripe of a set of roller wheels, compressing and finishing off the whole. Whence issuing, the cable is coiled within the tanks, in successive rings and layers. The method of applying the asphalt coating by means of bucket wheels or turbines, in reverse operation, is most ingenious, effective, and noteworthy.

The description applies to the formation of a single cable, as well as to a multiple cable, with this difference, that in the latter case several of the insulated cores of stranded tinned copper wire are twisted in combination with other strands of yarn into a compound core, which then receives the outside sheathings of yarn and galvanized iron wire.

A remarkable feature about these telegraph works is that they are almost entirely self contained, so that nothing is required beyond the raw materials worked up in the manufacture, the metals, iron, copper, and zinc, the acids and chemicals, the jute yarn, and the insulating substances. The drawing of the wire, the annealing, acid cleansing, galvanizing and drying thereof; the stranding of the core; the preparation and completion of the insulating sheaths—every initial intermediate, and ultimate stage is conducted and carried on, every process provided for and executed; and all the machinery for the purposes, and even much of the very buildings which cover and contain the work, is manufactured and put together on the premises excepting prime movers.

The motive power is mainly obtained from duplicate 75 horse power horizontal steam engines, of the ordinary type with some special features.

Improved Miter Box.

Mr. George E. Hedges, of Ashland, Nebraska, has invented an adjustable miter box, designed to improve the means for maintaining miter saws in their true position. A bed plate sustains a semicircular platform on which the piece to be sawn is laid. A flange on the straight side of the platform, forms an angle for the piece to rest in, as that of all miter boxes. This plate or platform is pivoted at the center of the circle to the bed plate. The box turns on this pivot, and may be secured on the bed in any desired position, so as to saw a piece of wood at a true miter or any other angle. The saw line passes at a right angle across the bed and directly through the central pivot. There are two uprights at each end of the saw line, connected together at top and bottom, but in such a manner that one of each pair is adjustable toward or from the other, so that the saw guides may be made to suit saws of different thicknesses. These guides are connected together at their top ends, and are attached to the uprights so as to slide up and down and govern the saw. A saw back is attached, between the guides at their upper ends, to the saw by a set screw, and supported in position by two arms, of which the first receives the saw near the handle, and the second is adjustable on the back. The saw and back being thus attached, the teeth are thrown below the guides to prevent injurious contact with the metal. The upright posts and guides are made of metal, and are consequently not liable to get out order like miter boxes made of wood. The guides with the saw back are suspended from the top of the uprights by light springs, but so that while their weight will be supported, the saw will work down into the wood with but slight pressure. We regard this as an excellent invention simple and practical.

Ripping Tool.

This invention relates to a new and useful tool for ripping seams sewn in cloth and for other purposes. This tool is a small flat instrument, of steel or suitable material, with a wide notch in one end, in which a oblique knife edged cutter and a clearance for the shreds are formed on the bottom of the notch, while prongs or projections at the sides of the notch form guides for keeping the seam to be ripped on the knife edge, each guide being different from the other, and adapted for a seam differing in some respects from what the other is adapted to. The handle or stock of the instrument is provided with a notch adapted for use as a wrench; also a hook and a niche, whereby the said implement is adapted for several uses in connection with sewing machines; the object of the invention being to provide a simple and efficient implement which will act by a shear cut, instead of the direct jam cut common to other ripping tools, in which the cutting edge is presented perpendicular, or nearly so, to the seam; and also to adjust the seam or cause it to assume the proper relation with the cutter as it is brought to the cutting edge. This handy little instrument is the invention of Justus O Woods, of New York City.

HAND TURNING.—The Company of Turners, in London, purpose to establish an annual prize for technical skill. The prize will be in the form of the company's silver medal and and the freedom of the company and of the City of London, and will be given for the best specimen of hand turning in the yeor. This year the competition will be in turning in wood. It is provided that the specimens shall be delivered at the Mansion House in the first week of October, and that they should not exceed 18 inches in hight and 1 foot in diameter.

PROPOSED TEST FOR STEEL AND IRON.—Mr. H. A. Walker, of Tarboro', N. C., proposes that the scintillation of iron and steel filings, when put in a fire, be made use of to test the quality of the metal. The different degrees of brilliancy, as well as the readiness with which the filings sparkle in the fire, are suggested by Mr. Walker as proofs of the varying purity of the iron or other metal. The test is handy and convenient, and might be of some practical value.

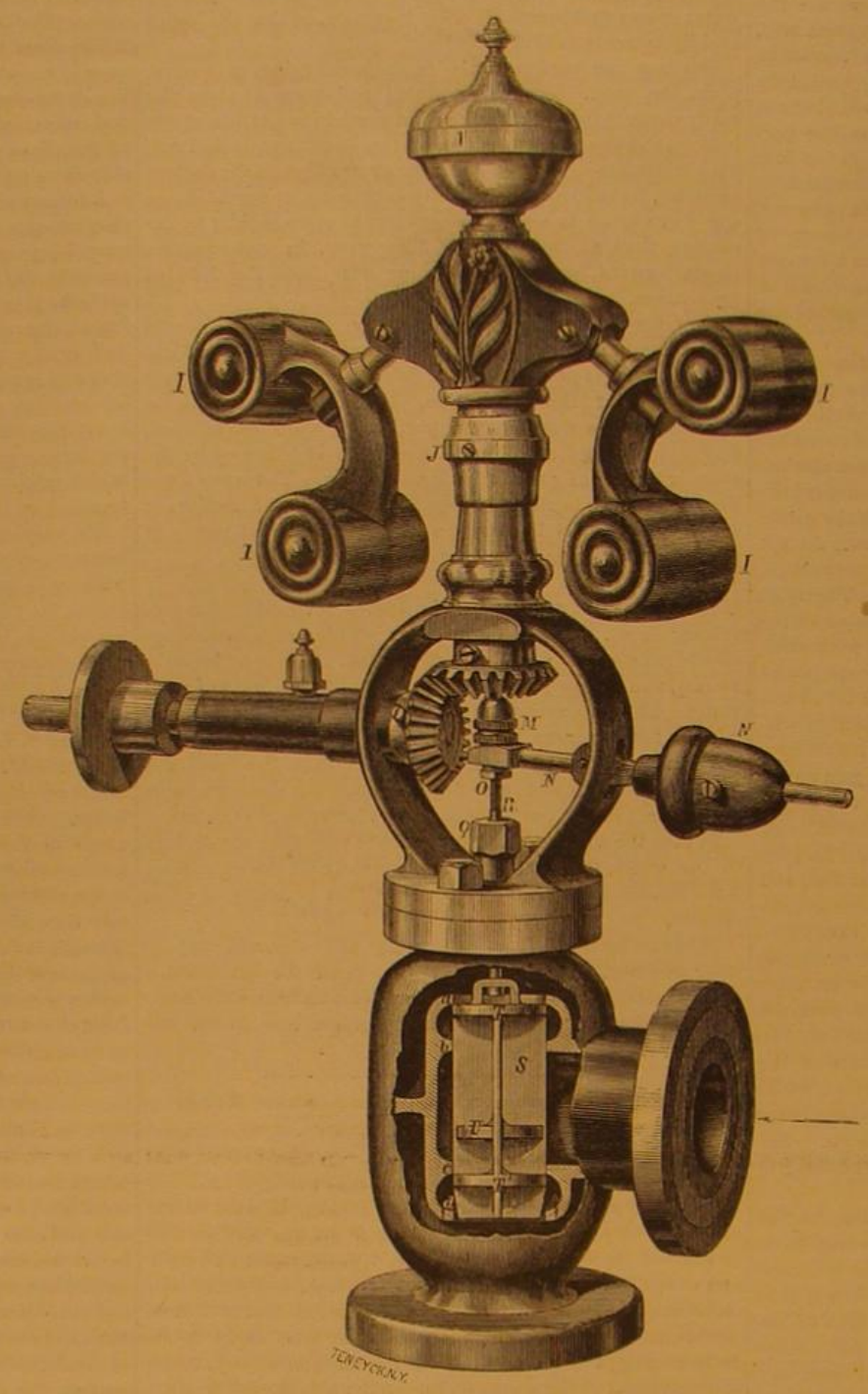
Patent Safety Steam Governor.

The one prime necessity in a manufactory using steam power is a good governor on the engine; a desideratum which the experience of every one, who has used steam any length of time, proves, has not been easy to obtain. The main difficulty has been that governors were not sensitive enough to the changes of load on the engine to prevent too much change of speed. Cotton and woolen mills, and flour, paper, and saw mills are especially troubled in this particular, as each makes large changes in the load suddenly, and each needs the most regular speed. The engraving herewith illustrates a governor, called by the inventor the "Acme," which would seem to meet all these requirements and difficulties, beside being a safety governor, as, in case of breakage or throwing off the governor belt, no "runaway" can occur.

Two difficulties have been found to exist in governors, both or either of which would prevent proper speed. The first was the construction of the upper or governing works, so that in motion they were bound, or else would work quicker one way than the other, cutting off steam quicker than letting it on, or *vice versâ*, when needed, thereby causing the engine to jerk and run much above and below its regular speed at each change of load. The second cause was that when steam was passing through the governor, the valve (although theoretically balanced) was forced out of balance, thus causing a variation of speed corresponding to the unavoidable changes of pressure of steam, and also continual antagonism between the valve and the governing works.

Referring to the engraving, the novel construction of the revolving weights, I, is designed to produce a quick response to any change of speed,—the theory of the inventor being that the lower part hangs in the proper position—nearest under center of suspension possible—to swing outward the most readily should the load be thrown off; and the upper part is in the best position—nearly on a parallel line with center of suspension—to exert all its weight downward, instantly, in case of slackening speed. It may seem that the power required to raise the upper part of weight, I, would balance its usefulness; but it is claimed that the power required to raise the weights when in motion is small, and of course gravitation compels them to act with their whole weight when required. In the brass case, A, is a volute spring, which is compressed by a thumb nut attached to the valve rod, tightening or loosening of which alters the speed of the engine. But the main object is a valve, balanced under all circumstances. S is a four winged valve, having two regulating disks, T and T', and a smaller balancing disk, U. The valve case has four ledges, *a*, *b*, *c*, *d*. When in operation T and T' are nearest *b* and *d* respectively. Steam passes up under T, and over and under T'. The action of the steam on T is to force it upwards; on T' to draw it downwards, a little more than overcoming the upward strain on T; to meet which, the smaller disk, U, is placed so that the steam acts between it and ledge, *c*, just enough to balance the difference between the regulating disks, as described, so that no matter how much or little steam is passing, or what the pressure is, the valve is always balanced, and the upper works have only to overcome the friction of the packing at Q, in raising or depressing the valve, the weight, N, just balancing the weight of valve, and used for no other purpose.

If the governor is stopped by disarrangement of belt or otherwise, the disks, T and T', are drawn up, as seen in the engraving, and the steam is throttled at ledges, *a* and *c*. This governor was patented October 11, 1870, and February 21, and August 8, 1871, by J. D. Lynde, 405 N. 8th Street, Philadelphia, Pa., where he can be addressed for further information. We are informed it will also be on exhibition at the Fair of the American Institute in this city, during this and next month.



LYNDE'S PATENT STEAM GOVERNOR.

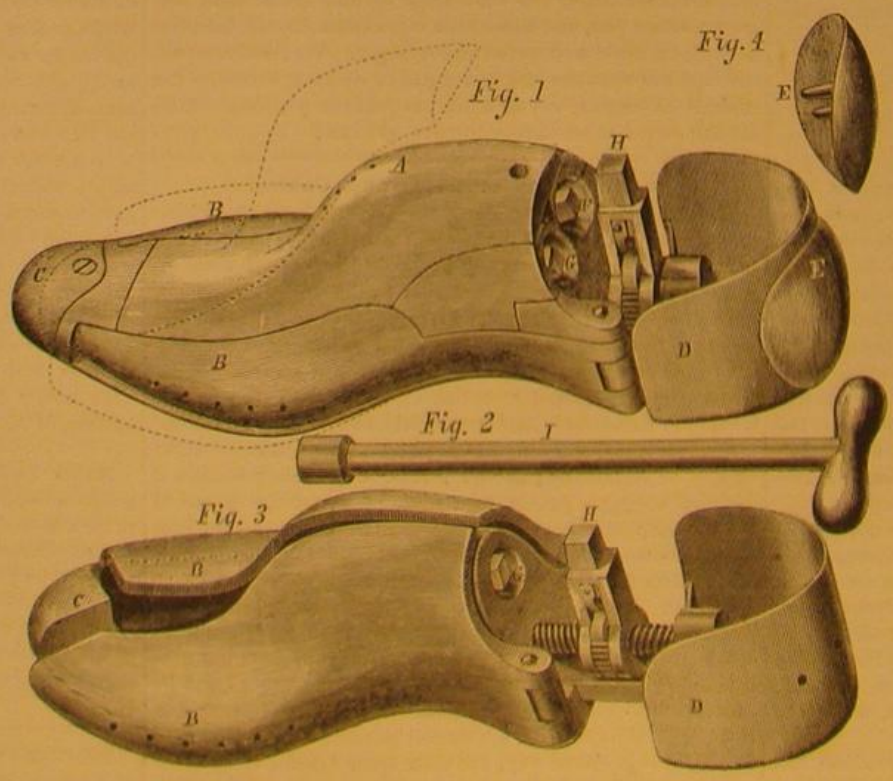
Implement for Stretching Shoes.

Dr. Dio Lewis says: "Within three blocks of my Boston residence there are eleven corn doctors. Some of them employ a number of operators, and do an immense business. A large majority of adults, among the better classes, suffer from corns, or other maladies of the feet."

The inventor of the instrument illustrated herewith, Dr. E. R. Bardin, is a practicing surgeon and physician at Newburgh, N. Y. Having had his attention strongly called to the numerous diseases of the feet resulting from the irrational style of foot gear now in vogue, and finding great difficulty in getting shoemakers to make boots and shoes according to the necessities of individual cases, and also difficulty in getting patients to wear properly shaped shoes, he was led to invent some means whereby boots and shoes may be efficiently stretched so as to relieve diseased feet.

The stretcher shown in the engraving is the ingenious and scientifically constructed device resulting from his study of the subject.

The general principle of the invention is that in order to stretch any one part of a boot or shoe effectively, all the slack leather in the upper must be first stretched, so that it will not, by its yielding, defeat the stretching at the exact point it is desired to enlarge. The operation of the stretcher is, therefore, first to draw all the leather tight, and afterwards to stretch the particular portion which is too tight to the foot.



DR. BARDIN'S SHOE STRETCHER.

Fig. 1 represents the instrument as constructed for men's boots. It consists of pieces A, B, C, D, and E, all formed of nickel-plated cast iron, and connected with sole piece and system of levers, links, and inclines in the interior, not shown.

The piece, E, is only used when it is necessary to enlarge the heel to relieve a tenderness which often results from too stiff counters.

The holes represented in B are for the attachment of leather bunches, by pegs, in order to enlarge portions over tender corns, bunions, etc.

The key, I, is used to operate the instrument, being applied at either T, G, or H, and producing the following effects:

In stretching the boot lengthwise after the stretcher is inserted, the key is applied at H. It is then oscillated from side to side, which actuates a ratchet and screw, and separates the toe piece, C, and the heel piece, D, till all the longitudinal slack is taken up.

The key is next applied to F, and turned about like an ordinary bed wrench. This actuates mechanism by which the instep piece, A, is elevated, and the slack leather taken up in that direction. Applying the screw to G, and turning it in a similar manner, the side pieces, B, are forced apart. The order of moving and extent to which these pieces are thus moved is varied according to the effect desired.

Fig. 3 is the form of the instrument employed for ladies' boots which open upon the instep or at the side of the ankle. In this form, the instep piece is omitted, and the side pieces enlarged to fill the vacancy.

The pawl on the piece at H is double acting, and is used to reverse the motion of the screw, so as to draw the heel piece towards the toe piece, when it is desired to take out the stretcher after the boot is stretched.

In conclusion, we may say that having, by the use of this stretcher, made a pair of intolerable boots quite easy and comfortable, we conclude that it is an excellent device for the purpose intended.

Patented June 13, 1871. The entire right, or portions, will be sold. For further particulars address Dr. Bardin, as above.

Improved Bee Hive.

