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Arrangement for Cross-cut Saws.

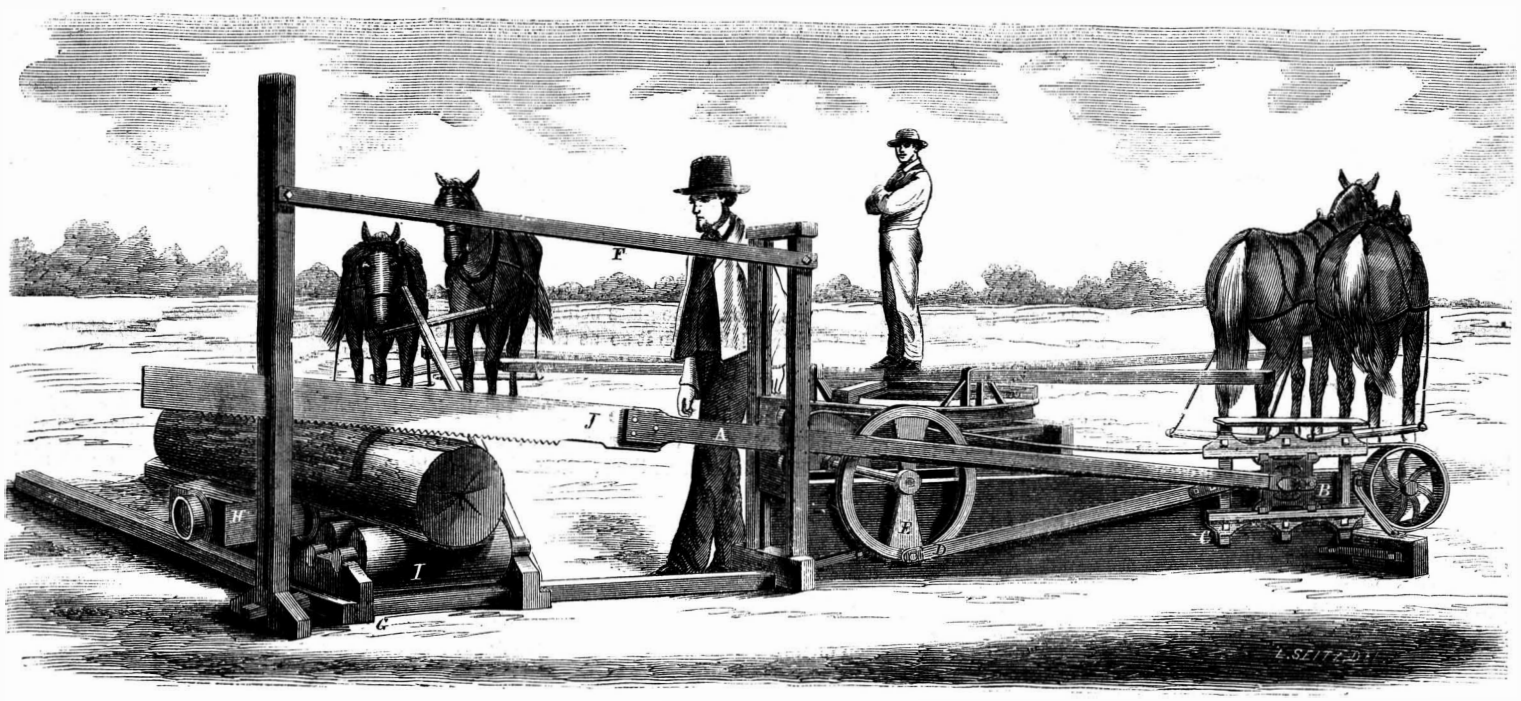
It is very convenient in newly-settled parts of the country to have some portable and efficient machine for sawing up logs into short sections. Trees that have been felled and that are to be made into boards or rails can, by the aid of the machine shown herewith, be cut into pieces of any size, and in a much shorter time than by chopping or cross-cutting by hand. The machine is also much more economical than the ax, as it not only saves time, but also timber, for it makes a clean square butt, instead of a long sloping one, which has to be cut square afterward by the saw.

The general arrangement of the parts is very simple, and can be easily understood by the intelligent reader. The saw is attached to a bar, A, which receives a reciprocating motion from the cross-head, B. This cross-head runs in the slide, C, and carries another bar, or connecting rod, D, one end of which is attached to the crank-wheel, E. This crank-wheel is driven by the horse-power machine seen in the distance—a man is standing on the draught-pole center. The horse-power may be on any plan, and is not confined to this machine alone; it may also be used for a variety of other purposes about a farm. Where steam power is convenient, or water power, it may of course be substituted for the horse-power.

