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Magazine Breech Loading Gun.

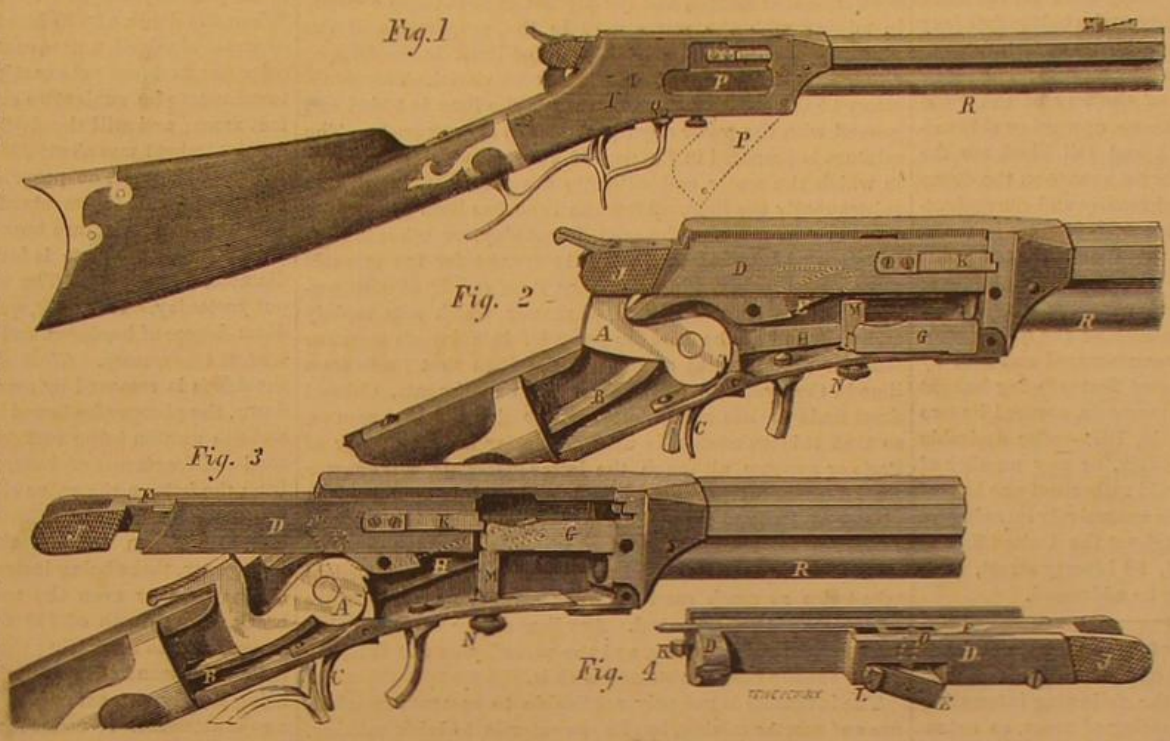
We this week place before our readers a firearm, designed more particularly for sportsmen and professional hunters, for which a number of important advantages are claimed.

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.