This hive is made of wood, of suitable size and proportion. One side is hinged and swings open so as to expose the interior and allow of the removal of the honey frames and boxes. The top of the hive is also hinged, and is fastened down by hooks. Ventilators, which revolve on central screw pivots, each having one or more orifices which register, with fly holes, are used (by turning or revolving them) to either allow the bees to pass through, or in and out, or close the holes. The ventilators in the upper portion of the hive have a screened orifice, which allows air to enter but excludes the bee. The friction of the ventilator on the outside of the hive is sufficient to hold it in any desired position. The honey frames are made with double beveled cross bars, and placed side by side in an upright position. The upper cross rails of every alternate frame are dropped down, which allows a free passage upward between the frames, not only for the bees but for ventilation. The honey boxes have slat bottoms through which the bees gain entrance to them. By dropping down the upper cross slats of every other frame, the bees, the heat, and the air are allowed free access to the honey boxes.

The slats of the bottoms of the honey boxes correspond with and cover the top rails of the alternate frames. The bees by this arrangement are prevented from attaching the comb formed in the honey boxes to the rails of the frames. The hive is so ventilated, and the frames are so constructed and arranged with regard to each other, that free access is given to every portion of the hive, and the interior is kept at an even temperature. William M. Henry, of Leo, Indiana, is the inventor of this hive.

Bearing Plates for Railway Rails.

It is the object of this invention to provide means for preserving the ties or sleepers of railroads; and it consists in a metallic plate of any form disconnected entirely from the chairs and from the rail, except so far as it affords the latter a bearing.

This bearing plate is adapted to various other purposes than separating the rail from the tie of railroads. It may be used for bridges and platform timbers, and for separating cross timbers, for the purpose of diminishing the actual bearing surface, and allowing water or moisture to be absorbed by the atmosphere. Elijah Myrick of Ayer, Mass., is the inventor of this improvement.

SUNSHINE is a powerful treatment for diseases, if you aspire to health and happiness, you must allow the sunlight to come into your houses.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

A Correction	163	Official List of Patents	171
American Association of Science	160	*Patent Safety Steam Governor	166
American Institute Fair	169	Pennyroyal and Fleas	163
Ancient Dentistry	160	Plucky Susan, or Luck at Last	163
A new Steam Boiler	163	*Portable Gas Generator	159
An Incident in the Life of Baron Leibig	163	Proposed Test for Steel and Iron	165
Answers to Correspondents	170	Psychic Force	168
A Patent Schemer Foiled	163	Queries	170
Bearing Plates for Railway Rails	166	Re-appearance of Les Mondes	163
Bleaching Shellac	159	Recent American and Foreign Patents	170
Boiler Explosion	159	Rejected Correspondence	170
Brick Burning	164	Right of Property in Inventions an Abstract Right	167
Business and Personal	169	Ripping Tool	163
Canal Navigation	164	Robinson's Breech Loading Rifle	168
Cannot afford to stop	168	School for Engineers	163
Coal Hoister and Conveyer	163	Spirits at a Discount	168
Curious Meteorological Facts	161	Sunshine	166
Drinking Water	161	Telegraph Instruments for learners	164
Glueing	162	Terrible Gun Cotton Explosion at Stowmarket, England	165
Hand Turning	165	The Coke Trade	161
*Implement for Stretching Shoes	166	The Effect of Sun on the London Asphalt Pavement	165
Improved Awl	169	The Hartford Steam Boiler Inspection and Insurance Company	164
Improved Bee Hive	166	The Late Professor Payen	168
Improved Miter Box	165	The Mental Capacity of Races	160
Interesting Extension Cases	169	The New Jersey Agricultural Fair	169
Intermarriage of Blood Relations	160	The Origin of Life	167
Inundation in Hungary	169	The Perturbation of Forces	160
Inventions Patented in England by Americans	169	The Reading Room of the British Museum	160
Japan a field for Inventions and Machinery	167	The Suez Canal	168
Labrador Spar in New Hampshire	162	The Surf	165
*Lemman's Antifriction Ball Gate Hinge	162	The Westfield Explosion	164
Lightning versus Gas Pipes	161	Tornadoes and Water Spouts	161
Manufacture of Telegraph Cables	165	Tremolos for Reed Organs	169
*Massey's Alarm for Steam Boilers	162	Wagner's Report on Technology	168
New Railway in Massachusetts	167	Watermelons	163
*New Test for Kerosene Oils	162		
"Nothing New Under the Sun"	139		

RIGHT OF PROPERTY IN INVENTIONS AN ABSTRACT RIGHT.

There once lived in England a famous writer upon civil law, whose wise teachings have, until quite recently, been accepted as almost the very foundation of legal lore, both in England and America. Wherever civil law is studied, "Blackstone's Commentaries" are—or, we should say, have been—considered as one of the most logical and rational expositions of the social rights of mankind ever penned. However, in the land of that celebrated thinker and most able expositor, there has arisen a new school who reject his teachings, and publish to the world a directly opposite doctrine to that which he taught.

Blackstone told us, so forcibly and with such solid argument, that the natural rights of individuals were only such as they had individually the power to maintain, that this principle has become almost a legal axiom. He taught, further, that the civil rights of individuals in society are only such as are granted to them by and in the society of which they are members, in exchange for the natural right they possess to seize and hold whatever they desire, and to force others to obey their will, in so far as they naturally possess the power to seize, and hold, and compel. Where individuals are possessed of, and employ, all their natural rights, there can be no society. The moment even two combine against a third, they do so by the agreement to let each other alone temporarily, and by so doing form a society, and surrender for the time some of the savage freedom they originally possessed to kill or maim any weaker than themselves, or to take and retain anything they wished, so long as there was no one strong enough to get it away from them.

The civil right of the weak, to have and to own property, has been obtained by their agreement to leave unmolested the possessions of those still weaker. In other words, the members of society mutually agree to let each other alone in certain particulars, and the terms of this agreement constitute civil law.

The recent vigorous discussion of the patent system in England has elicited many singular views, but none more absurd than the one that inventors have a natural and inherent right to exclusively use and enjoy the profits of their own inventions.

As a sample of this absurd doctrine, and because it expresses very briefly, yet fully, opinions that have occupied much space in our English exchanges, we quote the following from the *Mechanics' Magazine*:

It is surprising that a man's right of property in his own invention should be denied by men of reputed intelligence. Nothing seems to be more in harmony with the principles of equity than that this right should be conceded. There are some who absolutely repudiate the idea of abstract rights, and they are skeptical in regard to all rights save those established and guarded by law. By a kindred class of logicians it is argued that an exclusive right in the mechanical creations of the brain is opposed to the public good. On the common ground of honesty such an argument may safely be deemed absurd. Why, in various departments of enterprise the right is already virtually admitted. At a recent meeting of London Patent Agents, the right of inventors to the sole use and disposal of their inventions was emphatically declared, and it was further urged that this view of the question ought to be authoratitively recognized by the Legislature. It is rather difficult to see how the extension of right to the individual can prejudicially affect the interests of the community. The right of property is a sacred heritage, but if this right is refused to the personal achievements of inventive genius we have, as the result of such a course, an unjust anomaly."

Now these "London Patent Agents" are many of them intelligent men who must, it would seem, be blinded by self-interest to give utterance to such an absurdity.

There is no natural and abstract right to any property whatever, except the power to grab it, and to keep out of the way of some stronger grabber, a right which a wild beast possesses just as much as a man. All other rights are mutually conceded from motives of policy. To grant to inventors the power to exclusively use their own inventions for various periods of time, has been justly deemed by most enlightened modern governments a wise policy, tending to encourage invention, and thus to ultimately secure for society at large—not merely the individual himself—the benefits of improvements that would otherwise not be made, or, if made, would, for the benefit of the inventor, be held secret as long as possible.

Inventors have found that this limited protection is better than anything they can do to protect themselves; so they have hitherto been glad to agree that they would surrender their natural right to hide and conceal, as best they might, their discoveries and devices, for the privilege of selling to others part or all of the right accorded them by the government, or of using the same freely and unmolested for a term of years, more or less, in a free and public manner.

It is conceded that an inventor has the natural right to secrete his invention as long as he can; when, however, it is discovered, and others see fit to use it, he has no recourse unless he has taken measures to secure an exclusive right from the society in which he lives, for such time as society sees fit to grant it. His natural right to slay the discoverer of his secret, or to threaten the latter with violence in case he reveals it, or uses it, has been surrendered for personal immunity from violence or threatening on the part of others.

In short, the whole question of "Patents or no Patents," resolves itself into the simple question whether it is good policy to grant them or not. This is solid ground upon which to argue the question, and the only solid ground.

We believe the policy has been demonstrated to be a wise one in this country, and that it would, if properly carried out, have proved a wise one in every civilized land. That some European systems are defective, and have led to injustice and tedious litigation, cannot be denied, but it is the method, not the principle, that is at fault. And we believe that, with all their defects, these patent systems have greatly benefitted the countries in which they exist.

THE ORIGIN OF LIFE.

The present is the most active time, in the history of the world, for speculation of all kinds; and thinkers and theorists are straining their attention in all directions, to find some new fact or combination of facts which may help to elucidate the most important and greatest of all scientific questions: How did life begin on this planet? The labors of Huxley and Pasteur—and also of Bastian, although this eminent *savan* commenced by attempting to prove the possible spontaneity of life—have demonstrated, beyond all controversy, that all organisms receive their life from other life; that every living thing (and this term must now be taken to include the products of fermentation, the germs of disease, and many other natural formations not formerly regarded as instances of organic life) is in existence by means either of generation or separation from another being of the same order. We have thus a simple explanation of the manner in which the lowest of living creatures, such as *fungi* and sporules, are endowed with vital force. The myriads of instances of these growths which we see all around us are but "the present generation," having derived life from some now passed away, and standing ready to communicate it to others that are yet to come. The theory of spontaneous generation is now disregarded, the strong light thrown by modern science upon the varied means of communication of vitality having shown us a more excellent way.

But while this simple and truthful account of the continuance and propagation of life is recognized by all honest and candid students, the primeval origin of the vitality which is thus continued and diffused, remains an open question. It is the final result of all speculation and investigation to reach a point where it can go no further, and where the wisest must bow his head in reverence, and acknowledge his weakness and inability.

The temerity of the unwise is proverbial; and it is not encouraging to the many enthusiastic believers in the glorious nineteenth century, to find that a most prominent philosopher, a man well versed in most branches of science, an electrician of the most profound knowledge as well as ingenuity in invention, and chosen to preside over the session for 1871, of the British Association for the Advancement of Science, should have made a "flying shot" at the stupendous problem, and have succeeded only in eliciting expressions of regret from the friends of knowledge, and of derision from her foes. Sir William Thomson says:

"When a volcanic island springs up from the sea, and after a few years is found clothed with vegetation, we do not hesitate to assume that seed has been wafted to it through the air, or floated to it on rafts. Is it not possible, and if possible, is it not probable, that the beginning of vegetable life on the earth is to be similarly explained? Every year thousands, probably millions of fragments of solid matter fall on the earth—whence came these fragments? . . . . . Hence, and because we all confidently believe that there are at present, and have been from time immemorial, many worlds of life besides our own, we must regard it as probable in the highest degree that there are countless seed bearing meteoric stones moving about through space. If, at the present instant, no life existed on this earth, one such stone falling upon it might, by what we blindly call natural causes, lead to its becoming covered with vegetation. . . . . The hypothesis that life originated on this earth, through moss grown fragments from the ruins of another world, may seem wild and visionary; all I maintain is, that it is not unscientific."

Language fails us when we try to describe this extraordinary farrago. The professor has nothing to say for his idea, but that it is an idea; he has no evidence, and he is not likely to find any, that any meteoric body ever had a single organic attribute; he disdains to explain away the fact that these bodies are, by friction with the atmosphere, heated, as they approach the earth, to such a degree that any vegetable germs in or upon them would certainly be destroyed; and he altogether forgets the trifling point that his theory brings us no nearer to the origin of life than we were before. It must, after Sir William Thomson has left it, still remain open to discussion and speculation; and the question, "What is the origin of life?" will continue to interest us by its importance, and to awe us by its magnitude, long after the President for 1871, of the British Association, has passed away.

Before quitting the subject, we must enter a protest against Sir William's closing sentence. His hypothesis, unlike his germs of life, is a spontaneous emanation, and not a legitimately derived product; and he has for once forgotten his Bacon, and tried to discover new truth which does not grow organically out of old. And when we find him thus striking at the first principles of scientific investigation, we are not surprised to hear him say that a statement may be wild and visionary without being unscientific. It is because his theory is wild and visionary that it is unscientific. The wild and visionary speculators are the worst foes science has to encounter; and it is to be regretted that, on the subject of the origin of life, Sir William Thomson must be reckoned among the number.

JAPAN A FIELD FOR INVENTIONS AND MACHINERY

This country, comprising in its empire the three islands of Japan (called, in Japanese, Niphon), Kioo-Sioo, and Sikoke with many smaller ones, possessing a population which has been variously estimated up to 50,000,000, and a territory of over 163,000 square miles, has many characteristics which render it interesting to us. Of these the chief must be considered to be the accessibility of its people, and their willing recognition and encouragement of the introduction of modern improvements and inventions from our own and other shores. While the bulk of the Mongol Tartar race, the Chinese, have an abject fear of a foreign manufacturer or producer, and place an almost impenetrable barrier of "protection" around their enormous empire, the Japanese are courteous to visitors, and always ready to adopt any foreign product, if it be likely to prove useful to its industrious and ingenious people. Consequently, the benefits of the superior civilization of the United States and the kingdoms of Europe are being brought to the knowledge of the Japanese people with a rapidity unknown in the history of any Oriental nation, and we propose to describe a few of the innovations lately made in this remarkable empire, which is likely to become in time a valuable and potent ally of the Anglo-Saxon countries.

The appointment of Mr. Capron, late Commissioner of Agriculture in the United States, to a similar office in Japan, has been already commented upon in our columns; and of many steps taken by the Government, that is perhaps the most important and the wisest. The country being thickly populated, the soil has been closely cultivated, without, however, encroaching on the lands set apart for maintaining the supply of timber, which latter named proceeding many of our Eastern States would do well to adopt. But in farming implements and machinery, as well as in stock breeding, there is room for vast improvement; and the knowledge and judgment of Mr. Capron will prove of eminent service in all these branches of agricultural science. A cotemporary (the San Francisco *Bulletin*) points out that cattle and hog raising will not be likely to make great strides in Japan, as the people eat no meat, being devout believers in the transmigration of souls; but advancing civilization will probably eradicate this superstitious fanaticism.

Major Warfield, engineer, Dr. Austisell, geologist, and Dr. Eldridge, are also commissioned by the Japanese authorities in a similar manner. A school of medicine in all its branches has been established, and two eminent European professors have gone out to superintend it. And a postal communication has been formed between some of the most important places, and its extension to the country at large is a question of a very short time. The manufacture of coal gas, and the illumination of cities thereby, has long been carried on; and a discovery of a very different kind, namely, vaccination, must be added to the list. The importance of the latter as a prophylactic is well understood in Japan, and its practice is compulsory, and enforced by fine and imprisonment. A large foreign commerce will be assured to the people by their possession of large coal deposits, in the neighborhood of Nagasaki, a port which will soon be frequented by the flags of all nations, in search of fuel, so valuable and so scarce in all parts of the Eastern world.

With a country of singular beauty and fruitfulness, inhabited by a race of people now beginning a second life in the history of the nations, we cannot doubt the Japanese empire has a golden future before it. The American citizens who are there, and who have so highly useful a career before them, will no doubt keep us informed of the progress they are making; and news on the subject will be regarded with great interest by the public in general.

A NEW RAILWAY, 26 miles in length, has just been opened between Lowell and Framingham, Mass. The completion of this link establishes a direct railway line between Portland Me., Lowell and New York. The road passes through several important places, and affords long needed facilities of communication to a large population.

SPIRITS AT A DISCOUNT.

In ancient times every unusual freak of nature was attributed to the influence of invisible spirits. If there was anything which could not be explained upon ordinary principles, it was very convenient to ascribe it to these mysterious agents; and as one after another of the phenomena yielded to the touchstone of science, the domain of the spirit was more and more narrowed down until of late years they have almost exclusively been confined to table turning and mysterious communications from the other world. We now hear of a vigorous attack being made upon the last stronghold of spirits by the inventor of what is proposed to be called "Psychic force." Henceforth tables will be turned, musical instruments played, rappings heard, photographs taken, all of which proceed from the soul of the medium who exhibits the performances, and there will be no further occasion to call up any assistance from the vasty deep. This psychic force, proceeding from the will of the operator, it is said, can exert power over matter, it can overcome the force of gravitation and do many things that would require the intervention of the steam engine, or magneto-electric machine, or some other contrivance known to mechanics and physics. It is proposed to dispense with spirits hereafter and to explain the phenomena hitherto attributed to them upon common every-day principles. This is hard on the spirits, and will greatly interfere with a large class of persons, who have lived off them for a number of years. We are led to these observations on account of the publication of an elaborate article, by William Crookes of London, on the new force, reprinted in the SCIENTIFIC AMERICAN. Mr. Crookes has had an interview with the celebrated medium Home, and appears to have been regularly taken in by that adroit performer. As a result of the interview we have an article in the *Quarterly Journal of Science*, describing how an accordion was played without being touched, or how a lever was made to excite a force of six pounds by the simple laying on of hands.