The saw is guided in its action by the frame, F, and there is a frame, G, which has a carriage, H, and rollers, I, upon it, which contains the log to be sawed. Of course as one piece is sawed off the remainder of the timber is pushed up to the required distance and another one cut. The feed is obtained by the weight of the saw and its handle, but in cutting hard wood this feed may be increased by adding weights, fitted to set on the saw, close to the handle, as at J. These are not necessary, however, as the machine works well as it is.

This cross-cutting machine is highly spoken of by farmers and others in DeKalb Co., Ind. They have forwarded us certificates, which we are unable to present here. These persons recommend the machine as a useful and desirable one, and state that in their opinion it should be in every community.

It was patented on July 19th, 1864, through the Scientific American Patent Agency, by E. Berry, of Auburn, DeKalb Co., Ind. For further information address him at that place.



BERRY'S ARRANGEMENT FOR CROSS-CUT SAWS.

Novel Means for preserving Fruit.

The Cleveland (Ohio) *Herald* gives the following description of a building now constructing in that city:—

"The building is eighty feet by forty-four and a half, the side walls being twenty-two feet high. The front of the building, occupying about one-fourth of the whole size, is to be used as a store or ordinary warehouse, and will be constructed in the usual manner. The remainder of the building is to be walled entirely with iron, perfectly tight, and divided from the front part by similar walls. Within this inclosure is built another building also, of iron, with the walls about three feet distant from the walls of the outer building.

"The inner building is divided by iron walls into several smaller rooms, each of them being perfectly gas proof. The ground beneath the building was first packed with wet earth, the beams laid in coal tar, and the surface of the earth will be covered with coal tar. The space between the ground and the flooring will then be packed tight with sawdust, as will be the space between the outer and inner walls, and the hollow space in the iron-lined doors. Overhead will be packed tightly with ice, which will be congealed by a peculiar process, into a solid mass of hard ice, several feet thick.

"When all is completed, the small rooms will be filled with fresh fruits, such as apples, grapes, &c., the oxygen of the gas withdrawn by chemical process, and the room hermetically sealed. The vivifying elements being withdrawn, and the temperature kept down by a peculiar process to about 36 deg., the fruit remains perfectly fresh until the season for fresh fruit having passed away, a high market is open for them, when the chambers are opened as wanted, and the fruit taken out as fresh as when gathered."

How to dry Sweet Corn.

When the corn is in good condition for eating, the grains being fully grown, boil a quantity of ears just enough to cook the starch, and then let them cool and dry a few hours, and then shell or cut off the grains and spread them in the sun till dried. The best way to dry the corn is to nail a piece of cloth of very open texture on a frame, which if two feet wide and five long, will be of a convenient size to handle. If the corn is spread thinly upon this cloth it will dry quickly, without souring. It should be covered with a mosquito netting to keep off the flies. Another person gives the following directions for drying sweet corn:—"As soon as the corn is fit for the table, husk and spread the ears in an open oven, or some quickly drying place. When the grains loosen shell the corn, or shell as soon as you can. Then spread upon a cloth to dry in the sun, or on paper in a warm oven; stir often, that it may dry quickly and not overheat. It more resembles the undried by its being whole, is sweeter, and retains more of its natural flavor by drying faster. When wholly dried expose it to the wind by turning it slowly from dish to dish; the wind blows off all the troublesome white chaff."

EFFERVESCING POWDERS.—C. Bedell proposes preparing a mixture of tartaric acid and bicarbonate of soda, in granular form, and permanent in the air, by mixing well dried tartaric acid and bicarbonate of soda in the proportion of five to six, with sufficient strong alcohol to reduce it to a moist condition, passing it then through a somewhat coarse sieve, and thoroughly drying. If desired it may be flavored with a little oil of lemon dissolved in the alcohol. A mixture thus prepared effervesces, upon the addition of water, to the last crumb.

How to burn Spent Tan Bark.

In very many parts of the country spent tan bark can be had in large quantities at a nominal price, and attention has been repeatedly called to it as fuel for steam boilers. Many plans have been devised for burning it, as it needs special arrangement for utilizing it in this way. A recent letter from Indianapolis, Ind., to the *Shoe and Leather Reporter* conveys the following information. The plan is now in practical operation in the oak-tanning districts of the West:—

"Our boiler is 24 feet long and 42 inches in diameter. We set the boiler the height we want it from the ground, excavate a pit beginning two feet under the front end of the boiler, 20 feet long, 8 feet wide, and ten feet deep from the bottom of the boiler.