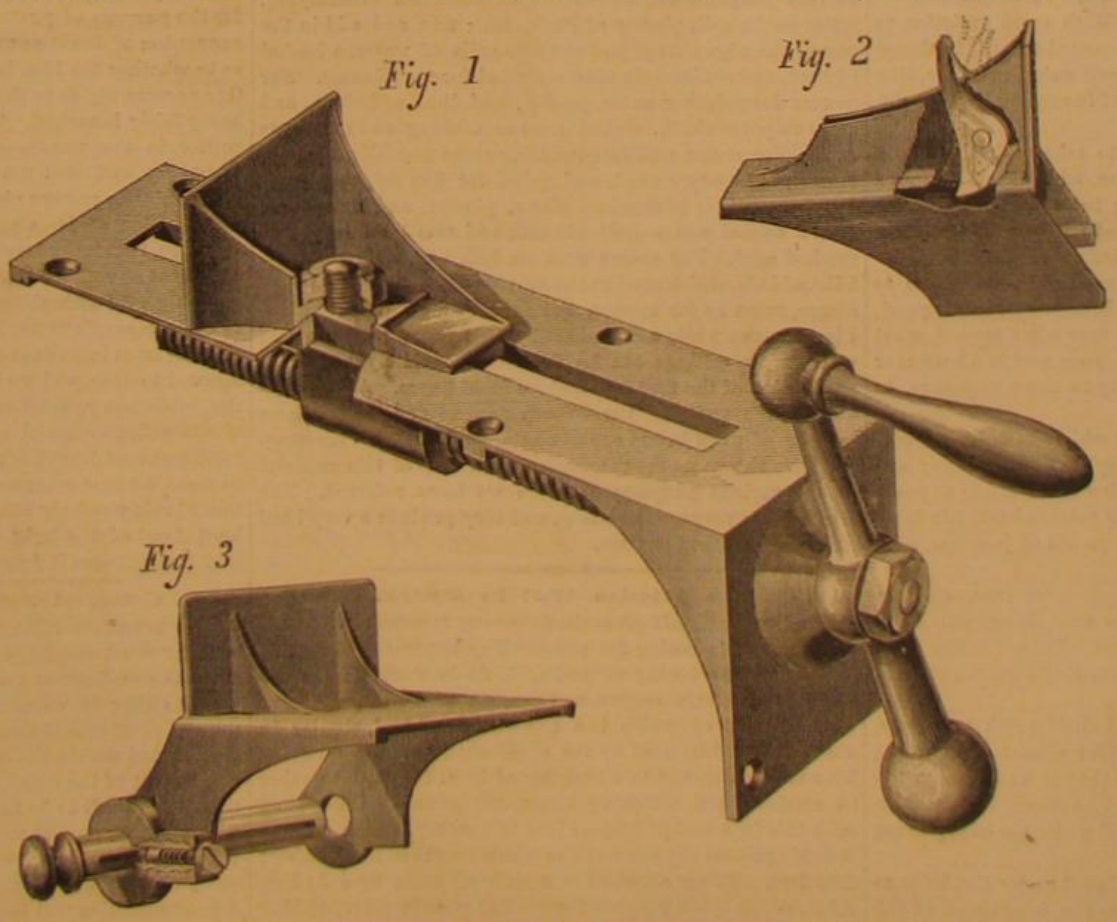
New Light for the Use of Photographers.

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.