As Mr. Crookes is unwilling to ascribe these performances to spirits, he proposes to establish a new force, to be called "Psychic," and to admit that by the simple exercise of will we can cause bodies to move and musical instruments to be played. Mr. Huggins, who was present, does not venture to express an opinion as to the cause of the results that occurred; but Mr. Cox, a lawyer, was so impressed by them that he wants to have a "Psychological Society" at once established for the promotion of the study by means of experiments, papers, and discussions, of the new science. We shall now probably hear of an animated contest between the psychologists and the spiritualists. The latter will naturally object to being so summarily dismissed from the stage, and will make a bold fight for the rescue of their faith. And it is possible that some good may result from the discussion. What the precise difference between the psychic force of Crookes and the odic force of Reichenbach is, we are unable to say. We have our suspicions that they will prove to be one and the same thing, and that it will only be necessary to unearth the Reichenbach literature to obtain all that we may wish to know on the subject. A psychic engine would be a marvelously convenient thing to have about the house, provided some member of the family proved to be a medium capable of running it at will. If there is anything in the new force we see no reason why such an engine may not be invented as a substitute for steam or water power.

Seriously, it appears to us that the constant recurrence of so-called spiritual manifestations in one form or another ought to be made the object of special study on the part of physiologists, to whose department this class of phenomena appears to belong. In what way a portion of the brain can be made unusually active, while other portions are asleep, and how to explain unconscious cerebration, are matters quite worthy the attention of physiologists.

Instead of founding a psychological society, it would be more appropriate to establish a physiological: in either case it is time to let the spirits rest, and to account for all phenomena on scientific principles.

WAGNER'S REPORT ON TECHNOLOGY.

The sixteenth annual report on the progress of chemical technology, by Professor Rudolph Wagner, has just appeared. It is a good specimen of the exhaustive research and careful study of the Germans, and is the best book of reference for recent discoveries with which we are acquainted. We have here a volume of 824 closely printed pages, illustrated by 122 handsome woodcuts; giving an account of the latest improvements in chemical technology, not in mere catalogue form, but in abstracts, and with critical observations and reference to previous authorities on the same subjects. The author classifies his subjects into eight groups: 1. Chemical metallurgy. 2. Chemical manufactures. 3. Chemical preparations, organic and inorganic. 4. Glass, porcelain, lime, gypsum, cement, mortar. 5. Technology of food. 6. Technology of textile fabrics, aniline colors, calico printing and bleaching. 7. Dye stuffs, varnish, cement, and rubber. 8. Fuel and light. All of these topics are carefully discussed, and we doubt if anything of importance has escaped the scrutiny of the author. All important facts are authenticated by reference to the original sources of information, and in every instance the journal is cited in which the reader can find the whole subject. There is no book in the English or French language corrresponding to Wagner's report; and it is a pity that the great expense must deter any publishers from attempting its translation. The book opens with an account of the rare metals thallium, zirconium, magnesium, aluminum, jargonium, natrium, strontium and iridium. Seven pages suffice to tell us all that has been done for these metals during the year. Thallium can be best preserved sealed up in a tube in water which has been previously boiled; it then remains bright for years. Zirconium is easily prepared by reducing the double fluoride of zirconium and potassium with metallic aluminum. Magnesium is recommended to be used as a reducing agent for nearly all metals, and aluminum is also highly commended for the same purpose. Jargonium is said to have no existence. Strontium is best prepared from its amalgam, by means of hydrogen gas, and is a yellow metal of 2·4 sp. gr., but of no value thus far in the arts. Iridium is still chiefly confined to zinc blende, where it occurs in minute quantities. A new and neat way of roasting the blende for the purpose of obtaining this metal is suggested. The pulverized ore is mixed with burnt gypsum, and formed into cakes, which are perforated, and easily roasted by placing them upon any open fire. By subsequently treating the cakes with hydrochloric or sulphuric acids, and boiling in an excess of metallic zinc, all of the iridium will be precipitated as a spongy mass, capable of being fused and reduced ready for use.

The subject of iron in all of its relations occupies seventy-five closely printed pages. A good deal of the matter has been anticipated by us during the year, but for convenience of reference it is a pity that the whole chapter as it stands could not be translated and printed in separate form. The principal points are methods for determining the amount of carbon in iron, also phosphorus, silicium, manganese, and other impurities; then follow important analyses of ores and slags.

Under the caption of "The Manufacture of Iron," we have a sketch of all the latest methods, from which it would be difficult to prepare an abstract. In reference to silver, the author gives a history of the desilverization of lead by means of zinc, which is now regarded as the best process in use The most careful comparative tests have been made, in which preference is given to this method over Pattinson's, so long employed. A full description, with cuts, is given of Stetefeldt's furnace, now so popular in the West. Miller's chlorine process for refining gold, which we described some time since, is spoken of in high terms of commendation, and all the new things about gold and silver are mentioned in detail. Copper and its alloys, galvano-plastic, zinc, lead, nickel, cobalt, platinum, manganese, bismuth, tin, and mercury, have their proper places in the literature of the metals. Under chemical manufactures, sulphur and sulphuric acid naturally occupy the chief attention. The recovery of sulphur from soda waste, by Mond's process, now appears to be an accomplished fact, and it is difficult to overestimate the mercantile value of the improvement. Another matter of importance is the increased attention now bestowed upon the manufacture and uses of the bisulphide of carbon. This valuable product is largely employed in Europe in the extraction of oils, and has other uses which ought to receive more attention in this country. Soda ash, chlorine, hydrochloric acid, bromine, iodine, nitric acid, and phosphorus are heavy articles of manufacture in Europe, and ought to be more firmly established in the United States. Whatever may be the right or wrong of protection, as the advocates of this doctrine have had their own way for many years, and these industries are not yet established, how would it do for them to step aside and give the other side a chance? There would appear to be no valid reason why these manufactures should not flourish in the United States, and the want of them is felt in every branch of trade.

Wagner affords us much important information in reference to the production of potash from sugar residues, and from the deposits of the Stassfurt mines; he also gives a sketch of the history and progress of the various explosive compounds recently introduced. Baryta salts, so much used in France and Belgium, are fully described, and it seems a pity that the information should not be more widely disseminated. In the department of organic chemistry, such products as are of use in the arts are mentioned in detail, and we are surprised to see how many of them there are, and how little is properly known of them.

The improvements in the manufacture of glass, porcelain, and cements have been considerable during the last few years, and Wagner gives us a fair review of them. Under food, fuel, light, textile fabrics, and dyes we have much important matter.

It is impossible in one short notice to refer to half the new matter contained in a book of this character, and if the authors of some of our school books on technology would carefully peruse the sixteen volumes of Wagner's reports, they would see how wonderfully behind the age they are in their compilations. For that matter, if they have not access to the German, a perusal of the columns of the SCIENTIFIC AMERICAN, would be the next best thing to enable them to correct many errors.

THE LATE PROFESSOR PAYEN.

M. Pierre Thomas gives a sketch in *Les Mondes* of his uncle, Professor Payen, which discloses a life of such extraordinary industry and usefulness that we cannot do better than translate it for the benefit of our readers.

Payen's first great work was to fix the rational application of manures, in 1824. He gave the theory of the decoloration of liquids by means of animal black, and proposed the employment of the residue for agricultural purposes. In 1830, he established the principle, now universally accepted, of computing the nutritive value of composts according to their contents of nitrogen; he studied thoroughly the exact structure, mode of formation and transformation of starch, and this conducted him to the determination of cellulose in the vegetable tissue, to the remarkable indications of the secretion of mineral substances in the organs of vegetables, to the manufacture of dextrine by the kiln, and also to the discovery of the principle of diastase, which plays such an important part in the process of fermentation.

These conspicuous discoveries afford but a faint idea of the enormous amount of work accomplished by Payen. It would be difficult to conceive of a man more indefatigable, more anxious to accomplish something. There was not a scientific society of which he was not a member; not a meeting at which he was not present; not a commission of which he did not form a part, and usually as the reporting secretary. The works of Payen, so far from being confined to his personal publications, are found spread out in the transactions and proceedings of all learned societies. And yet to form an idea of his prodigious activity, it is well to recall that he was to be encountered on all occasions of ceremony, taking a part in public and private entertainments, and in general fulfilling his duty as a member of society to the minutest particular.

One fact, often related of him, shows to what an extremity he pushed his economy of time. His carriage was made into a perfect workshop; he wrote in it, he had in it reagents and a few simple pieces of apparatus, and he used it as a dressing room to avoid the necessity of the loss of time required to return home and change his toilet for a reception. Payen taught industrial chemistry at the *Ecole Centrale* for forty-one years, and at the *Conservatoire* for thirty-two years, without losing a single lecture. Last year, when attacked by a severe illness so that he could take no nourishment for several days, he could not be persuaded to intermit his lectures, but had to be carried fainting from the rostrum. The disease to which he finally succumbed, and which carried him suddenly away, was apoplexy. It will be difficult to replace Payen. He was the only professor who united, to a grand scientific knowledge, complete practical information of the subjects taught, derived from thirty years of personal technical work.

PSYCHIC FORCE.

Mr. Coleman Sellers, of Philadelphia, Pa., well known as an able mechanical engineer, and among his intimate friends as an amateur prestidigitator of unusual skill, has, in a brief article in the *Franklin Journal*, thrown considerable doubt over the genuineness of those manifestations of "Psychic force" which have lately been announced by Dr. Crookes, supported by the well known astronomer, Mr. Huggins, and others.

Mr. Sellers first draws attention to the fact that scientific men have not as a rule "been unwilling to investigate" *facts* (?) of the class under discussion, but have only insisted that these *facts* should be produced under conditions excluding facilities for sleight of hand and other related deceptions.

Such requirements, however, have not been complied with generally, nor in the case related by Dr. Crookes, therefore Mr. Sellers argues that the right sort of "expert" to investigate such phenomena would be one skilled in legerdemain and the intricacies of complex mechanism.

He further alludes to the floating accordion, and suggests a striking parallel in the care of Hermann's floating wand, and in reference to the music from the same instruments, calls attention to a whole class of performances related to ventriloquism, which serve to explain the means by which the recorded effect was probably produced.

The writer of this has seen Mr. Sellers among a company friends perform a feat, which, with a change of instruments, would be identical with that described by Dr. Crookes, and which, without the aid of an ear trumpet, which was not applied by our English friends, would defy detection on the part of the uninitiated.

Robinson's Breech-loading Rifle.

In our description of this invention, published on the first page of No. 9, current volume, an error occurred in describing the method of filling the magazine with cartridges. It is not necessary to take out the screw, Q, as therein stated. This screw does not pass through a hole in the outer plate, but simply fits into a slot. It is, therefore only necessary to turn the plate down into the position shown in dotted outline. No screw has to be taken out, as erroneously stated. Also in the seventh paragraph, the link, O, is referred to Fig. 1. It should be Fig. 4.

A CORRECTION.—In the article in our issue of the 26th of August, in commenting upon the testimony of Mr. McMurray, we styled him the Inspector of the New York and Hartford Steam Boiler Assurance Association, this being the title applied to him in the reports of his evidence as printed in the city papers. We now understand there is no such organization as the one named, and that the gentleman in question is the chief Inspector of the New York Branch of the Hartford Steam Boiler Inspection and Insurance Company.

THE SUEZ CANAL.—General C. W. Darling, of New York city, has received a letter written by Baron de Lesseps, President of the Suez Canal Company, stating that the report of the canal being rendered comparatively useless by the filling up with sand, is incorrect. M. de Lesseps says: "The deposits of sand brought by the wind are insignificant, and the sides of the basin are so solid that the most exposed portions of the work, after eighteen months' use, present scarcely a perceptible variation."

CANNOT AFFORD TO STOP.—An advertiser in answer to our enquiry if he wished his advertisement continued, says:—"Every week we sell machinery, the profits on which will pay for our advertisement for six months, that we should not sell but for your paper; so you see we cannot afford to stop, so please keep on as heretofore."

[Special Correspondence of the Scientific American.]

INTERESTING EXTENSION CASES.

Washington, D. C., August 26, 1871.

The following extensions have recently been granted: James A. Watrous, for mode of suspending eave troughs; George C. Dolph, for a mowing machine; Charles Monson, for an extension gas tube; John Toulmin, for vibrating shears, the jaws being adjustable to maintain a good cutting contact of the blades; Israel Dodenhoff (deceased), a raking mechanism for harvesters, consisting in the construction and combination of the rake with the platform, guides, and gate. The rake travels in a continuous horizontal path. This is one of those cases in which the patentee and his heirs have been unable, for lack of means, to prosecute the invention, and properly bring it before the public. Charles H. Sayre, for cultivator, in which a horse hoe is combined with a double mold board plow, the plows and mold board being made adjustable. Philip W. Mackenzie, cupola furnace for melting iron; the blast is in a continuous sheet; invention very valuable, but no opposition to the extension. Two applications have been refused. Gideon B. Massey, measuring depth of water in slips. This invention consists in an arrangement of an alarm bell and trip, operated by a spring barrel, upon which is wound a cord suspending a heavy float on the water in the hold, so as to indicate on a dial the depth of water, and also to give audible notice when it reaches certain hights.

In view of the patent to Nelson Edwards, March 5, 1850, and the rejected application of W. H. Horton, filed December 1851, the examiner reported unfavorably to the extension, holding that the original patent should not have been granted.

A novel case, and it is to be hoped an exceptional one, has been before the Commissioner this month, in which an extension was both granted and refused, namely, the patent of Timothy Taft, for a metal cutting shears. The upper edge of the movable blade constitutes the inclined plane on which the wheel travels, while the wheel itself is compelled to follow a horizontal direction. The bearing surfaces of the two wheels and two planes are plain, and to prevent slipping, cogged plates are attached which interlock.

Upon the hearing of this case, reference to the records of the office showed that the patentee had made an assignment of all his interest, including the extension, if granted. Under the law the office is not allowed to grant extensions for the sole benefit of assignees, and the Commissioner so ordered; whereupon the attorney in charge of the case, stated that the assignment had been given as a temporary security for money loaned, and that the patentee having cancelled that obligation, the patent had been that day *re*-assigned to him, but the re-assignment papers had not yet been recorded.

Upon hearing this explanation, and being assured that the transaction was a *bonâ fide* one, the Commissioner, after the re-assignment was duly entered in the record room, granted the extension. As soon as the decision was rendered, the attorney filed a third assignment of same date with the re-assignment, transferring all right and interest in the patent back again to the same assignee, one Lucius W. Bond, thereby showing that the re-conveyance to Taft was a mere fiction to deceive the Commissioner. The records further show that the patentee, a few days later, assigned his interest in full to one Elizabeth H. Taft. It is not difficult for those who know Mr. Leggett, to believe that on learning the above facts, only an exceedingly curtailed period of time intervened before his first decision was reversed, and the extension refused. Tricks like this are not likely to thrive under Commissioner Leggett's administration.

In a previous letter some figures were given showing the number of patents issued to applicants of each State, based on an examination of the issues of one month only—not two months, as was erroneously stated. [Your Illinois correspondent, who took exception to the number for that State, will please take note of the above correction.]

I now send you the list of issues by States during the first six months of the present year.

New York, 1,282; Pennsylvania, 688; Massachusetts, 613; Illinois, 438; Ohio, 404; Connecticut, 306; New Jersey, 231; Indiana, 193; Michigan, 174; Maryland, 127; California, 121; Missouri, 119; Wisconsin, 112; Iowa, 93; Rhode Island, 84; District of Columbia, 62; Kentucky, 60; Virginia, 52; Georgia, 42; Louisiana, 39; Tennessee, 35; North Carolina, 30; Mississippi, 24; Delaware, 23; Texas, 21; Minnesota, 20; Kansas, 20; West Virginia, 16; South Carolina, 13; Alabama, 13; Oregon, 10; Nevada, 8; Nebraska, 7; Arkansas, 6; Florida, 5.

AMERICAN INSTITUTE FAIR.