"The oven in which the tan is burned is then commenced by building a wall of good brick, commencing 18 inches under the front end of the boiler, making that wall 18 inches thick, so the inside of the wall will be flush with the end; the other walls may be 13 inches —the thicker the better. Size of the oven to outside of the walls, of thickness named, is 8 feet wide, 10 feet long from the end of the boiler. The wall is carried up two feet all around, leaving an opening of 2 feet wide in front, for taking out ashes, and ventilating under the grate-bars which are of the size ordinarily used for coal; then put on bearing bars from grate-bars, one at each end and one in the center of the oven, two lengths of bars being required, the center bearing bar should be very heavy to prevent sagging with the weight when hot. The walls are then carried up 2 feet as before, excepting the inside course and must be of the best quality of fire-brick put in with fire-clay, requiring 1,500 to 1,800 for an oven. Set in front of the oven, over the space left open below the grates, is an iron door frame 2 feet square. This frame should be well anchored in the wall. At the end under boiler, a space 33 inches wide immediately under the boiler is left. After building some three or four courses above the grate bars in the center of this space a column of 13 inches and 30 inches high is built, forming two holes 10 by 30 inches which must be securely arched over at the the top—the sides of these holes, as every other part exposed to the fire, must be lined with fire-brick. Through these holes the heat enters the furnace around the boilers. When the oven is two feet above grates, then an arch two feet deep is turned over the top with fire-brick, leaving two round holes 15 inches in diameter, equal distance from each end, and apart in the top of the arch for feeding the spent tan. The outside walls are carried up 18 inches, or 2 feet above the top of the arch, with common brick. The feeding holes, being walled up the same distance with fire-brick till on the top of the arch—with any kind of soil or sand to the top of the walls, and pave with hard brick. The fire-holes are covered with iron covers, the same as cistern-tops or coal-holes in pavements.

"The wall under the end of the boiler, is carried up and around the boiler, holding it up and forming the end of the furnace around the boiler, which is built the same as any ordinary furnace, excepting at the front end where fire and heat enters from the oven it should be slanted back from the bottom of the fire-holes some 5 feet to within 10 or 12 inches of the boiler, and paved with fire-brick. Two or three small iron doors should be put in the side of the furnace for the convenience of cleaning out the loose ashes from under the boiler, which accumulate rapidly—a breech and smoke-stack, the same as any other furnace. It being understood that a good draught is necessary, the balance of the excavation wall should be as high as is necessary for the ash-pit.

"For larger boilers or more than one boiler, two arches and from four to six holes for feeding the tan would be required. Persons building ovens should get mechanics that have had experience, or get drawings and specifications before commencing; although quite simple it is necessary to be accurate, or trouble may follow. We burn the tan wet, as it comes from the leeches, using wood only to start the fires after cleaning the boiler; requiring about a cord a week. The wood is put in at the front door, from the ash-pit. Tan is fed through the holes described, from the top. We can keep, with attention, a stronger and better heat with the wet tan than with wood. Besides the economy in labor, we get clear of a large portion of the tan that otherwise would be expensive to move. With the boiler and furnace as described, we do the work and heating required for a business of 20,000 sides per annum of heavy leather.

"Messrs. Lang & Warner, Dunlap street, Cincinnati, are using similar furnaces for heating their extensive shops with hot air, with success."

Endurance of Steel Tires for Locomotives.

We extract the following paragraphs from the *American Railroad Journal:*

"We have before us some curious drawings illustrating the amount of wear and tear of the steel tire as tested on some of our principal railways. That of a tire used on the Chicago, Burlington and Quincy road shows, after being worn on a driver of an engine weighing 34 tuns, and running 13 months in heavy freight service 29,500 miles, a loss of but 3-32ds of an inch.

"Those used on the Naugatuck, after running 100,-181 miles for two years and six months, were only worn about 6-32ds of an inch. On the Erie railway the tires of some heavy freight engines running 21,-450 miles do not yet show a wear of 1-16th of an inch, and are expected to run 100,000 miles before being worn down to their first turning. Upwards of twenty-three other different roads use these tires, and not only do they wear well throughout, but they have never been known to burst or crush, a fact of the utmost importance, as an additional guarantee of safety to travelers. The same results have been ascertained by an extended use and trial of these tires in Europe. The conclusion is therefore obvious that these steel tires must come into general use, indeed no others can be safely trusted. They wear well from first to last, and are made of metal so prepared as to be practically indestructible."

Imitation of Muslin Glass.