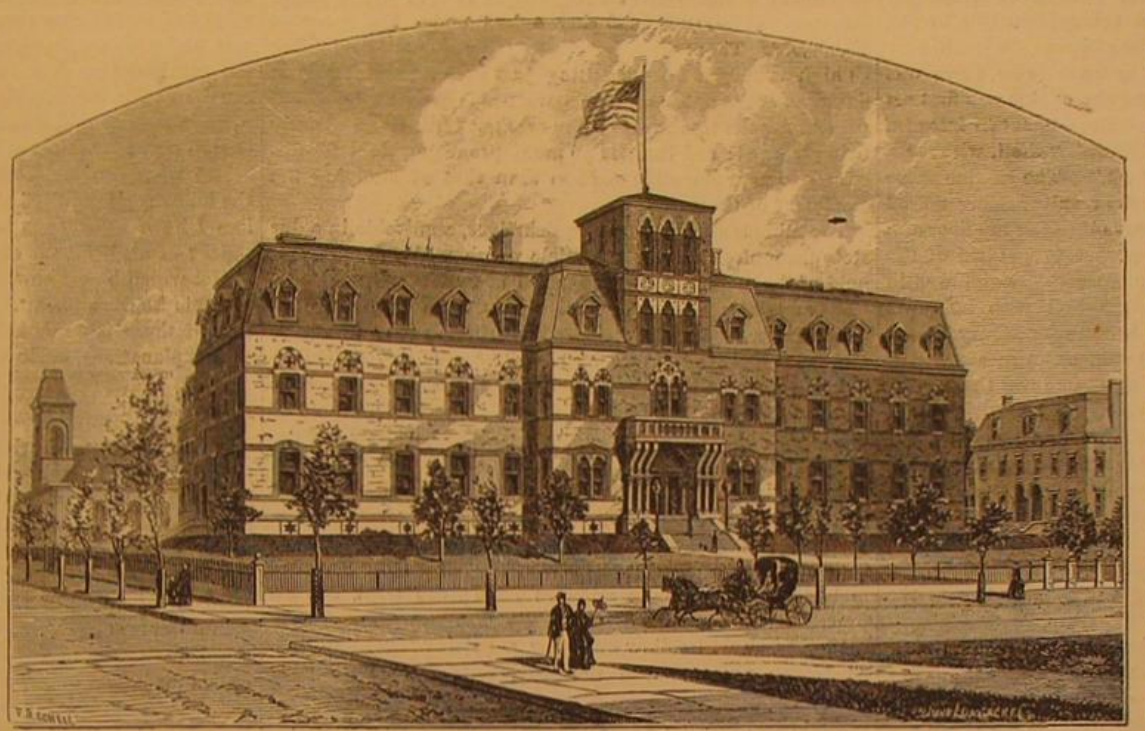
The most recent and, as it promises, one of the most complete of American schools of mechanical engineering, is that about opening in our neighboring city of Hoboken, N. J., the "Stevens Institute of Technology."

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 consider 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:

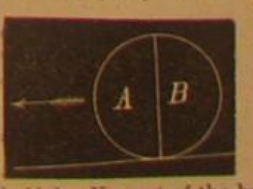
In the SCIENTIFIC AMERICAN of July 22, page 69, is the following editorial answer of L. C. to E. W.:

"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.

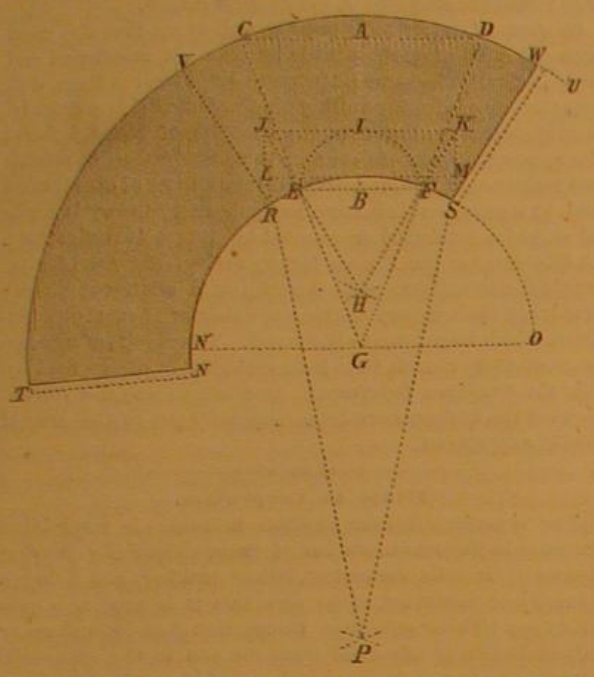
THE following ludicrous arrangement of sentences, quoted from different parts of a letter of H. M. Paine in the SCIENTIFIC AMERICAN, relative to his electro-motor, are produced by the *Brooklyn Eagle:* "Some years since I made the discovery that when hydrogen gas was treated by simple contact with turpentine, 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.