A visit on the 30th of August to the immense building known as the Empire Skating Rink, in which the coming Fair of the American Institute is to be held, opening on the 7th of September, revealed the fact that in all probability the delays attending the former expositions of this Association are to be repeated this year. Scarcely anything to be shown was on the ground, although the building seemed thoroughly prepared for the reception of everything to be exhibited. The steam boilers were in position, and the large steam engine intended to drive the machinery was nearly set up. The line shafting is also all mounted, and, in short, the managers seem to have performed all the necessary preliminary work. The delay, then, if it takes place, will be on account of the dilatoriness of the exhibitors. We trust, however, that the managers will refrain from opening the Fair until all the arrangements are perfected, and not lay themselves open to the charge made in previous years that they advertised their show, and took money for admission before scarcely anything was ready for exhibition. The building has been enlarged, and the prospects are that the Fair will exceed in interest any previous one.

Inundation in Hungary.

Our latest European advices bring accounts of a great calamity in the valley of the Temes. This river rises in the Carpathian mountains, and after a course of 180 miles, flows into the Danube at a point six miles from Belgrade. To save the adjacent lands from flooding, dams were many years ago built; but these were allowed to get out of repair, although the attention of the authorities was called, by the inhabitants of Southern Hungary, to the impending danger. The Temes and its three tributaries, the Bisztra, the Bogovitz, and the Berzava have been unusually full for some time past, and at last the dams have given way. Whole tracts of country have been overflown, and crops of enormous value utterly ruined. To add to the desolation, severe hailstorms have visited the district, destroying vineyards and orchards, wheat and tobacco fields. The government has, in reversal of the policy of conciliation pursued for some time past, vigorously collected the taxes, these calamities notwithstanding; and the population of a large agricultural district is thus deprived of its trade and industry, and the inhabitants are in great distress.

Improved Awl.

Mr. Samuel Babbitt, of Brazil, Indiana, has recently patented an awl constructed with an eye for withdrawing the thread or bristle from the inside of a boot or shoe in the process of sewing. The eye of this awl is made so that it can be opened or closed by a slide which, coming in contact with the leather when the awl is thrust in, automatically opens the eye, the slide being actuated by a spring to close the eye when the awl is withdrawn. The thread, entering the open eye, is held therein by the closing of the slide, and is thus withdrawn.

THE NEW JERSEY STATE AGRICULTURAL SOCIETY announces its thirteenth fair, to be held at Waverly station, near Newark, on September 19, 20, 21 and 22, 1871. Premiums are offered to meritorious exhibits in every branch of agricultural and mechanical industry, as well as in manufactured articles, ornamental as well as useful, and in the fine arts. Steam power and main shafting are provided for the accomodation of exhibitors of machinery, who will, however, have to provide counter shafting, where required, at their own expense. A feature, novel and especially commendable, in the programme, is the offering a gold medal for the best specimen of apprentice's labor in any branch of the mechanical arts. A competition of more than usual interest will be a trial between an Aveling and Porter steam road engine, imported from England, and an engine of the Scotch design, (Thompson's patent), built by the Grant locomotive firm at Paterson. A gold medal is offered for the best steam fire engine. The general superintendent of the arrangements is Mr. E. G. Brown; and the secretary, Mr. E. M. Force, of Newark.

MR. HEYSINGER, of Philadelphia, writes to suggest that the invention of Colonel Clerk, described and illustrated on page 114, current volume, would be much simpler, as well as more effective, if the water resistance were accommodated to the varying strain by using a solid piston, and grooving the inside of the cylinder longitudinally with several grooves following a curve.

Inventions Patented in England by Americans.

August 8 to August 14, inclusive.

COVERING WIRE, ETC.—A. P. Brown, New York city.
DRESSING MILLSTONES, ETC.—J. W. Fry, Nashville, Tenn.
DRESS PROTECTOR.—F. Wittram, New York city.
HOLDER FOR UMBRELLA.—A. Clarke, Chicago, Ill.
SAND PAPERING MACHINE.—J. Barker, Chicago, Ill.
SCREW PROPELLER.—H. Zahn, San Francisco, Cal.
SEED PLANTER.—W. L. Seward, Washington, D. C.
UMBRELLA.—J. Shepard, New Britain, Conn.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Examples for the Ladies.

Mr. Gilbert Brown, of Williamsburg, N.Y., brought a $55 Wheeler & Wilson Machine in 1856, (price then $100;) borrowed most of the money to pay for it; has supported his family with it; bought and paid for a house and lot paid taxes, church dues, etc., besides doing his family sewing. During the war he averaged daily 8 infantry frock coats, or 10 cavalry jackets, or 8 military overcoats. Since then he has earned at custom work from $3 to $5 per day of 9 hours, and would not now sell his machine for the price he paid for it.

Says a late issue of the Philadelphia *City Item*: "Ingenuity has been taxed to find the surest and most direct means of reaching the public, and the business man who would advertise a specialty, and get the greatest good out of the greatest number in the shortest space of time, is compelled to go to Geo. P. Rowell & Co., of New York, for advice. Why to this house? Because it is the head and front of the advertising business. It is prompt, methodical and clear in its transactions, and possesses the confidence of all the houses which advertise most."

Rose Cold and Hay Fever disappear by the use of Jonas Whitcomb's Asthma Remedy.

[By Telegraph.]

American Steam Safe Co., Cole & Lambert, Managers, No. 300 Broadway, New York City: Our hotel and 30 buildings were destroyed by fire on the 23d inst. The steam safe made by you has just been opened, *after remaining in the burning ruins sixty hours*, and books and papers remarkably preserved, not being even discolored, W. H. WELCH & SON,
Ithaca, N.Y., August 26, 1871. Late Proprietors Ithaca Hotel.

Safety of Herring's Safe.

ABBOT, Ill., Aug. 26.—The safe of J. Little, banker, whose bank shared in the conflagration, last night, has been got out of the ruins, *and its valuable contents are uninjured*. It is one of Herring's safes.—*Chicago Journal*.

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.

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.

Rare Chance—A very profitable manufacturing business for sale—Water Power, Mills, &c., 10 miles from N.Y. city. Price $5,000. Address H. Wilber, Newark, N. J.

For sale, at a bargain, the Machinery and Stock, for Hoop Skirt Making. Also, a valuable patent for hoop skirts. Will exchange for other property. R. M. Mansur, Augusta, Maine.

A Patent Lock Business for sale, at a bargain. Machinery Tools, Patterns, complete. Apply to C. S. Fordham, 545 W. 21 st., N.Y.

A foreign correspondent asks for description and prices of Shingle Sawing Machines. Send circulars and replies to this office.

Wanted—A party with capital, to finish a machine for whitening and buffing leather. Patents secured, machine nearly done—excellent results have been obtained. Wm. A. Perkins, 39 Peabody st., Salem, Mass.

d'Heureuse's Patent Air Treatment in the quick, cheap, and perfect manufacture of wine, cider, spirits, sugar, oils, etc. Rights for sale. For particulars, apply to R. d'Heureuse, P.O. Box 6,544 New York.

No end to demand for reversible sash illustrated July 22, M'f'rs Sash, Builders' Hardware, etc., secure your territory *now* at low rates. Wm. P. Nelson, 618 N. Main street, St. Louis, Mo.

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 15 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. 885 Broadway, New York, and by return mail you will receive their Descriptive Price List of 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, 197 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.

Makers of 4 in. light Cast Iron Pipe address E. Whiteley, 61 Charlestown Street, Boston.

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. Aray, 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.

Line, Shafting, Pulleys, and Hangers.
First class. Send for circulars and price lists. Greenleaf Machine Works Indianapolis, Ind.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

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.

For Sale—The whole or one half interest in Shaw's Patent Feed Water Heater, Filter, and Lime Extractor for Steam Boilers, now being manufactured by David E. Shaw, patentee, Chatsworth, Ill. Send for circular. Investigation solicited.

Patent for sale, or Partner wanted with capital to introduce the same. Please address Philip Marquard, 468 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 Woodworking 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.

Manufacturers of Corset and Hoop Skirt Steel Springs address D. M. Crawford, Sterling, Ill.

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.

TEMPERING MILL PICKS.—F. A. K., in issue of July 15th, asks for a recipe for tempering mill picks. I find the following an excellent method: After working the steel carefully, prepare a bath of lead heated to the boiling point, which will be indicated by a slight agitation of the surface. In it place the end of the pick to the depth of 1½ inches until heated to the temperature of the lead, then plunge immediately in clear cold water. The temper will be just right, if the bath is at the temperature required. The principal requisites in making mill picks are: First, get good steel—"Butcher" or "Jessup" I have found good. Second, work it at a low heat; most blacksmiths injure steel by overheating. Third, heat for tempering without direct exposure to the fire. The lead bath acts merely as protection against the heat which is almost always too great to temper well.—R. B., of Tenn.

SCALING STEEL.—L. G. can remove the scale from steel articles by pickling in water with a little sulphuric acid in it, and when the scale is loosened, brushing with sand and a stiff brush.—D. G. P., of Ill.

SOFTENING GUMS.—The trouble with W. W. G.'s gums probably is a deposit of salivary calculus upon his teeth, under the free edge of the gum, which can only be removed by the scaler of a dentist.—D. G. P., of Ill.

PARIS GREEN ON POTATOES.—In your issue of August 19th, C. E. McR. asks if Paris green put on potato plants will poison the tubers so that people would be poisoned by eating them. I think not, and yet cannot consider it entirely safe to use it. Pure Paris green, or Scheele's green, is arsenite of copper. It is insoluble in water; hence, when put upon the soil, it remains in it like so much sand. W. W. Daniels, of the University of Wisconsin, writing on this subject, says, "There is no evidence to show that plants ever take this substance into their circulation, and the laws of vegetable physiology would lead us to believe that if they do so at all it must be in the smallest quantities." Still, to use it is to put an active poison into the soil, which *may* never do any harm. Of course, it is not likely to do any harm from being on the outside of the tubers, for they are usually pared, or at least well washed, before being cooked. But time, only, will show the result of using it, for it will remain in the ground unless removed by those "slow natural solvents which are constantly at work decomposing the mineral ingredients of the soil."—L. Q. B., of Ohio.

BATTERY.—"Neutral" asks some questions which I will endeavor to answer. First: A carbon plate is preferable to a copper one in a theoretical sense, since the battery resistance is less, that is, the intensity is greater with carbon than with copper; but to T. G. B., wishing to construct his own battery, I recommended copper and zinc, because I believe that, in most places, copper plates are more readily obtained than good carbon ones; besides there are practical objections to carbon plates which are difficult to overcome. Carbon is permeable by liquids; and the fluids of the battery, being drawn up by capillary attraction, finally reach the metallic caps and corrode them, thus offering a great, if not an insurmountable barrier to the current. The only means of preventing this is to thoroughly cleanse the plates and their metallic caps after use, or to make the carbons reach so far above the cells that capillary attraction will not raise the fluids to their tops. The first of these methods is troublesome the second inconvenient, and it thus usually happens that carbon plates are dearer in the long run than platinum ones. Second: I know nothing about "electropoin," having never even seen it; nor do I understand why people should buy "battery fluids" when they can get all the water, acid, and salts necessary. Third: The bichromate solution gives off no fumes when in action, unless too much sulphuric acid be added, when a little hydrogen is eliminated. It may consequently be used in a parlor with impunity.—NEMO, of Canada.

CONE PULLEYS.—Although the subject of what are termed "Cone Pulleys" has been somewhat ventilated in the SCIENTIFIC AMERICAN, and various correspondents have forwarded, from time to time answers to some proposed questions, it does not appear from the communication of A. W. G. that the subject is yet clear in his mind. If A. W. G. has tried the rules given by previous correspondents and found them incorrect, or in some cases worthless, I do not wonder at it. An answer to his question, even if he had given all the data, requires the solution of a transcendental equation, and cannot possibly be solved by diagrams, while, as it now stands, it is mathematically indeterminate. The truth is, that the theory of cone pulleys is a complicated and difficult one, one element in the solution of which is the distance between the axes of the pulleys; and it is only when this distance is very great in comparison with the diameter of the larger pulley, or when the two pulleys are of nearly the same size, that the rule commonly given will apply. If belts were made of some inextensible substance, the difficulties of adjustment would require more accurate rules, but fortunately leather straps readily accommodate themselves to slight errors of construction, although not running in such cases with "equal tension."—NEMO, of Canada.

TABLE CUTLERY.—It is possible that the carving knives which trouble R. S. S. H., with their relenting temper were not heated enough to harden them, except on the edge; or that they were dipped when hot, so that only the edge was suddenly cooled. If the blades were cooled between cold plates, the edge and back might be hard and the middle of the blade softer. Then, when the edge wore away, the temper would gradually fail. If the knives, while in his possession, were sharpened on an emery wheel or dry grindstone, the temper might have been extracted by friction heating; and, furthermore, as "constant dropping wears away stone," so a frequent heating to a temperature of 212° may lower the temper of steel by relaxing the rigid cohesion of its particles. In any case here mentioned, the quality of the steel remains uninjured, and its temper can be restored by rehardening. Working hot steel has been my business for 22 years, and I am surprised at the assertions in the paper read at the London Association of Foremen Engineers, entitled "What is Steel?" I take exception to many of its statements. Watching the effects of circumstances upon the temper of steel has been my practice. It is singular how slight a thing may change its nature. R. S. S. H. may be laughed at for his scalding water theory, but he is not much out of the way.—B. F. S., of N. Y.

BELLOWS.—Let L. V. H. take a common wash tub or half barrel; put a keg inside it, with a hole one inch in diameter. Adjust a small bellows in connection with the keg, to be worked by a treadle. A rubber hose will do to convey the air from the keg to the flame. Fasten the keg to the bottom of the tub, and two thirds fill the latter with water. When the bellows is worked, the air cannot pass out of the mouth of the tube as fast as it is forced into the keg, so the air forces the water out of the hole; and the weight of the water forces a steady pressure of air through the tube.—T. E. L., of Ky.

TABLE CUTLERY.—I will answer that scalding water is of far too low a degree of heat to have any effect on the temper, but hot grease (which table cutlery is likely to come in contact with in the hands of servants), might, if it was brought almost to a flaming point. However, all table cutlery is hardened in oil, and the degree of heat that will give the best result on the thinner part of the blade will not harden the back at all. Hardly any knife with anything like a thick back is hardened for more than one third of its width.—R. F., of Ill.

BELTS.—S. G. D., in pressing one end of his "straight faced tightener" to the belt harder than the other, is only illustrating the principle of the "crowning," or "high faced pulley."—E. B. T., of Pa.

WATER FOR AQUARIA.—G. W. G. can use either well or cistern water, for neither will injure gold or native fishes. I have kept mine, first in one, and then transferred them to the other, in order to see if it would injure them, but I could not see any change in them. He need only change the water when it becomes green. Let him have a small cup handy, and when he passes his aquarium take up a cup full and pour it back into the aquarium from a hight of eighteen inches—that will help to keep the water pure.—T. E. L., of Ky.

SPONTANEOUS IGNITION.—I suppose it is a well known fact, that a handful of cotton waste, slightly saturated with boiled linseed oil, will spontaneously take fire within two hours. Will some chemist please explain?—S. S. B., of Vt.

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.—EXTRACTING FIBRIN FROM BLOOD.—I would ask the many readers of the SCIENTIFIC AMERICAN, how to deprive blood of its fibrin?—S. G. D.

2.—LOCUST SEED.—I wish to plant a quantity of white locust seed, to grow posts for fencing purposes, and have been informed that not more than one seed in every pint will sprout, if sowed ordinarily. Will some of your numerous readers inform me through what process, if any, the seed can be taken to make them propagate? I have been informed by one person that they will require roasting. Is it so? If so, how much? Should they be planted in fall, winter, or spring?—V. A. J.

3.—POLISHING SHELLS.—I wish to know how to remove the dark crust from ornamental shells, and how to polish the same.—E. A. S. B.

4.—KILLING FLIES.—Can any of your readers tell me of anything which, if burnt in a close room, will kill the flies therein? I have tried brimstone with no effect except to increase the animation of the insects.—J. G. D.

5.—CONCAVE REFLECTORS.—Permit me, through your "Query" columns, to ask the following questions: What is the cheapest way to make concave reflectors, about sixteen or eighteen inches in diameter, which will condense the rays of the sun at a point about six feet from the reflector, that is, of six feet focus? It is not necessary that they should be perfectly true. How are the glass lamp reflectors made, the kind that are silvered like a looking glass?—R.

6.—COMPRESSED AIR ENGINE.—I see it noticed in some papers that there is a slight modification of the steam engine necessary in order to run the same by compressed air. Please state the said modification. I wish to construct and use an engine to run by compressed air.—A. R. C.

7.—RENOVATING CARPETS.—What kind of machinery is used for renovating carpets in large establishments in the city?—O. G. M.