Here is a simple and ingenious means of giving to glass the appearance of delicately wrought muslin:—

The process, which comes to us from Germany, consists in spreading very smoothly a piece of lace or tulle and covering it with some fatty substance by means of a printer's roller. The glass being carefully cleaned, the cloth is laid upon it so as to leave in fat a print on the surface of all the threads of the fabric.

The glass is then exposed about five minutes to the vapors of hydrofluoric acid, which roughens the spaces between the lines, and leaves the polish on the surface under the fat.

A glass thus prepared becomes like a veil, protecting from exterior indiscretion persons who, from their apartment, desire to look commodiously outside.

We recall here that the manipulation of hydrofluoric acid requires great prudence. This acid is so corrosive that a drop of its vapor condensed produces upon the hand a lively inflammation, and may even lead to graver accidents. Breathing the emanations should therefore be avoided with the greatest care.—*Le Moniteur Illustre des Inventions.*

A Miniature Steam Engine.

The *Mechanics' Magazine* says:—"We recently had the pleasure of seeing a miniature working model of a pair of Penn's patent trunk engines, made by Mr. Thomas Smith, modeler, of 20 Walnut-tree Walk, Lambeth. These engines are fac-similes of those in H. M. S. *Warrior*. The model engines, however, are intended to work at high pressure, whereas the *Warrior's* are condensing engines. The weight of the pair of model engines is two grains less than that of a silver three-penny piece; and they stand on less space than a silver three-penny piece would cover. The cylinders are 3-32nds of an inch in diameter. Length of stroke 1-16th of an inch. The throw of the eccentric is 1-60th of an inch. The engines are constructed with the link-motion reversing gear. The hexagon-headed bolts used for fastening on the cylinder covers are 1-100th of an inch in diameter. The engines can be worked at from 20 revolutions per minute up to 20,000 revolutions per minute."

Increased Explosivensss of Mining Powder.—Mr. Nobel announces that by damping mining powder with nitro-glycerine its explosive power is trebled, and the noise of the explosion much less than when ordinary power is used.—*Chemical News.*

Good Suggestions about Cylinder Boilers.

The Manchester Boiler Association gives the following useful information to engineers and owners of steam boilers:—

"1st. Heat the feed water before its introduciion to the boiler, and disperse it by means of a perforated pipe carried horizontally for several feet near to the surface of the water, and thus prevent its impingement on any particular spot, especially near the firing end.

"2d. Where the water is at all sedimentary an efficient blow-out apparatus should be attached and regularly used. Surface blowing-out, by means of a scum pipe, is particularly adapted to externally-fired boilers.

"3d. Do not allow the flames to act too intensely on any one spot, but spread the action over as extended a surface as possible, and lower the fire-bars should any signs of distress appear at the seams of rivets.

"4th. Have a spare boiler, so that defects may be suitably repaired immediately on detection, and the boilers regularly cleaned out without the necessity of Sunday work—a practice which is unadvisable, though, regarded only from an engineering point of view, is demoralizing in its influence upon the workmen, and expensive to the steam user.

"5th. With regard to the construction of the boiler, secure good workmanship and material in the first instance. It is a mistake to suppose that externally-fired boilers are better for being made of thick plates. Those under inspection which have given the least trouble have not been more than three-eighths of an inch in thickness, and it is thought that in plain cylindrical boilers this thickness should not be exceeded. In effecting repairs, as well as in the first construction, the rivet holes should be brought fairly one over the other, without straining, while drifting should not be allowed. In putting in new plates to old boilers, it will, in many cases, be advisable to cut away the old line of rivet holes and drill new ones; while the new work should rather be thinner than the old, instead of being thicker, as it sometimes is."

The Cheapest Filter.

Le Moniteur Illustre des Inventions says:—"It is known that charcoal is the most efficacious substance that can be employed for the purification of liquids; foul and stagnant waters containing decaying animal carcasses have been purified to the extent of becoming inodorous, potable, and healthy. Here is a method of construceing one of these filters in the easiest manner. Take a flower-pot, or any other vase having a hole in the bottom, fill the bottom with large round pebbles, then cover with smaller pebbles, then with coarse sand or fine gravel, and finally with about four inches of poun ed charcoal. The coal may be placed in a bag and broken with a mallet or hammer. It should be sifted, and the very finest dust thrown away."

Our contemporary adds that nothing is necessary above the charcoal, but we should suppose that it ought to be covered with a clean flannel, held down by stones on the corners. The charcoal should be freshly burned, and renewed occasionally. The other parts will of course last indefinitely.

New Method of Graining in Imitation of Rosewood and Walnut.

Dingler's Polytechnisches Journal describes a new method proposed by Dr. Wiederhold for treating the surfaces of certain woods so as to produce imitations of other woods more valuable.