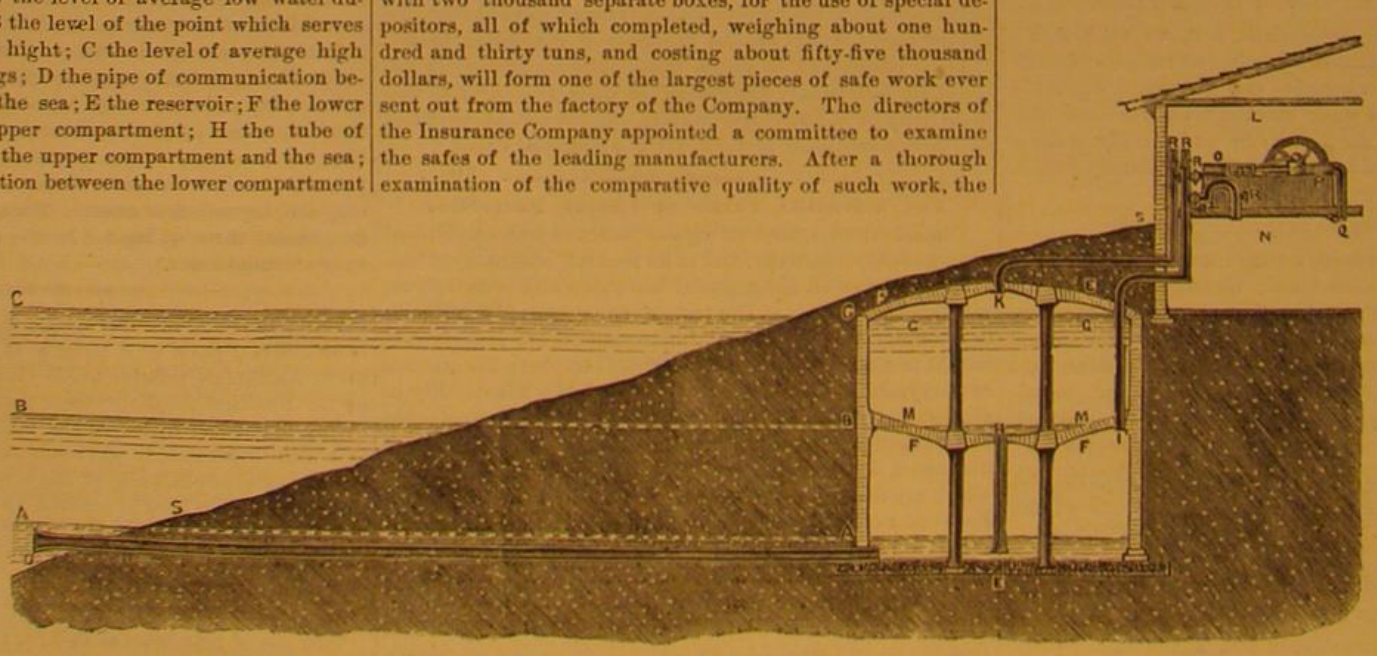
Improved Liquid for Galvanic Battery.

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.

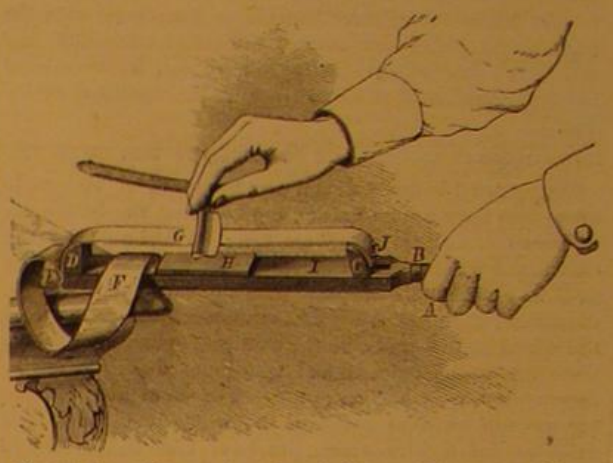
LUBRICATING oil has at last rewarded some persevering well borers at Terre Haute, Ind. The auger was driven 1,636 feet into the earth.

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.)

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.

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.

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. Wilhoit, 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.