8.—COLORING GOLD.—Can some of your readers give me the *modus operandi* by which gold is colored so as to make the so called "Etruscan" jewelry?—R. L. K.

9.—RESTORING GRINDSTONE.—I have a large, fine grit grindstone, which has become hard and glazed by exposure. Can any of your readers inform me how it can be restored?—J. E. G.

10.—ANASTATIC PROCESS.—Will some of the readers of the SCIENTIFIC AMERICAN tell me how to prepare a zinc plate for anastatic printing, and how to make a transfer ink which can be used with a pen?—E. P. W.

11.—APPLYING SAND TO SURFACE OF IRON.—How can I make sand (the same as used in the manufacture of the best flint sand paper) adhere to the planed surface of wrought or cast iron? I wish to use it for sand papering wood. And where can I obtain the sand?—M. N. S.

12.—FORMULA FOR SAFETY VALVE.—Will any of the readers of the SCIENTIFIC AMERICAN be kind enough to instruct me how to calculate the effective weight of a safety valve lever?—A.

13.—BRONZING PLASTER CASTS.—I have two large plaster busts which I wish to bronze in imitation of good French bronze. Will some one give me the method in detail?—J. W. H.

Declined.

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

BEDFORDIAN SYSTEM OF ASTRONOMY.— ——.
CAUSES OF DISEASE.—Z. C. Mc E.
COLORADO AND NEVADA ORES.—C. W.
GRAVITY AND HEAT.—M. R. L.
OZONE AND ANTOZONE.—C. H. Du P.
PERPETUAL MOTION.—F. J. A.
PROPULSION ON CANALS.—E. O. P.
PSYCHIC FORCE.—J. E. H.—G. W. R.
SEASONING LUMBER BY DRY STEAM.—H. G. B.
THE AEROLITE THEORY.—C. M
VAIN EGOTISTS.—R
ANSWERS TO CORRESPONDENTS.—A. D.—B. T.—J. C. C.
QUERIES.—A. D.—A. L. W. Jr.—W. J. H.

Recent American and Foreign Patents.

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

DENTAL DRILL.—Alexander Hartman, of Murfreesborough, Tennessee.—A rattan is applied in a dental drill as the flexible rod or connection by which the burr-holding mandrel is revolved. A double threaded nut is applied to the holder and the rattan within a tube to connect the two parts together. The invention is used with some rotating device similar to the fiddle drill movement, or otherwise as may be expedient.

STREET CARRIAGE.—Mr. George S. McHenry, of Kansas city, Missouri, has invented an improvement in the construction of street carriages to adapt them more especially for running upon Nicolson and other smooth pavements, and which will make the carriage as convenient as a street car, while requiring no track. The wheels are made large so as to roll easily and smoothly. The axles are bent twice at right angles near each wheel, so as to bring the horizontal middle part of the axle close to the ground. The body of the carriage is connected with the axles by bolts or other devices to keep it in place. Springs are interposed between the body and the axles, having sufficient strength and elasticity to support the carriage body and cause it to ride easy. The springs are made of steel or other suitable material, and of any suitable form. The lower part of the side walls of the body of the carriage is made double for a sufficient hight to form recesses to receive the wheels, so that the latter may be entirely out of the way and almost entirely out of sight, and, at the same time, not lessen the carrying capacity of the carriage.

BALANCING PISTON.—Leonard Finley, of St. Louis, Mo.—This invention relating to steam or air pistons working horizontally; it consists in providing one or more cavities in the face of the piston at the under side, and admitting steam thereto to act between the piston and the cylinder to counteract the weight. The arrangement also facilitates lubrication.

PUMP.—Everard S. Crowell, of Augusta, Maine.—This is an improvement in the class of force pumps provided with two sets of inlet and outlet valves, and two pistons simultaneously reciprocated in the same cylinder and in opposite directions. It consists in the arrangement, with receiving and eduction chambers of peculiar construction, of three induction and three eduction valves, whereby, it is claimed, water may be constantly drawn into the cylinder and forced out of the same with more uniformity and steadiness, as well as force of flow, than in allied inventions.

STEAM BOILER.—George Keen, of North McGregor, Iowa.—The object of this invention is to increase the steam generating surface of the ordinary flue boiler and to consume the smoke and gaseous products of combustion thereby economizing fuel. It consists in a series of short funnel shaped conducting tubes, which connect the furnace or fire box with a main flue or combustion chamber of the boiler, and in an adjustable damper at the front end of the said main flue, by means of which any required amount of atmospheric air may be admitted to mingle with gaseous products of combustion in the flue, thereby supplying an additional amount of oxygen to such gases and consuming them. It also consists in a general arrangement and combination of parts.

GANG PLOW.—John Blackwood, of Madison Township, Ohio.—This invention furnishes an improved gang plow, so constructed as to plow furrows of uniform width and depth, and which raises the furrow slice without pressing upon the bottom of said furrow, leaving the ground at the bottom of the furrow loose and porous. It consists in the construction and combination of various parts, as set forth in the specification of the inventor.

ATTACHING PLOWS TO TRACTION ENGINES.—William H. H. Heydrick, of Chestnut Hills, Pa.—The plows are arranged diagonally across the machine. The plow beams are connected with the beam of a triangular drawing frame by plates. These plates are provided with ribs on the under side which are perpendicular to the line of draft. Each plow beam is provided with a hinge plate, grooved so as to correspond with the ribs of the first named plates, and also with a slot. The hinge plates are clamped to the ribbed plates and to the beam by bolts and suitable screw nuts. These bolts are provided with rubber springs placed under the head of the bolt or under the nut. The object of this arrangement of the spring is to allow the hinge plates to escape when the resistance on the oblique walls of the ribs of each plate becomes excessive. When this resistance is greater than the resisting power of the springs in the lengthwise direction of the bolts, the said plates will escape. The tension of these springs may be regulated by screwing up the nuts.

MOLDING MACHINE.—This is the invention of John Demarest, of Mott Haven, New York. The mechanical details of the invention are of such a nature that they cannot be described here. The machine is especially designed to be useful in core casting, in molding pipes, etc. The claims cover the use of triangular gates arranged and operated in a specified manner, and for the purpose set forth, also combinations of various devices, but the most prominent and novel feature is the formation of the core shafts of large cores of an oval form, so as to leave the greater thickness of sand in the line of movement of the sections of the mold, thereby securing uniform compression of the sand when the mold is closed.

CARPET STRETCHER.—S. Elliott, of Sonora, Cal.—This consists of two bars, at the end of one of which is a box into which the other bar slides. One of the bars is provided with claws to seize upon the carpet. Within the box is a pulley block, cord and windlass. The cord passes from the windlass over the pulley and is then attached to the bar in such a way that winding up the cord thrusts the bar out. In use, the claws are made to engage the carpet; the other end of the device is placed against the opposite side of the room, and the windlass being turned, the carpet is stretched; the windlass being held by a ratchet and pawl while the stretched carpet is being tacked down.

DOVETAILING MACHINE.—John B. Ritchey, of Pomeroy, Ohio.—A revolving cutter is mounted in a vertically reciprocating frame, and a table whereon the work is to be presented to the machine, having the boards, to be dovetailed, clamped upon it, has to be moved along past the cutter the distance from center to center of the tenons or mortises, and held while the cutter moves up or down through the board when laid flatwise to do its work; and as the distances between centers vary in different work, it becomes necessary to employ adjustable spacing devices in connection with the table for the purpose. These consist in the adjustable blocks arranged in a slotted bar, and having the wedges between them, by which they are shifted closer together or further apart, as may be required by the work in hand, the said wedges being driven in or drawn back by a plate and adjusting screw, and the upper ends of the blocks engaging a spring pawl or holder, attached to the under side of the table, and springing down over the blocks, so that a projection on it, bearing against the blocks at one side, will regulate or gage the position of the table. In this example it is proposed to make use of the same instrumentalities, with the following modifications. The blocks are notched on one side, and fit the wedges in them to hold them down.

MEDICAL COMPOUND FOR KIDNEY DISEASES.—Robert Hawkins and Albert Addison Hill, of Beallsville, Pa.—This is a combination of vegetable remedies to form a remedy for gravel and stricture, and it is claimed is used with the best results in diseases of the kidneys, bladder, and liver, reducing inflammation in those organs and acting favorably upon the stomach.

GUN LOCK.—William N. Bennett, of Illyria, Iowa.—This invention is a new trigger mechanism which can be used like a plain trigger, or set to constitute a hair trigger, as may be desired. It consists in connecting the main trigger by a slotted arm and pin with the discharge lever so that it will swing said lever plainly for an ordinary discharge, or first lock and then suddenly release it for more accurate firing.

COVER FOR THE LENS OF PHOTOGRAPHIC CAMERA.—Oscar W. Noble, of Darlington, Wis., assignor to himself and Luke Agur, of same place.—This invention relates to covers for lenses of photographing apparatus; and consists in the application of hinged caps to photographic cameras for the purpose of covering and uncovering the lenses. An arrangement of an arm an arbor, ears, cranks, rod, crank, and handle, is employed, whereby the caps are operated through the turning of a crank to immediately and simultaneously open or close the caps when desired.

MACHINE FOR CUTTING CLOTH.—Ephraim B. Wells, of New York city.—An important improvement in textile manufacturing is that of Ephraim B. Wells, of New York city, an improved machine for cutting cloth. In this machine two drums are mounted, respectively, upon horizontal shafts which hang in horizontal frames, pivoted to an upright post of the main frame. The drums are in line with each other, and serve to hold an endless band or belt, made of thin metal, with projecting lancet shaped cutters that are sharpened at one or both edges. The back ends of the frames are connected with each other by a rod, carrying a nut, and a spring or piece of rubber, under the nut. The nut and rod serve to hold the band tense, and the spring gives it the requisite degree of elasticity. A projecting arm carries a grooved wheel, in which the band is guided to prevent swinging. The platform on which the cloth is supported is of circular form, and is surrounded by an annular platform, which is, by wheels, supported on a lower projecting flange of the first named platform, so that it can be turned around. Both platforms are slotted to permit the removal and application of the band. The cloth to be cut is placed upon the first named platform and fed against the continuous cutter in the requisite direction; it then arrives in rear of the cutter, where it is, in part, supported by the ring platform, and can be readily be brought in front of the cutter by turning the ring. This avoids to a great extent, the labor of bodily carrying the cloth to the front, such labor being, at times, considerable when the cloth in its several thicknesses weighs one hundred pounds or more. At the sides of the cutter are fastened, to the supporting platform, small metal plates, which have a slight lateral play, being slotted where the fastening pins pass through them. These plates line the slot above mentioned in the platform just in line with the cutter, and yield slightly to the side whenever some cloth is dragged down into the slot by the cutter. They therefore prevent the clogging of the machine.

WATER WHEEL.—J. Bell, of Carrollton, Mo.—This is a vertical wheel, running in a vertical trunk or cylinder. The wheel consists of a shaft running on a suitable step. A spiral web passes down this shaft, the pitch of the web being varied according to the head. At proper intervals along this web, project from the web, buckets, the space underneath the buckets being filled up with wood. The water passes into the upper part of the trunk through inclined chutes and acts upon the buckets to turn the wheel.

WASHING MACHINE.—William Clark, of Prairie Du Chien, Wis.—This machine consists of a cylinder attached to the axle of a one horse cart, to one of the wheels of which is fixed a gear, meshing into a pinion upon a central shaft passing through the cylinder. This shaft actuates an endless wire netting which passes between rollers in the cylinder, and also the rollers, which may be plain or fluted. The clothes are put in so that the wire netting carries up the goods from suds previously put in, to and between the rollers, so that by driving the machine about, the clothes are alternately soaked in suds and squeezed between the rollers till cleansed. Then a plug being drawn out at the bottom of the cylinder the suds are drawn off, and the continued motion of the machine squeezes out the water, and thus wrings the clothes dry.

RANGE SETTING.—Andrew F. Barry, of New York city.—The inventor proposes to have a wide cast metal plate, as high as the wall of the room, with a cornice at the top, an opening at the front for the range, and a register above the range for setting the latter, instead of the heavy and cumbersome brickwork now used. The plate will fit snugly against the wall at the edges and at the back of the cornice, but between the edges and the opening for the range it will swell outward by graceful curves, to the extent that it is desired to inclose the range. The front may be lined or grooved to represent stone or brick, or it may be ornamented in any approved way, and may have eyebolts or staples projecting from it at either or both sides of the range, near the floor, for the attachment of a bracket, for the support of the range boiler. The edges of the opening for the range may be formed in any way to match the walls of the range where they meet, to be lapped and bolted or otherwise for making close joints. It is claimed that these improved range settings may be afforded cheaper than the brickwork, can be much more readily put in, and will be more ornamental.

DRAWING BOARD.—J. B. Franklin, of New York city.—This invention provides drawing boards with concealed metallic stays or braces, whereby they are prevented from warping, and retained smooth when shrinking. The difficulty to be overcome consists chiefly in the necessity of keeping metal away from the surface of the board in order to permit the application of drawing pins. The invention consists in interposing metallic strips or braces between the hardwood edge pieces and the board in the dovetail grooves at the ends of the board, and also in the use, for large boards, of central hardwood cross pieces, lined at the edges with L shaped strips of metal. These pieces are let in to the body of the board, and act to hold the board from warping, as a piece dovetailed into the board would do. The entire board has nothing but wood on both surfaces, and can, therefore be used on either side.

GLOVE FASTENER.—Monroe B. Foote, of Northampton, Mass.—This is a new and improved fastener for gloves, mittens, and the like, applicable also for shoes and other articles. The invention consists in a metal or other disk, with two eccentric grooves or slots extending from opposite points near the periphery to points near the center, in such a way as to draw studs attached to the parts of the glove or other article to be fastened one toward the other, and hold them when turned in one direction, and push them in the opposite direction when turned the other way. The disk is made detachable from one of the studs for opening the parts more widely when relieved of the strain by the turning of it.

BUTTON.—George W. Phillips, of Fresh Pond, New York.—This invention relates to improvements in the construction of buttons for sleeves, bosoms, or other articles of wearing apparel; and consists in a front piece, of porcelain, metal, or other substance, with a shank having one end screw threaded and the other split for attaching to the said front piece of porcelain or other substance by driving into a hole having two opposite sides under cut for spreading and clinching the split shank, the screw threaded end of which is for attaching the disk for the back part of the completed button to it, said disk having a screw threaded socketed shank for screwing on to it.

ANIMAL POKE.—Nicholas Denny, of Saranac, Mich.—The bow of this poke passes around the animal's neck. The journals of the roller work in sockets or holes in the arms of the bow, in such a position as to leave a suitable space for the animal's neck between its upper side and the top or bend of the bow. The tail or bar of the yoke is pivoted to the upper or forward part of the roller. To the bar is attached a curved plate, which is forked or branched to form prongs or prickers, which pass up in an inclined direction through holes in the roller, in such position that, should the animal press the bar against a fence or other object, the prongs or prickers will be forced out against his neck and thus stop him. A spring, one end of which is attached to the roller, and the other or free end of which rests against the inner side of the plate, is made of such strength as to support the bar when raised from the ground and keep its weight from forcing the prongs or prickers out against the animal's neck.

TREMOLO FOR ORGANS AND MELODEONS.—John R. Lomas, of New Haven, Conn., assignor to B. Shoninger, of same place.—This invention removes the strain from the shaft of the wind wheel, and overcomes the consequent friction and rattling noise produced when such wheel is connected with an oscillating wing or fan which acts as a tremolo for an organ or melodeon. The invention consists in the use of two wings or fans, which are connected with opposite cranks, and therefore vibrated in opposite directions, so that one will balance the other, thus keeping an even strain on the power applied, making it work with ease, without noise, and, it is claimed, producing a perfect tremolo and beautiful effect on the music.

CONSTRUCTION OF DIES FOR FORMING THE LIPS OF AUGER BITS.—Richard N. Watrous, of Elmira, N. Y., assignor to himself and W. W. Kellogg, of same place.—A block of steel suitable for the die required is so shaped at the striking surface as to constitute the die for forming the lip and head of an auger. Into the striking face of the die is bored a hole, preferably of slightly conical form, into which is inserted a steel pintle, of tapering form. At the end of the pintle is formed a pin or projection, which gives form to the inside of the lip or cut of the auger. A hole is bored into the opposite end of the die to permit the removal of the pintle by the insertion of a rod. The advantages of this arrangement are claimed to be manifold. The die and pintle can be tempered separately. The die, having to withstand the blow or pressure, must be very hard in order to be durable, while the pintle must have a spring temper to prevent breaking. Should the projecting pin break, which it is liable to do, a new pintle can be inserted without great cost, while heretofore the entire die would have to be made anew. Both dies of a pair are or may be provided with such removable pintles.