A concentrated solution of hypermangate of potassa is spread on the surface of the wood, and allowed to act until the desired shade is obtained. Five minutes suffices ordinarily to give a deep color. A few trials will indicate the proper proportions. The hypermangate of potassa is decomposed by the vegetable fibers with the precipitation of brown peroxide of manganese, which the influence of the potassa, at the same time set free, fixes in a durable manner on the fibers. When the action is terminated the wood is carefully washed with water, dried, and then oiled and polished in the usual manner. *Dingler's Journal* remarks that the effect produced by this process on several woods is remarkable. On the cherry, especially, it gives a very beautiful red color. The color resists well the action of air and light, and the process is very short.

Annealing.

In a considerable number of instances, bodies which are capable of undergoing ignition, are rendered hard and brittle by sudden cooling. Glass, cast-iron and steel are the most remarkably affected by this circumstance; the inconveniences arising from which are obviated by cooling them very gradually, and this process is called "annealing." Glass vessels are carried into an oven over the great furnace called the leer, where they are permitted to cool, in a greater or less time, according to their thickness and bulk. Steel is most effectually annealed by making it red-hot in a charcoal fire, which must completely cover it, and be allowed to go out of its own accord. Cast-iron, which may require to be annealed in too large a quantity to render the expense of charcoal very agreeable, may be heated in a cinder fire, which must completely envelope and defend the pieces from the air till they are cold. The fire need not be urged so as to produce more than a red heat; a little beyond this, bars and thin pieces would bend, if destitute of a solid support; and would even be melted without any vehement degree of heat. If it be required to anneal a number of pieces expeditiously, and the fire is not large enough to take more than one or two of them at once; or if it be thought hazardous to leave the fire to itself, from an apprehension that the heat might increase too much, the following scheme may be adopted: heat as many of the pieces at once as may be convenient, and as soon as they are red-hot bury them in the dry sawdust. Cast-iron, when annealed, is less liable to warp by a subsequent partial exposure to moderate degrees of heat than that which has not undergone this operation.

The above methods of annealing render cast-iron easy to work, but do not deprive it of its natural character. Cast-iron cutlery is, therefore, stratified with some substance containing oxygen, such as poor iron ores, free from sulphur, and kept in a state little short of fusion for twenty-four hours. It is then found to possess a considerable degree of malleability, and is not unfit for several sorts of nails and edge-tools.

Copper forms a remarkable exception to the general rule of annealing. This metal is actually made softer and more flexible by plunging it, when red-hot, into cold water, than by any other means. Gradually cooling produces a contrary effect.—*Mechanic's Own Book.*

Nerve of our Naval Gunners.

The following incident occurred on board the *Lackawanna* immediately after butting the ram *Tennessee*, during the recent naval engagement at Mobile Bay. The correspondent says:—"On this side we had but one large gun—our whole battery being pivoted on the starboard side, it being our intention to have brought him on that side after striking him, but the delivery of her broadside, and the tremendous crash against this mountain of iron, disarranged things so that we were unable to pivot round in time for her. The captain of this gun, a quartermaster, was in the port fore-chains at the lead. Throwing his lead on the monster's back, he sprang to his gun, and depressing her until the muzzle came in a line with the ramparts, he stood, with lock-string in hand, the rebels trying to shoot him down with small-arms from their port-holes, as they knew the gun was loaded, and our crew as valiantly keeping them from re-loading theirs.

"At this moment one of them, whether lieutenant or seaman I cannot say, stuck his head out of the port-hole and sang out, 'let her come; let her come.' Our quartermaster coolly replied, 'Hold on a bit.' And hold on he did, until about twenty seconds, when their ports came abreast each other, muzzle to muzzle, and not ten feet apart, when he let fly, exclaiming, 'Take it and be d—d to you.' What damage she sustained by this fortunate shot I will leave it for others to say, who are here for that purpose, but certain it is, in a very few minutes she displayed the white flag in token of submission to Uncle Sam, her rightful owner."

AMATEURS, or others who use small lathes, will find that the "chattering" of the hand-tool may be stopped by placing a piece of leather between the tool and the rest.

How to gage a Cask.

In taking the dlmensions of a cask it must be carefully observed:—1st, That the bung-hole be in the middle of the cask; 2d, That the bung-stave, and the stave opposite to the bung-hole, are both regular and even within; 3d, That the heads of the cask are equal, and truly circular; if so, the distance between the inside of the chime to the outside of the opposite stave will be the head diameter within the cask, very near.

RULE.—Take, in inches, the inside diameters of a cask at the head and the bung, and also the length; subtract the head-diameter from the bung-diameter, and note the difference.