This is a quarto volume, containing seventy-eight designs adapted to different requirements. The designs are of a strictly practical character, and may be produced precisely as lithographed. They may also admit of modification without relinquishing their general features. The collection contains designs for almost every class of monuments in marble or other materials, including architectural metal-work. The work is the most artistic of any book of the kind that has passed under our notice, and the plates are executed in fine style. The price is five dollars, free of postage.

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117,957.—SEINE.—L. H. Alexander, Gloucester, Mass.
117,958.—WHEEL.—F. Alger, Boston, Mass.
117,959.—BROOM.—E. A. Anderson, Danville, Tex.
117,960.—COUPLING.—J. F. Andrews, Nashua, N. H.
117,961.—CULTIVATOR.—W. J. Arrington, Louisville, Ga.
117,962.—BALING PRESS.—W. J. Arrington, Louisville, Ga.
117,963.—FENCE POST.—C. Ayers, Farmington Centre, Wis.
117,964.—SLATE.—W. F. Baade, Buffalo, N. Y.
117,965.—EPERGNE.—S. S. Barrie, Green Point, N. Y.
117,966.—FRUIT GATHERER.—J. S., A. M. Barry, Sheridan, Mich.
117,967.—NEEDLE WRAPPER.—M. E. Baylis, Redditch, Eng.
117,968.—IRON AND STEEL.—H. Bessemer, London, Eng.
117,969.—FAN.—J. M. Beverly, Chicago, Ill.
117,970.—PLOW.—J. Blackwood, Madison, Ohio.
117,971.—HOIST.—D. A. Bolt, Harrisburgh, Pa.
117,972.—BRAKE.—H. Bothe, St. Louis, Mo.
117,973.—PULVERIZER.—G. C. Bovey, Cincinnati, Ohio.
117,974.—CHEESE FRAME.—T. M. Brintnall, Medina, Ohio.
117,975.—WATER METER.—J. Broughton, Brooklyn, N. Y.
117,976.—BED BOTTOM.—G. Brownlee, Princeton, Ind.
117,977.—LIFE BOAT, ETC.—C. Butgenbach, Louisville, Ky.
117,978.—CARVING MACHINE.—J. W. Campbell, New York city.
117,979.—ANNUNCIATOR.—J. Capron, New York city.
117,980.—PACKING.—H. S. Cate, Deerfield, Pa.
117,981.—CORN PLANTER.—W. B. Chambers, Decatur, Ill.
117,982.—EGG BEATER.—D. B. Clayton, Columbia, S. C.
117,983.—TILE MACHINE.—G. Clayton, Cleveland, Ohio.
117,984.—OIL CAN.—W. Cleveland, Orange, N. J.
117,985.—DRESSING FRAME.—R. Collier, Laurel, Md.
117,986.—BROOM.—R. E. Copson, Hamburg, Iowa.
117,987.—SCROOL SAW.—T. L. Cornell, S. Whitlock, Derby, Ct.
117,988.—EGG CARRIER, ETC.—J. T. Cornforth, Kansas city, Mo.
117,989.—CULTIVATOR, ETC.—H. J. Coyle, Buffalo, N. Y.
117,990.—BRAN DUSTER.—J. Damp, Ashland, Ohio.
117,991.—PADDLE WHEEL.—D. S. Darling, Brooklyn, N. Y.
117,992.—CAR COUPLING.—P. W. Davis, Portland, Oregon.
117,993.—EXCAVATOR.—R. W. Davis, Sonora, N. Y.
117,994.—HAME TUG.—P. R. Dawson, Brenham, Tex.