DRINKING FOUNTAIN FOR FOWLS.—John S. Orndorff, of Virginia City, Nevada.—A vessel with a cover, having a concentric series of holes, through which fowls may drink, but which prevents their getting into the water, has water placed therein, and in the center is inverted a vessel with a narrow mouth, previously filled with water. When the water in the first named vessel is exhausted, so that air can pass under the mouth of the inverted vessel, a portion of the water in the latter descends, and thus keeps up the supply.

MOLDBOARD FOR PLOWS.—George Peacock, Selma, Ala.—This invention has for its object to prevent soil from adhering to the moldboards of plows as they are drawn through it, and thus increasing their resistance to the draft animals, and necessitating frequent halts to enable the moldboards to be cleaned off. Supposing the cause of the adhering of soil to moldboards to be the formation of vacua between the earth and the clay by the great pressure of the one upon the other, the inventor has devised a mold board, having a corrugated, grooved, or ribbed exterior surface, and having also orifices made through it for the purpose of preventing the formation of such vacua.

WASHING MACHINE.—John Lawson, Humboldt, Kansas.—This invention relates to a cylindrical tub, supported in a horizontal position upon legs, the upper half of the tub being removable and serving as a cover, and the lower half being lined with a corrugated zinc plate, and a semi-cylindric rubber, also corrugated, being placed within the tub, supported upon an axis, and vibratory with respect to the corrugated bottom.

BEEFSTEAK MANGLE.—Dr. John Locke, Lewisburg, Pa.—This invention relates to a beef steak mangle, in which there are two serrated toothed cylinders placed side by side, between which the steak to be mangled is passed, the stays that support said cylinders not coming together at their outer ends, but being at an interval, which is opposite the space between the two cylinders, wide enough to permit part of the steak to pass through it when the whole cannot pass between the two cylinders.

TELLURIAN.—Joseph Troll, of Belleville, Ill.—This invention relates to improvements in tellurians, and consists in the arrangement of parts for illustrating the inclination of the earth's axis, for disengaging the lunar globe from the terrestrial, and in the apparatus as a whole, whereby is secured, by simple and inexpensive means, what has hitherto required complicated and costly ones. The operation of the parts composing the train results in imparting to the entire daily and monthly train a rotation in a vertical plane about the sun globe; and the obliquity of the moon's orbit is indicated. The axis of the earth globe is jointed, for the purpose of illustrating the inclination of the earth's axis upon the ecliptic, which causes the change of seasons on the earth. The whole daily and monthly trains move about the sun by means of an automatic motor—as watchwork—or by hand, which better adapts the application for use in both schools and lecture rooms; the axis of the earth is shown inclined; the horizon both fixed and movable; and the lunar globe may be easily thrown out of action when it is desired to illustrate the movement of the earth alone.

FISH HOOK HOLDER.—Levi Arnold, Belchertown, Mass.—This is an improvement in the mode of securing fish hooks to fish lines or holders, and consists in a grooved stem and ring slide, arranged to operate in connection. The line holder is of the form well known and in use. A stem is rigidly attached to the line or line holder. This stem is grooved to receive one or more hooks, and is made tapering or larger in diameter at its outer end than it is where it is joined to the line holder. At the end of the stem the groove or grooves are designed to be sufficiently deep to receive the stem or stems of the fish hooks. A sliding ring is placed on the stem. This ring is put on before the stem is attached to the line holder, its interior diameter being less than that of the outer end of the stem. When the ring is slipped back on to the small portion of the stem, the "flat" of the hook or hooks may be inserted within the ring, and then the ring and the hooks are slipped up until the ring comes in contact with the stem. In this position the "flat" prevents the hook from being withdrawn from the ring. A weight on the hook serves to tighten instead of loosen the slide.

SOLDERING APPARATUS.—Jacob Gulden, Keyport, N. J.—The can to be soldered is secured on a revolving plate, being held thereon by a spring presser foot, which also serves to hold in place the top which is to be soldered. The soldering iron is attached to a box or chamber in which a gas flame constantly maintains the necessary heat. The chamber and its attached soldering iron are held at a short distance from the work by suitable spring mechanism. The can being placed in position, the soldering iron is held down to the work by operating a foot treadle, and solder being placed at the point of contact, the revolving can is at once rapidly and neatly soldered.

BOOT STRETCHER.—J. Hoffman, Belvidere, N. J.—This instrument consists of a sole piece, from the heel of which rises an angular support, through the top of which descends a screw which presses upon the end of a lever having its fulcrum upon the upper surface of the sole piece. The end of the lever opposite the screw carries a metallic piece to stretch the leather when the lever is operated as described. There are two fulcrums upon the sole piece, one nearer the heel than the other, a short lever being put in the latter for stretching the instep. And also various lengths of levers may be used to stretch any particular part of the boot.

ICE ELEVATOR.—John J. Neuman, Middletown, Ohio.—This invention is an improvement in machinery for elevating ice from the water and delivering it to a chute or other conductor. It consists in an endless machine chain arranged on drums having perpendicular projections at suitable distances along it, one at each end of a strong frame, having bottom rails for the blocks of ice to draw up on and side rails to control it, which frame is connected at one end by hinges or hooks and eyes with the end of a chute or other conductor, and the other end is suspended in the water, so that the blocks of ice being floated against the chain will be caught by the projections, raised out of the water by the chain, and delivered to the chute, the chain being worked by suitable gearing applied to the upper drum.

BURIAL CASKETS.—J. Owen Moore, of Albany, N. Y.—This invention has for its object to make burial caskets or coffins which will not inclose or "box up" the corpse as long as the same is to be exposed, but will leave it entirely open to view from all sides, and which can be readily closed to form receptacles in which the corpse can be buried. The invention consists in hinging the sides and one of the ends of the coffin to the bottom of the same, and in hinging the cover to the sides, so that sides, ends, and cover can be let down to about a level with or below the bottom to fully expose the corpse in the latter. The corpse will then appear as lying on a sort of ornamental couch, producing thereby an effect far less gloomy and depressing than when partly boxed up ready for the grave. When the coffin is to be closed the sides and ends are swung up and the cover folded off the sides, suitable catches being used to hold the parts together. The disagreeable process of securing the lid down by means of screws is thus also avoided. One end of the casket may be rigidly affixed to the bottom so that it will remain in an upright position to support the grillon.

FARMER'S BOILER OR CALDRON.—This is a combination of a large kettle or caldron with a furnace and jacket for heating, so arranged that the caldron can be easily dumped, when it is desired to remove its contents. The furnace is provided at the upper end with a jacket which directs the heated gases and flame from the firebox up around the kettle, so as to effectively heat its contents. A portion of this jacket is made so that it slides backward out of the way when the kettle is to be dumped. The kettle is hung on trunnions, from which descend arms which engage the sliding part of the jacket when the kettle is turned upon the trunnions, and thus push this portion of the jacket downward and backward out of the way. The kettle is provided with a cover, having a spout and strainer. This is a good practical improvement which adds much to the convenience of such apparatus. George H. Buckley, of Quincy, Ill., is the inventor.

MACHINE FOR POINTING HORSE SHOE NAILS.—Harry A. Willis, of Vergennes, Vt.—An intermittingly rotating carrying, holding, and delivering disk, of metal, with notches in the periphery, works on a horizontal axis in front of a set of four hammering dies, under a guard, and behind a guard. This disk is geared with a vertical shaft extending downward, and having a ratchet wheel on the lower end, with which a pawl works to impart one movement to the disk for each revolution of the driving shaft by which the pawl is worked through the medium of a lever and tappet. The nails, being previously roughly shaped, are put in the notches under one guard, and pointing toward the hammers by hand, or any competent feeding mechanism; so that the heads will pass in front of the other guard, by which guards they are so confined in the notches as to be readily carried to the hammers and held for being acted on by them. The hammers are operated by a tappet wheel, whereon the tappets are so arranged that the hammers will be at rest, both when the nail is being carried to the position for being acted on by them, and when being carried away. After being hammered on the sides and edges, the nails are carried down and delivered into slots in a horizontally and intermittingly revolving disk on the vertical shaft, working over another fixed disk, said slots being suitably shaped to receive the heads of the nails at the inner ends, while the points project beyond the disk as much or a little more than the distance from the point it is required to hammer them. These slots are arranged relatively to the notches of the previous disks, and the two disks are so geared together that a slot will always be ready to receive a nail from the first disk as soon as the nail passes beyond the guards and falls out. This disk, working intermittently, carries the nails first over an anvil, where they are hammered by a die, and then over a pointing die, through which they are forced by a punch, by which and the said die, the edges are trimmed off, and the nails are then discharged.

MACHINE FOR THE MANUFACTURE OF SOLDER, PRINTERS' LEADS, ETC.—Reuben Painter, Baltimore, Md.—This invention relates to a machine in which metals for the manufacture of solders, printers' leads, etc., are melted and stirred together while melting, and are drawn off from the melting pot through a tube having an adjustable feed apparatus, from which the compound is drawn off into circumferential grooves in a revolving wheel, within which grooves the compound is pressed by a flanged roller above, and also cooled by means of cold water introduced within an annular closed box cast in the rim of the wheel next to the grooves therein, the compound being sent out of the grooves by means of spring scrapers fitting in the latter, and passed through a cutting apparatus, wherein it is divided into pieces of suitable length, being then a marketable commodity.

WOODEN PAVEMENT.—James F. Gyles, Chicago, Ill.—This invention relates to a pavement whose foundation consists of boards or planks laid at intervals of an inch, more or less, crosswise of the street upon the ordinary sand bed, and whose rows of blocks are also laid crosswise of the street upon the board foundation directly above the intervals thereof, each row of blocks being furnished with a longitudinal rib, running centrally of one side, and armed with projecting nails which extend into the ribless side of the next row of blocks, when the latter are driven up against the aforesaid rib by which construction there are created two longitudinal spaces between every two adjacent rows of blocks, of which spaces the upper is to be filled with a novel concrete of Mr. Gyles' invention, and the lower is to be left open for drainage into the gutters at the sides of the streets.

ELECTRIC INSTRUMENT.—L. L. Dnerden, of Brooklyn, N. Y.—This instrument may either be used as a toy for children or as a sounding instrument for telegraphing. By a suitable arrangement of parts, an armature may be caused to vibrate without interruption when the proper cups are attached to the battery. By another mode of connecting the wires, however, the armature may be made to vibrate or strike at the desired intervals for transmitting messages. An arm carrying a hammer projects upward from the armature, which, striking against a sonorous body of any suitable character, gives the required sound. The armature tilts on its point of contact with the surface of the magnet, and has no lateral pivot as heretofore used. The friction of the pivots is thus avoided, the magnet moving on a spring support and moving easily on account of the flexibility of the spring.

BLOWER FOR CHIMNEY STACK.—Nathaniel L. Blanchard, of Spuyten Duyvil, New York.—The shaft of a fan blower is supported by the chimney or casing, and is placed one side of the center, or in a position where the wings just clear the cylinder on one side, and leave a broad opening on the other side. As the wings revolve, there is a constantly increasing current of the smoke and gases, the strength of which depends on the velocity with which the blower is revolved. The blower is driven by a belt from any convenient portion of the revolving machinery. The inventor states that his experience has taught him that it is more advantageous to draw the smoke and gases from the fire box through the boiler flues than to force or push them, as is usually done; and that the simple fan blower, when properly arranged, answers the purpose admirably.

ICE PICK.—William T. Eames, of New York city, assignor to Leonard J. Hass, of same place.—This is an instrument for picking and breaking ice. It consists in a breaking and picking instrument composed of a hammer head with a steel point or pick at one end, and a handle with a socket containing a pointed steel instrument for driving into the ice by the hammer. This pointed instrument is adapted to be held in the hand, for driving into the ice by the hammer in such parts as cannot be reached by the pick; for instance, a piece of ice being dropped into the mouth of a pitcher, and having projections low down in the contracted part of the vessel requiring to be chipped off to admit the piece, and that cannot be reached by the point, may have them chipped off by the pointed instrument driven by the hammer. It is also desirable to employ the instrument in any case, as it will not cause small pieces to fly off as much as the pick, which cannot be guarded with sufficient accuracy, at each blow, to prevent chipping off the wall of the hole formerly made. As the tool is intended for use on the table, these considerations are important, and make the instrument more desirable than those having only the pick point.

BELLOWS.—Alfred F. Jones, New York city.—The object of this invention is to obtain an air and watertight top and bottom for bellows or similar instruments, and airtight joints at their edges. For this purpose the inner face and edge of the wooden top and bottom are lined with sheet metal, and form a projecting metallic flange at the edge. The metal lining effectually closes the pores of the wood, making it water and airtight, while the projecting flange admits of such an attachment of the flexible sides that an airtight joint will be produced.

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118,422.—SPINDLE, ETC.—C. L. Austin, Lawrence, Mass.
118,423.—PAPER CUTTER.—W. G. Ayres, S. L. Cole, Brookl'n, N. Y
118,424.—BEDSTEAD.—E. T. Barlow, San Francisco, Cal.
118,425.—FURNITURE.—B. B. Blackwell, Jamaica, N. Y.
118,426.—CORD.—A. Boardman, Lancaster, Pa.
118,427.—BLEACHING.—H. B. Bond, Terrebonne, La.
118,428.—RETAINER.—W. D. Brewer, Charlestown, Mass.
118,429.—SPIKE MACHINE.—F. Bruso, Buffalo, N. Y.
118,430.—RAKE.—J. V. Bryson, Greenupsburg, Ky.
118,431.—CLOTHES WRINGER.—P. H. Capron, Hudson, N. Y
118,432.—HEATER.—E. Caulfield, Oswego, N. Y.
118,433.—BRACKET.—J. E. Chesley, Boston, Mass.
118,434.—PEN CASE, ETC.—J. M. Clark, Jersey City, N. J.
118,435.—DOLL.—G. P. Clarke, New York city.
118,436.—COUPLING.—C. M. Colby, Corinth, Vt.
118,437.—DRESSING ORES.—C. F. Collom, Calstock, England.
118,438.—BARREL, ETC.—J. B. Davenport, New York city.
118,439.—PRINTER'S RULE.—A. J. H. Duganne, New York city.
118,440.—SOAP.—R. Eastman, Media, Pa.
118,441.—TOY.—J Fallows, Philadelphia, Pa.
118,442.—BOILER.—B. T. Fellows, Lancaster, Pa.
118,443.—BRAKE.—A. W. Filer, L. T. Hatfield, Danby, Ill.
118,444.—BOOT.—C. S. Foster, Ashland, and O. Saylor, Phil., Pa.
118,445.—MUSICAL INSTRUMENT.—J. Foster, Keene, N. H.
118,446.—LOOM.—H. R. Fry, Wabash, Ind.
118,447.—HOIST.—E. R. Gard, Chicago, Ill.
118,448.—SAWING MACHINE.—L. W. Green, Williamsport, Pa.
118,449.—GROOMING HORSES.—J. J. Greenough, Syracuse, N. Y.
118,450.—SEWING MACHINE.—W. O. Grover, Boston, Mass.
118,451.—STAND.—E. A. Harris, Chicago, Ill.
118,452.—SEAT.—B. Hershey, Erie, Pa.
118,453.—BOX OPENER, ETC.—G. J. Hill, Buffalo, N. Y.
118,454.—WINDOW BLIND.—I. H. Hobbs, Philadelphia, Pa.
118,455.—ROTARY PUMP.—C. E. Hutson, St. Louis, Mo.
118,456.—WATCH KEY, ETC.—J. Jenner, Chicopee Falls, Mass

118,457.—STEAM BOILER.—W. R. Jones, Cambridge, Mass.
118,458.—SHIP.—H. Jordan, Liverpool, Eng.
118,459.—HYDROCARBON GAS.—J. Kidd, New York city.
118,460.—LOG CART.—A. Kirkwood, Jackson county, Miss.
118,461.—FENCE.—H. H. Landis, Lancaster, Pa.
118,462.—CULINARY VESSEL.—S. Lee, Taunton, Mass.
118,463.—STEAM ENGINE.—C. Levy, Toronto, Canada.
118,464.—IMITATION CARVING.—G. W. Ley, Croydon, Eng.
118,465.—BRAKE.—G. W. Loomis, Torrington, Conn.
118,466.—MOLDING.—J. S. Loomis, Brooklyn, N.Y.
118,467.—THREAD CUTTER.—J. A. Lord, Sanford, Me.
118,468.—ELEVATOR.—J. Macomb, Chicago, Ill.
118,469.—STUD.—R. H. McCann, Zanesville, Ohio.
118,470.—CALK.—J. J. Mervesp, New York city.
118,471.—PAVEMENT.—D. H. Mulford, Saratoga Springs, N.Y.
118,472.—GAS.—P. Munzinger, Philadelphia, Pa.
118,473.—PADLOCK.—H. Nelsen, Jerome, N.Y.
118,474.—COUPLING.—J. Ochsner, New Brighton, Pa.
118,475.—JACK.—A. V. Ojeda, San Francisco, Cal.
118,476.—COUPLING.—J. H. Oliver, Baltimore, Md.
118,477.—STONE.—A. Ott, New York city.
118,478.—WASH STAND.—D.O. Parker, Liverpool, Nova Scotia.
118,479.—CHAIR, ETC.—D. O. Parker, Liverpool, Nova Scotia
118,480.—CHAIR.—D. O. Parker, Liverpool, Canada.
118,481.—FEEDING WIRE.—E. G. Parkhurst, Hartford, Conn..
118,482.—GRINDER.—J. Pedder, G. Abel, Temperanceville, Pa.
118,483.—HERNIAL PAD.—W. Pomeroy, New York city.
118,484.—DENTAL PLATE.—S. Purvine, H. Smith, Salem, Oreg.
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118,667.—CONSTRUCTION TRAIN.—H. Baines, Toronto, Canada.