If the measure of the cask is taken outside, with callipers, from head to head, then a deduction must be made of from 1 to 2 inches for the thickness of the heads, according to the size of the cask.

1. If the staves of the cask, between the bung and the head, are considerably curved (the shape of a pipe), multiply the difference between the bung and head by ·7.

2. If the staves be of a medium curve (the shape of a molasses hogshead), multiply the difference by ·65.

3. If the staves curve very little (less than a molasses hogshead), multiply the difference by ·6.

4. If the staves are nearly straight (almost a cylinder), multiply the difference by ·55.

5. Add the product, in each case, to the head-diameter; the sum will be a mean diameter, and thus the cask is reduced to a cylinder.

6. Multiply the mean diameter by itself, and then by the length, and multiply it for wine gallons, by ·0034. The difference of dividing by 294 (the usual method) and multiplying by ·0034 (the most expeditious method) is less than 500ths of a gallon in a 100 gallons.

EXAMPLE.

Supposing the head-diameter of a cask to be 24 inches, the bung-diameter 32 inches, and the length of cask 40 inches—what is the content in wine gallons?

1st variety.

Bung-diameter,	32	Brought up	876.16
Head-diameter,	24	Leng h,	40
Difference,	8		35046.40
Mul ipler,	.7		.0034
	5.6		14018560
Head-diameter,	24		10513920
multiply by	29.6 29.6		119.157760

Carry up Square, 876.16 Ans. 119 galls. 1 pint.

To obtain the contents of a similar cask in ale gallons, multiply 35046.40 by .002785, and we get 97.6042 (or 97 gallons 5 pints).—*Butt's Mechanics' Handbook.*

Some details of the Russian Submarine Boat.

We cut the subjoined paragraph from the London *Engineer*:—

"Messrs. Russell, the tube-makers of Wednesbury, are busy upon an extensive order for wrought-iron tubes for the Russian Government, to be used in the construction of marine war vessels to float below the surface. In a description which has been published of what Messrs. Russell are doing, it is said:—'To afford some idea of the magnitude of the Russian enterprise, it may be stated that the cost of the tubes alone for a single vessel of this submarine fleet will be nearly £9,000. It will contain no less than 38 lengths of wrought-iron tubes, of 60 feet each, having a 13-inch bore, and a thickness of seven-eighths of an inch. The specification demands that they shall be capable of bearing a pressure of 2,000 pounds to the square inch, and Messrs. Russell test every tube up to 2,500 pounds. The submarine boat which these tubes are destined for is of such dimensions that it is estimated that 200 tuns of iron and steel will be used in its construction. The cost will, it is calculated, reach 175,000 silver roubles, or £27,000; and the expenditure of this amount has been authorized by the Emperor. Each vessel is to have engines worked by compressed air, and to have a very strong beak, with provision for attaching large cylinders, charged with powder, to the bottom of vessels, to be fired by electricity. The parties navigating the vessel will see what they are doing by means of "bull's eyes," and they will be able to regulate the depth at which they swim, generally keeping quite close to the surface.'"

The New System of Defensive Warfare.

A correspondent of the Cincinnati *Commercial*, writing from near Atlanta, August 15, says:—Among the many modifications and new features of warfare that have been introduced during the present struggle, the one most noticeable and most revolutionizing in its tendency, is the practice becoming so universal on both sides, of *intrenching and fortifying*. To one who has made military engineering a study, it is perfectly astonishing to notice how skillful all the line officers, and even the privates, have become in laying out and constructing defensive works. Formerly, no works were attempted until regular engineer officers could survey and stake out the grounds; and then pioneer parties and regular fatigue parties would do the work. This required days and sometimes weeks, to construct anything like efficient defenses. Now, every officer and man is an engineer; and every regiment and company has its pioneer party. If a command halts in line for thirty minutes, good defensive works are constructed. If a company is sent out on picket, the inevitable pick and spade go with them, as certainly as the musket; and within a few minutes from the time the post is assigned, the picket is well intrenched. If one army moves to attack the other, the army that is on the defensive will construct good protecting works, while the attacking army is deploying and getting ready to assault. The result is that the attacking party on either side always encounters efficient breastworks, that more than double the fighting strength of the party being attacked. "Open field fighting" has almost passed into history. It only occurs now when the party attacked is either surprised or flanked. Experience has abundantly shown that no general can afford, very often, to storm well-manned breastworks; for although he may carry his point, yet he does it at an enormous sacrifice of life, and a sacrifice generally greatly disproportioned to the injury he inflicts. The general who is most expert in flank movements is the one who will get control of the most territory. These facts present an aspect of our struggle not altogether agreeable to contemplate. While flanking an army will compel it to change position, yet it generally leaves it intact. An army may be flanked a thousand times, and be an army still. Had Johnston met us in open field, and fought us near Dalton or Resaca, we would probably have destroyed his army ere this. But he reached Atlanta with his army whole. He kept it carefully behind substantial works, which compelled Sherman to drive him back by a succession of the most skillful flank movements ever made. Hood took command of the rebel army at Atlanta, and not till after his sore experience of July 20, 22, and 28, when he lost from fifteen to twenty thousand men, would he acknowledge the new feature of battle tactics—the potency of the spade and pick.