117,995.—BILLIARD CUSHION.—M. Delaney, New York city.
117,996.—STOVE.—W. Doyle, Albany, N. Y.
117,997.—SCRUBBER, ETC.—W. H. Earnest, Parkersburg, W. Va.
117,998.—GAS.—H. H. Edgerton, Fort Wayne, Ind.
117,999.—MEAT CHOPPER.—M. L. Edwards, Salem, Ohio.
118,000.—CULTIVATOR.—J. T. Ellis, Decatur, Ill.
118,001.—ROOF BRACKET.—D. Fisher, Mansfield, Mass.
118,002.—DRESSING HIDES.—E. Fitzhenry, Boston, Mass.
118,003.—DRESSING LEATHER.—E. Fitzhenry, Boston, Mass.
118,004.—PACKING.—J. M. Flagg, Providence, R. I.
118,005.—RAISING LETTERS.—R. R. Foote, Chicago, Ill.
118,006.—PHOTOGRAPHY.—E. J. Foss, Boston, Mass.
118,007.—TOY ENGINE.—R. Frisbee, Cromwell, Conn.
118,008.—GAS COCK.—S. Gardiner, Jr., New York city.
118,009.—THILL.—M. C. Graves, Tuscola, Mich., B. D. Graves, Waterloo, Iowa.
118,010.—TUNNELING MACHINE.—C., J. P., and L. Griscom, Port Carbon, John Fritz, Mahanoy Top, Pa.
118,011.—RACE COURSE TOY BANK.—J. Hall, Watertown, Mass.
118,012.—FAUCET.—J. Hayden, Jr., Haydenville, Mass.
118,013.—ENGINE.—W. H. H. Heydrick, Chestnut Hills, Pa.
118,014.—WASHING MACHINE.—H. C. Horsey, Rome, Iowa.
118,015.—BLACKING BRUSH.—J. R. Howard, Boston, Mass.
118,016.—MOVEMENT.—C. W. Hurd, Comstock's Landing, N. Y.
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118,166.—LIGHTNING ROD.—G. A. Stephenson and O. L. Sutliff, Wooster, Ohio.
118,167.—RAILWAY CAR.—E. Sturgeon, Columbiana, Ohio.
118,168.—LIFE PRESERVER.—J. E. Thomson, Buffalo, N. Y.
118,169.—MOLD.—G. W. Tinsley, E. W. Storer, Minneapolis, Minn.
118,170.—CAR WHEEL, ETC.—C. D. Tinsdale, Boston, Mass.
118,171.—FIRE ARM.—J. B. Wayne, Birmingham, England.
118,172.—FIRE ESCAPE.—E. R. Wethered, London, England.
118,173.—SPOKE MACHINE.—J. Woodburn, Indianapolis, Ind.
118,174.—CASTING BRASS.—L. T. Wooster, Ansonia, Conn.
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. 78,769, 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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DRILLING MACHINE.—W. H. Thorne, Philadelphia, Pa.
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VESSELS FOR CONVERTING STEEL, ETC.—H. Chisholm, Cleveland, Ohio.

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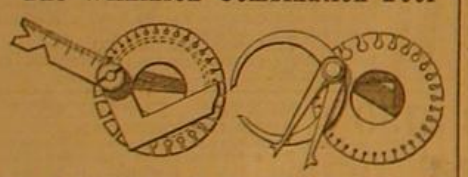

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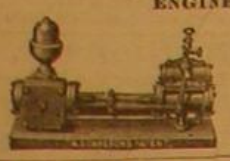

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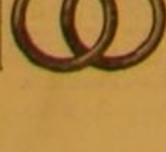

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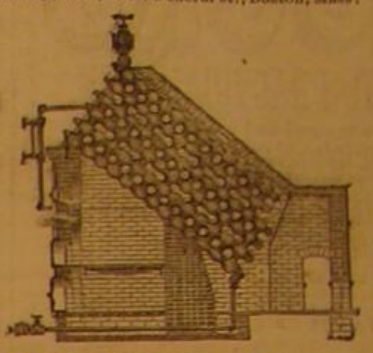

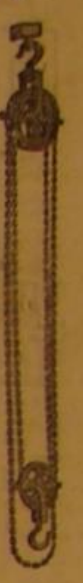

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