REISSUES.

4,528.—EVAPORATING PAN.—F. G. Butler, Bellow's Falls, Vt.—Patent No. 112,319, dated March 7, 1871.
4,529.—RUBBER, ETC.—A. Charles, Pittsburgh, Pa.—Patent No. 13,258, dated April 4, 1871.
4,530.—STOVE.—Eddy, Corse & Co., Troy, N. Y.—Patent No. 35,564, dated June 10, 1862; reissue No. 2,709, dated July 30, 1867.
4,531.—EVAPORATING, ETC.—T. W. Johnson, Jr., A. W. Goodell, Windsor, Nova Scotia.—Patent No. 108,793, dated November 1, 1870.
4,532.—TELEGRAPH.—G. Little, Rutherford Park, N. J.—Patent No. 108,496, dated October 18, 1870.
4,533.—PLOW.—J. C. Pfeil, Arenzville, Ill.—Patent No. 76,343, dated April 7, 1868.
4,534.—BUFFING LEATHER, ETC.—A. W. Pratt, Salem, Mass.—Patent No. 89,789, dated May 4, 1869.
4,535.—GENERATOR.—R. E. Rogers, J. Black, Phila., Pa.—Patent No. 65,281, dated May 28, 1867.
4,536.—SUGAR.—M. L. Senderling, Jersey City, N. J.—Patent No. 60,797, dated January 1, 1867.
4,537.—Division A.—EDGE TOOLS, ETC.—The Collins Company, Collinsville, Conn.—Patent No. 30,668, dated Nov. 20, 1860.
4,538.—Division B.—EDGE TOOLS, ETC.—The Collins Company, Collinsville, Conn.—Patent No. 30,668, dated Nov. 20, 1860.
4,539.—WATER WHEEL.—J. Tyler, West Lebanon, N. H.—Patent No. 15,309, dated July 8, 1856; reissue No. 3,015, dated June 30, 1868; extended seven years.
4,540.—STOVE.—G. W. Walker, Malden, Mass.—Patent No. 108,852, dated November 1, 1870.

DESIGNS.

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5,236.—BADGE.—N. Joseph, San Francisco, Cal.
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5,238.—CUSHION, ETC.—J. Kuhlmann, Cincinnati, Ohio.
5,239.—BIRD CAGE.—O. Lindemann, New York city.
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The Intersection and Development of Surfaces, with Applications.—The Intersections of Cylinders and Cones, Plate XIV. The Delineation and Development of Helices, Screws, and Serpentines, Plate XV. Application of the helix—the construction of a staircase, Plate XVI. The intersection of surfaces—applications to stopcocks, Plate XVII. Rules and Practical Data—Steam, unity of heat, heating surface, calculation of the dimensions of boilers, dimensions of fire grates, chimneys, safety valves.

The Study and Construction of Toothed Gear.—Involute, cycloid, and epicycloid, Plates XVIII. and XIX. Involute, Fig. 1, Plate XVIII. Cycloid, Fig. 2, Plate XVIII. External epicycloid, described by a circle rolling about a fixed circle, inside it, Fig. 3, Plate XIX. Internal epicycloid, Fig. 2, Plate XIX. Delineation of a rack and pinion in gear, Fig. 4, Plate XVIII. Gearing of a worm, with a worm-wheel, Figs. 5 and 6, Plate XVIII. Cylinder or Spur Gearing, Plate XIX. Practical delineation of a couple of Spur wheels, Plate XX. The Delineation and Construction of Wooden Patterns for Toothed Wheels, Plate XXI. Rules and Practical Data—Toothed gearing, angular and circumferential velocity of wheels, dimensions of gearing, thickness of the teeth, pitch of the teeth, dimensions of the web, number and dimensions of the arms, wooden patterns.

Continuation of the Study of Toothed Gear.—Design for a pair of bevel wheels in gear, Plate XXII. Construction of wooden patterns for a pair of bevel wheels, Plate XXIII. Involute and helical teeth, Plate XXIV. Contrivances for obtaining differential movements—The delineation of eccentrics and cams, Plate XXV. Rules and Practical Data. Mechanical work of effect, the simple machines, center of gravity, on estimating the power of prime movers, calculation for the brake, the fall of bodies, momentum, central forces.

Elementary Principles of Shadows.—Shadows of Prisms, Pyramids, and Cylinders, Plate XXVI. Principles of Shading, Plate XXVII. Continuation of the Study of Shadows, Plate XXVIII. Tuscan Order, Plate XXIX. Rules and Practical Data—Pumps, hydrostatic principles, forcing pumps, lifting and forcing pumps, the hydrostatic press, hydrostatical calculations and data, discharge of water through different orifices, gaging of a water course of uniform section and fall, velocity of the bottom of water courses, calculations of the discharge of water through rectangular orifices of narrow edges, calculation of the discharge of water through overshot outlets, to determine the width of an overshot outlet, to determine the depth of the outlet, outlet with a spout or duct.

Applications of Shadows to Toothed Gear, Plate XXX. Application of Shadows to Screws, Plate XXXI. Application of Shadows to a Boiler and its Furnace, Plate XXXII. Shading in black. Shading in Colors, Plate XXXIII.

The Cutting and Shaping of Masonry, Plate XXXIV. Rules and Practical Data—Hydraulic motors, undershot water wheels, with plane floats and a circular channel, width, diameter, velocity, number, and capacity of the buckets, useful effect of the water wheel, overshot water wheels, water wheels with radical floats, water wheels with curved buckets, turbines. Remarks on Machine Tools.

The Study of Machinery and Sketching.—Various applications and combinations. The Sketching of Machinery, Plates XXXV and XXXVI. Drilling Machines; Motive Machines; Water Wheels—Construction and setting-up of water wheels, delineation of water wheels, design of a water wheel, sketch of a water wheel; Overshot Water Wheels, Water Pumps, Plate XXXVII. Steam Motors; High-pressure Expansive Steam Engine, Plates XXXVIII., XXXIX., and XL. Details for construction; Movements of the Distribution and Expansion Valves. Rules and Practical Data—Steam engines; Low-pressure condensing engines without expansion valve, diameter of piston, velocities, steam pipes and passages, air pipe and condenser, cold-water and feed pumps, high-pressure expansive engines, medium pressure condensing and expansive steam-engine, conical pendulum or centrifugal governor.

Oblique Projections.—Application of rules to the delineation of an oscillating cylinder; Plate XLI.

Parallel Perspective.—Principles and applications, Plate XLII.

True Perspective.—Elementary principles, Plate XLIII. Applications—flour mill driven by belts, Plates XLIV and XLV. Description of the mill, representation of the mill in perspective, notes of recent improvements in flour mills, Schiele's mill, Mullin's "ring millstone," Barnett's millstone, Hastie's arrangement for driving mill, Currie's improvements in millstones. Rules and Practical Data—Work performed by various machines, flour mills, saw mills, veneer sawing machines, circular saws.

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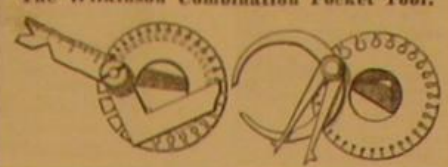

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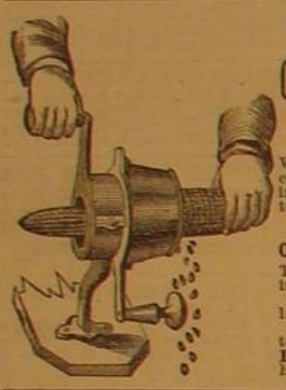

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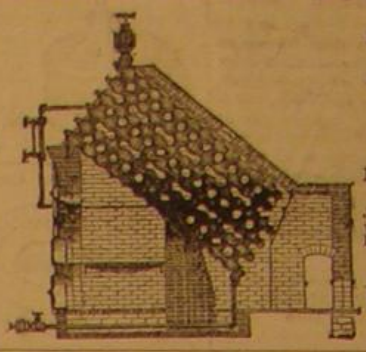

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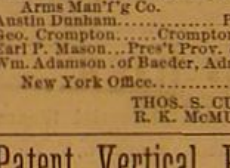

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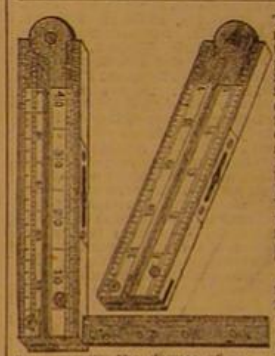

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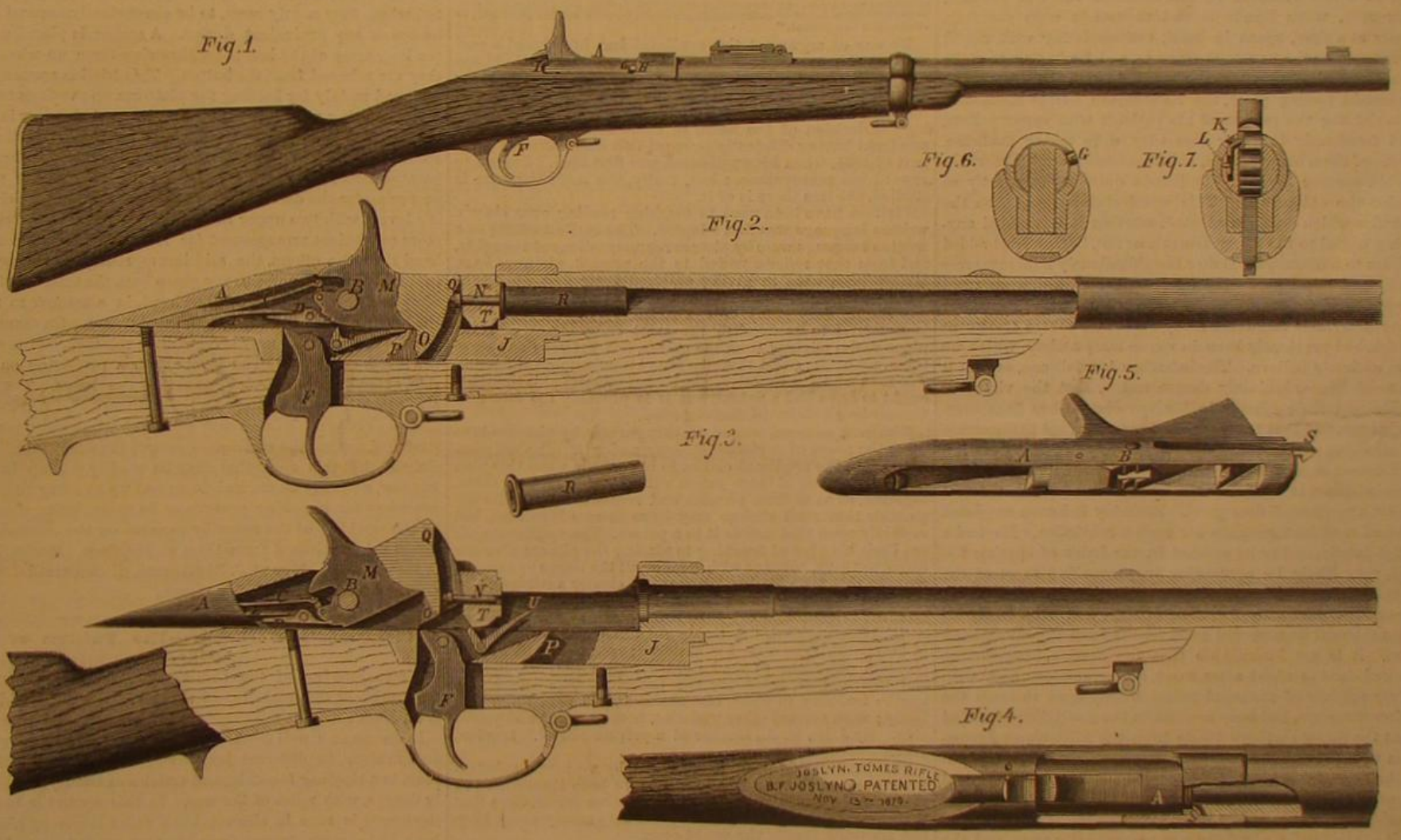
Vol. XXV.--No. 12. [NEW SERIES.] NEW YORK, SEPTEMBER 16, 1871. $3 per Annum. [IN ADVANCE.]

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 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 JOSLYN TOMES BREECH LOADING RIFLE.

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 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 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 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.

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 Malden 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 invention 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 operation. 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 83 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.

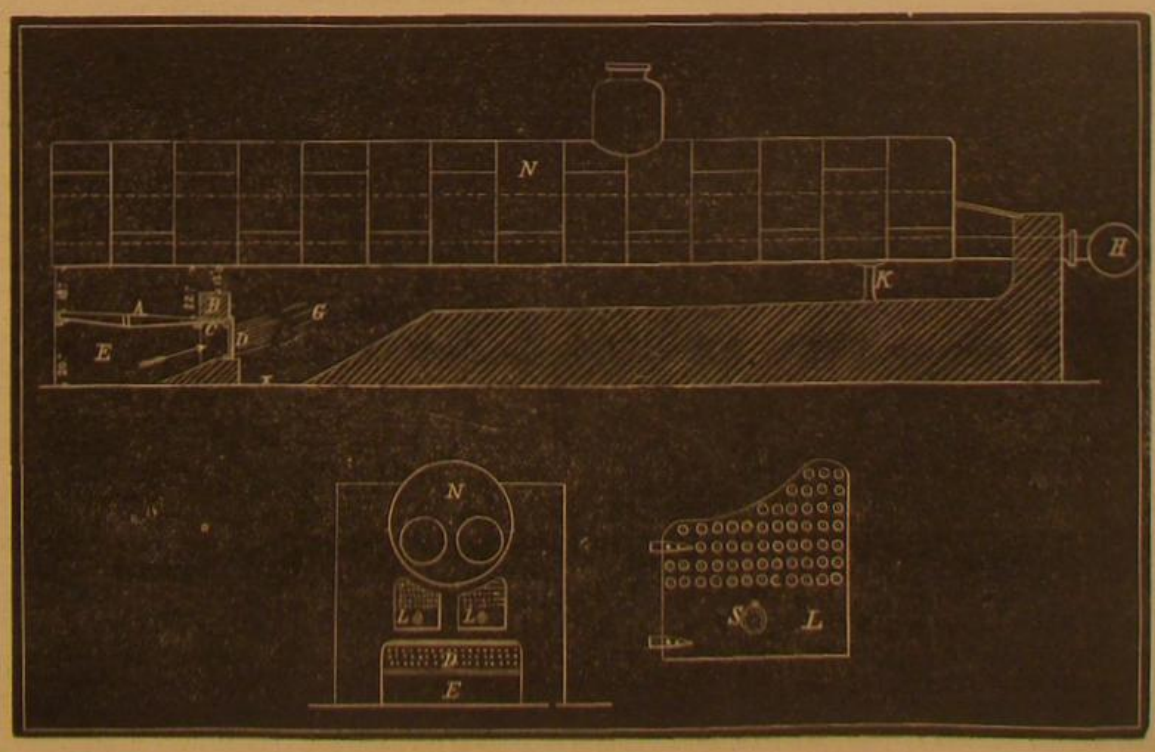
The Editors are not responsible for the opinions expressed by their Correspondents.

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.