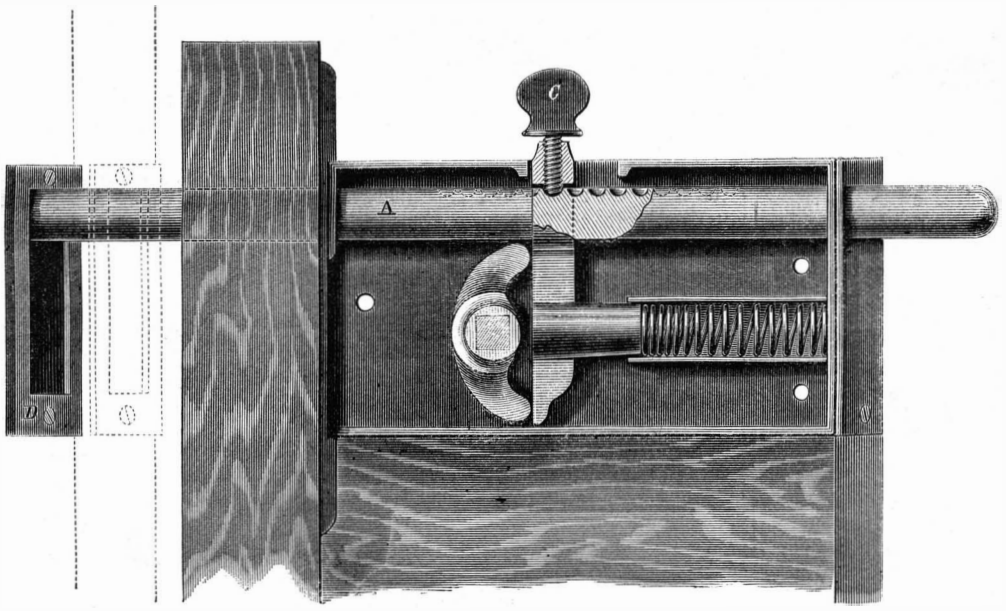
Every regiment now carries its intrenching tools, and they are cared for with the same tenacity as the arms, and all become expert in their use. The unpleasant aspect of this new feature of warfare is the great advantage it gives to the party which is acting on the defensive, and will enable the rebels to hold out much longer than they otherwise could. By these tactics Lee's and Hood's armies are still intact, and much hard fighting and heavy warfare will still be necessary to effect their destruction.

SILVERING.—Cold silvering may be performed on brass and copper which is well cleaned and quite bright, by rubbing with a moistened cloth, dipped in the following powder:—1. Chloride of silver, 2 parts, pearlash, 6 parts, salt, 3 parts, whiting, 2 parts; mix. Or, 2. Precipitated silver, 1 part, common salt and cream of tartar, each 2 parts; mix. When the metal is silvered, it should be washed in a hot weak solution of alkali, and then washed dry. Other silvering powders are:—3. Nitrate of silver and salt, of each 1 part, cream of tartar, 7 parts. 4. Nitrate of silver, 1 part, cyanide of potassium, 3 parts. 5. Bath. Nitrate of silver, 15 parts, sulphate of soda, 100 parts; dissolve in water, and dip the article into the solution.

Adjustable Gate Latch.

The object of this invention is to supply an acknowledged want. Many persons must have observed, that in consequence of the alternate shrinking and swelling of gates and fences—when constructed of wood—the latches and fastenings in common use during a great portion of the year are entirely worthless. The ordinary latch, if properly applied, will operate well at first, but if a protracted rain occurs, the gate cannot be closed at all; or for a long period the weather is warm and dry—the gate and fence then shrink, and the latch will not reach its proper position. In either case there is no fastening, and a piece of rope, or a strap, is relied upon to supply the deficiency.

The latch herewith illustrated obviates these difficulties. By the application of the long bolt, A, made to slide in the case, B, and secured at any length by the thumb-screw, C, the bolt is made *adjustable*, and whatever change the weather may make in the relative position of the gate and fence-post, is readily met and compensated for. The change is made in a moment of time, without the use of any tool.