CONSTRUCTION OF BOILER FURNACES.

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.

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 safoet 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 electro-motors, 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 £10.

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 5½ pounds of water: 5½ pounds of campeachy, extract of 6° Baumé; 1 pound 2 ounces of green vitriol, and 8¾ 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 exceeedingly 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

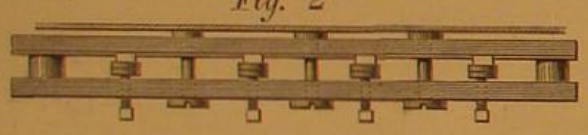


Fig. 3

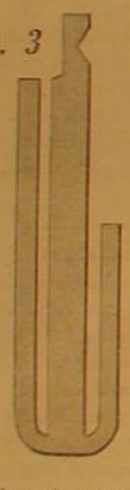


Fig. 4

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

A PIANO WITHOUT STRINGS.

has not yet had time to become generally known. For further information address the inventors as above.

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

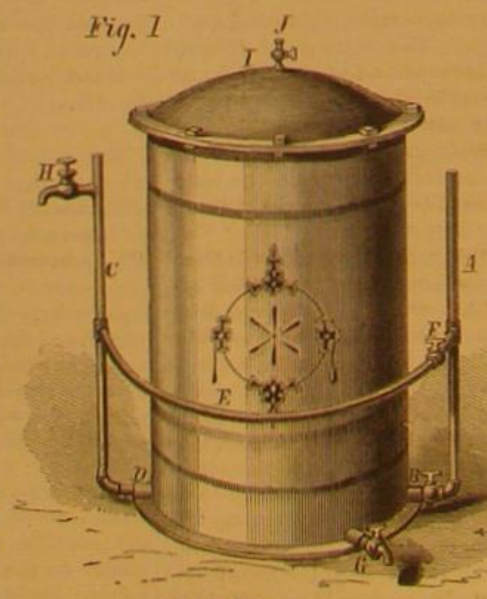
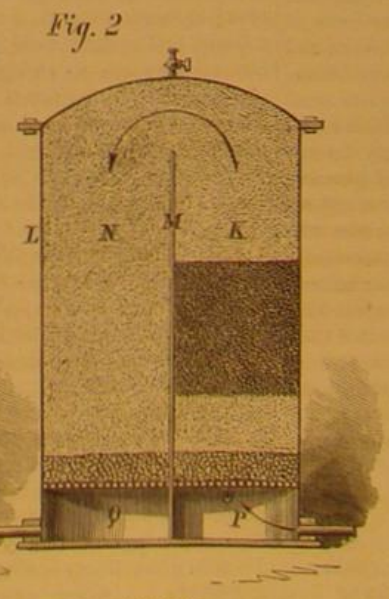


Fig. 2



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.

Scientific American.

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NEW YORK, SATURDAY, SEPTEMBER 16, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

A Clergyman's Workshop 176
American Institute Fair 185
A New Apparatus for Manufacturing Gas 181
Answers to Correspondents 186
*A Piano without strings 182
Apparatus for distilling Turpentine 181
Black Luster Color 181
Boiler Explosions 183
Business and Personal 186
Coating Metals with Nickel 177
*Construction of Boiler Furnaces 179
Does the Internal Administration of Drugs ever Defeat Disease and Death? 176
Drinking Water 177
Dr. Thomas Schnebly 185
"Explosive" Errors 180
Extraction of Gold from Tailings 180
Fermented Milk 176
Fire Escapes 176
Fire Proof Floors 181
Greenland 182
Gun Cotton 177
How to See under Water 181
*Improved Water Filter 182
Industrial Association of Georgia 185
Inventions Patented in England by Americans 186
Iron *versus* Lead Pipes 177
Jonathan Dennis, Jr.'s Appeal 176
Light for Photographers 185
Louisiana State Fair 185
Mississippi State Fair 185
Narrow Gage Nonsense 183
Occasional Notes 185
Official List of Patents 188
On Certain Habits in Modern Civilization 184
Pharmacy in Prussia 184
Post Office Stamps 181
Protecting Telegraph Lines from Lightning 177
Queries 187
Recent American and Foreign Patents 187
Rejected Correspondence 186
Rocks Polished by Sand 177
Scientific Intelligence 185
Steam Boiler Explosions 179
*The Fog Bow, as seen from the Matterhorn 178
The Introduction of India Rubber Shoes 184
*The Joslyn Tomes Breech Loading Rifle 175
The Labor Problem 184
The Latest Phase of Darwinian Controversy 181
The Mont Cenis Tunnel 177
The New York Iron Founders' Grievance 186
The Paine Electro Motor 180
Veneering 181
Vitality and Strength 180
Watch Case Springs 181
Who Wants to Enjoy Good Health, etc.? 177

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		
473 tuns of rails, 30 pounds per yard, at $70	3,325	3,325		
491 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 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 $\frac{1}{1500}$ 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, 1871.

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 of 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, 468 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 Woodworking 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 tant; 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

$$P \div B = b \div p$$

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

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

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 of 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., of 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 300,000 sheets will be but one inch in thickness; silver and platina can be worked considerably thinner than 4,000 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 ¼ 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. R.

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 Mansel, 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. Walt, 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.

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118,668.—TREATING FIBERS.—W. Adamson, Philadelphia, Pa.
118,669.—GAS LIGHTER.—M. Andrew, New York city.
118,670.—SEALING CANS.—H. M. Anthony, Providence, R. I.
118,671.—SEWING MACHINE.—M. E. Antrim, Philadelphia, Pa.
118,672.—GRAIN MILL.—E. H. Austin, Scott's Hill, Tenn.
118,673.—MOWER.—J. C. Baker, Mechanicsburg, Ohio.
118,674.—FURNACE.—W. Baynton, Pottsville, Pa.
118,675.—KNIFE HANDLE.—C. Peckham, Alexandria, Va.
118,676.—THROTTLE VALVE.—W. Bellis, Indianapolis, Ind.
118,677.—BED LOUNGE.—A. F. Benten, San Francisco, Cal.
118,678.—CARRIAGE JACK, ETC.—N. Berkeley, Aldie, Va.
118,679.—FEED REGULATOR.—R. Berryman, Hartford, Conn.
118,680.—PROTECTING LIME.—H. Bisbing, Bridgeton, N. J.
118,681.—EARTH CABINET.—W. H. Bliss, Newport, R. I.
118,682.—SHAFT.—C. and D. Bock, Drum's, Pa.
118,683.—SPECULUM.—J. D. Bruce, Newbury, S. C.
118,684.—LOCK NUT.—A. W. Bunnell, Linesville, Pa.
118,685.—LOCK NUT.—A. W. Bunnell, Linesville, Pa.
118,686.—MEDICINE.—G. W. Chambers, Talladega, Ala.
118,687.—CHURN.—J. W. Chapman, Madison, Ind.
118,688.—JOURNAL BOX.—P. P. Child, St. Louis, Mo.
118,689.—ICE SHAVER.—C. C. Clawson, Raleigh, N. C.
118,690.—SHEARS.—W. F. and G. H. Clemmer, Alexandria, O.
118,691.—LUBRICATOR.—E. Collins, New York city.
118,692.—STEAM ENGINE.—J. M. Cooper, Pittsburgh, Pa.
118,693.—CASTING CYLINDERS.—H. W. Cornell, Owego, N.Y.
118,694.—WHEEL PLOW.—R. Coreth, New Braunfels, Texas.
118,695.—VELOCIPEDE.—J. A. Crandall, Brooklyn, N. Y.
118,696.—ELEVATOR.—H. H. Day, Bloomingdale, N. J.
118,697.—LOG BINDER.—W. L. Dean, Dayton, N. Y.
118,698.—CLOTHES POLE.—J. and W. Denton, Amsterdam, N.Y.
118,699.—CANAL.—W. H. Doane, Cincinnati, Ohio.
118,700.—FIRE KINDLING.—L. Dodge, Waterford, N. Y.
118,701.—AXLE BOX.—D. H. Dotterer, Philadelphia, Pa.
118,702.—GENERATOR.—R. W. Dugan, Covington, Ky., and B. F. Clark, Cairo, Ill.
118,703.—BEARING, ETC.—E. Dummer, Newbury, Mass.
118,704.—HUB.—J. Dump, Kingston, Ohio.
118,705.—LUBRICATOR.—L. Fagin, Cincinnati, Ohio.
118,706.—LINIMENT.—G. H. Fairchild, St. Louis, Mo.
118,707.—GRADING MACHINE.—J. W. Fawkes, Maroa, Ill.
118,708.—WATER WHEEL.—D. A. Flummerfelt, Bridgeville, N.J.
118,709.—GAS PUMP.—W. Foster, Brooklyn, N. Y.
118,710.—COFFEE CLEANER, ETC.—R. Frisby, Cleveland, Ohio.
118,711.—SPARK ARRESTER.—M. A. Glynn, Matanzas, Cuba.
118,712.—CHURN.—E. Groat, Napa, Cal.
118,713.—CHURN.—E. Groat, Napa, Cal.
118,714.—MEDICINE.—B. Gutierrez, Santa Barbara, Cal.
118,715.—STOP VALVE.—W. Haas, New York city.
118,716.—SEED DROPPER, ETC.—E. P. Harnish, Felton, Del.
118,717.—HOLDER.—S. Harwood, F. L. Ames, Albany, N. Y.
118,718.—EVAPORATOR.—M. P. Hayes, Seaforth, Canada.
118,719.—RECLINING CHAIR.—W. Heath, Bath, Me.
118,720.—CUTTER.—W. L. Heberling, Mt. Pleasant, Ohio.
118,721.—MOUSE TRAP.—C. A. Hotchkiss, Bridgeport, Conn.
118,722.—CONNECTING JOINT, ETC.—L. Hull, Charlestown, Ms.
118,723.—MOVEMENT.—J. J. Kimball, Naperville, Ill.
118,724.—BUCKLE.—W. W. Kittleman, Bloomfield, Iowa.
118,725.—CURTAIN FIXTURE.—A. H. Knapp, Newton Center, Ms.
118,726.—HAY RAKE.—C. Kugler, Barnesville, Ohio.
118,727.—EGG BEATER.—E. B. Kunkle, Fort Wayne, Ind.
118,728.—SEWING MACHINE.—T. Lamb, Phila., Pa.
118,729.—SHACKLE.—L. M. Lawless, Genesco, Ill.
118,730.—WEATHER STRIP.—L. M. Lawless, Geneseo, Ill.
118,731.—WATER WHEEL.—A. C. Lesner, Fonda, N. Y.
118,732.—MILLING MACHINE.—W. A. N. Long, Worcester, Mass.
118,733.—BOOT SOLE.—J. Luttenchlager, New York city.
118,734.—INJECTOR.—W. B. Mack, Manchester, England.
118,735.—GENERATOR.—J. Mann, Tuscola, Ill.
118,736.—BENDING WOOD.—A. F. Marshall, Black River, N.Y.
118,737.—DETECTOR.—G. B. Massey, New York city.
118,738.—COATING CASKS, ETC.—C. P. Matthews, Grantham, Eng.
118,739.—MAKING CIGARS.—E. A. Metz, Cincinnati, Ohio.
118,740.—LIFTING MACHINE.—F. B. O'Connor, New York city.
118,741.—RAISING VESSELS.—M Osborn, Cleveland, Ohio.
118,742.—COUPLING.—A. V. Pitts, Chicago, Ill.
118,743.—ATTACHING BUTTONS.—W. S. Pratt, Waterbury, G. J. Capewell, Cheshire, Conn.
118,744.—NAIL MACHINE.—H. Reese, Baltimore, Md.
118,745.—BED BOTTOM.—G. Richardson, Milwaukee, Wis.
118,746.—PRESERVING HIDES, ETC.—A. Rock, New Orleans, La.
118,747.—FLY TRAP.—F. L. Rosentreter, Des Moines, Iowa.
118,748.—MITER BOX.—M. O. Royce, East Cambridge, Mass.
118,749.—CLOD CRUSHER.—J. Schlosser, Piqua, Ohio.
118,750.—BATH.—G. Scholl, New Philadelphia, Ohio.
118,751.—TORCH.—I. W. Shaler, Brooklyn, N. Y.
118,752.—FIRE ARM.—C. Sharps, Philadelphia, Pa.
118,753.—PICK HOLDER.—J. P. Sinclair, Mottville, N. Y.
118,754.—PLANING MACHINE.—L. T. Smart, Center Ossipee, N.H.
118,755.—FLUID METER.—D. B. Spooner, Syracuse, N.Y.
118,756.—COTTON PRESS.—J. Templeton, Florence, Ga.
118,757.—PAPER FILE.—E. H. Thompson, Washington, D. C.
118,758.—PLOW.—I. P. Tice, New York city.
118,759.—SEWING MACHINE.—E. J. Toof, Fort Madison, Iowa.
118,760.—AXLE.—A. B. Tripler, New Orleans, La.
118,761.—PULLEY.—M. Ward, Mount Carmel, Pa.
118,762.—GRATE.—R. F. Weller, Albany, N.Y.
118,763.—SPINDLE.—A. A. Westcott, North Scituate, R. I.
118,764.—STEAM ENGINE.—J. Wheelock, Worcester, Mass.
118,765.—DESK, ETC.—J. F. Whiting, E. Fisher, Eaton, Ohio.
118,766.—MEDICINE.—A. Whitney, Boston, Mass.
118,767.—RAG CUTTER.—E. Wilkinson, Paterson, N. J.
118,768.—PACKING CAN.—G. F. Wilson, Providence, R. I.
118,769.—PLOW.—L. S. Wilson, Wabash, Ind.
118,770.—AXLE.—S. A. Wing, I. G. Johnson, Greenfield, N. Y.
118,771.—STOVE.—H. E. Wolcott, Elbridge, N.Y.
118,772.—FISHING LINE.—H. Camp, Covington, Ga.
118,773.—DESK.—T. A. Galt, G. S. Tracy, Sterling, Ill.
118,774.—WASHING MACHINE.—J. W. James, J. Streit, Centertown, Mo.
118,775.—REIN HOLDER.—H. D. Page, Morenci, Mich.
118,776.—FORCING FLUIDS.—T. W. Malone, Mason City, W.Va.

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.

DESIGNS.

5,251.—WAGON SEAT.—P. P. Child, St. Louis, Mo.
5,252.—NAIL HEAD.—H. L. Judd, Brooklyn, N.Y.
5,253.—BURIAL CASKET.—W. F. Lane, Boston, Mass.
5,254 and 5,255.—BIRD CAGE.—G. R. Osborn, B. A. Drayton, New York city.

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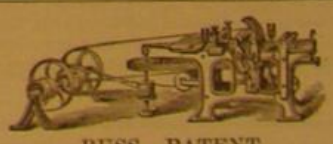

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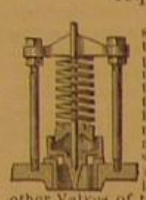

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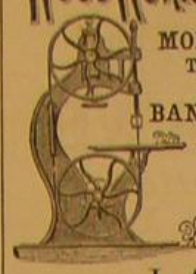

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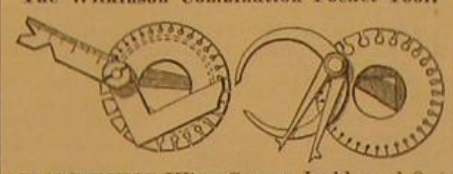

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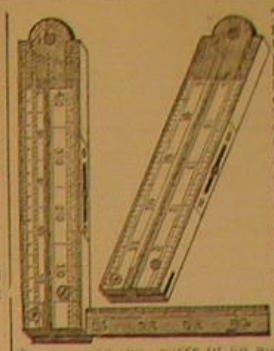

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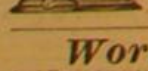

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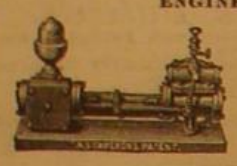

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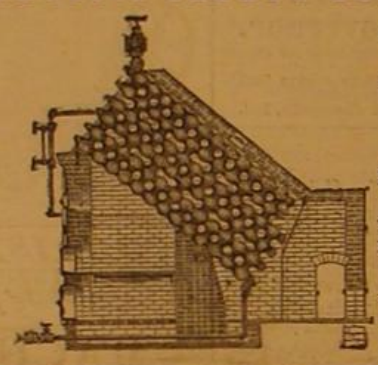

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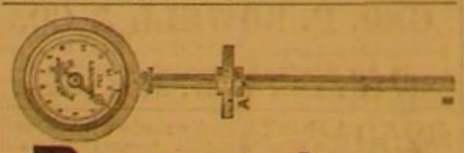

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