WILLIAMS'S ADJUSTABLE GATE LATCH.

Perpendicular variations, occasioned by the heaving or setting of a post, or the sagging of the gate, are provided against by the slot in the catch, D, which is made of sufficient length to meet such variations.

This gate latch was patented through the Scientific American Patent Agency, on Dec. 8, 1863, by S. B. Williams, of Leavenworth, Kansas. For further particulars, address him at that place.

Propelling Boats by driving a Column of Water out Astern.

This method of propulsion is very old, but every year it is tried by some person confident of success. Dr. Franklin tried it in 1785, and his method is here appended; although the machinery itself was rude, the obstacles to success are the same to-day as they were at that period:—

"Dr. Franklin, in the year 1785, planned a simple method of applying steam to give motion to boats. He proposed that the steam should act immediately upon a piston, which should move in a cylinder perpendicularly fixed in the center of the boat. The bottom of this cylinder connected with a horizontal cylinder fixed from bow to stern, and there communicating with the surrounding water. Two valves in the horizontal cylinder on each side of the perpendicular one, each opening toward the stern. When in this simple machine the piston rose by the force of the steam, the bow valve would open and the water rush in with considerable force, fill it, and also the perpendicular cylinder. The piston would then descend, the bow valve shut, that nearest the stern open, and the body of water rush through the after part of the horizontal cylinder, and out with considerable violence against the sorrounding fluid, and consequently propel the boat.

"He conceived also, that when the piston ascended, the boat would acquire a small quantity of motion by water being sucked in at the bow. These cylinders he proposed should be of a considerable diameter, the exact size to be fixed by experiment, and suggested the propriety of doubling the apparatus, the pistons to work alternately.

"The simplicity of this contrivance, and the little friction it would occasion, are considerable recommendations to it; but a striking objection to this is a waste of power. The whole force of the water rushing out of the stern would not tend to propel the boat, as the surrounding fluid would not oppose an absolute resistance to the column of water acting on it."

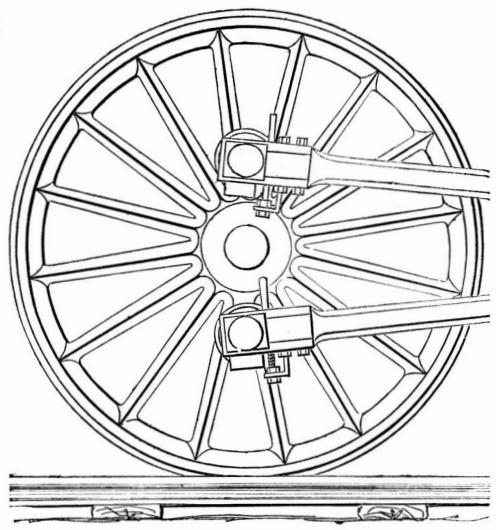
The "Philadelphia Photographer."

This work fully maintains the excellence which characterized its first issues. Indeed, it becomes more and more valuable. It contains a large amount of original matter, from the hands of some of the best practical artists in the country, while the art gems with which every number is embellished render it in the highest degree attractive to lovers of the beautiful. The number for August contains a most charming view of Indian Ladder Bluff, at the Delaware Water Gap, Pa. Benerman & Wilson, Philadelphia, Pa., publishers. $3 a year.

POWER REQUIRED TO START A TRAIN.

Mr. H. B. Morrison, of Le Roy, N. Y., sends us the diagram published in connection with this article, and accompanies it by the following query:—

"Will it take any more power to start a train when the crank is on the upper half center, than when it



is on the lower half center, as shown by the heavy and light lines on the diagram?"

It will take more power on the lower center than the upper, for this reason: The center of the axle is the fulcrum of a lever of which the wheel-spoke is one long arm, and the crank the short arm. Levers are of three classes, first, second, and third, and their efficiency is in the same ratio. Where the fulcrum is between the power (in this case the crank) and the work (in this case the adhesion of the tire to the track), the lever is of the first class. A third-class lever is one wherein the power is applied between the fulcrum and the work, as when the crank is on the lower half center, and it would therefore require more pressure to start a train on the lower than on the upper half center.

There are other considerations involved in this question, however, which render it a complex one when followed out fully, for the relation of the power to the work performed is very different from that of ordinary leverage.

Bleaching of Sponges.

A French savant, M. Artus, has been experimenting on the bleaching of sponges. Some good sponges were well washed by M. Artus, in river water, and whilst still wet were placed in a bath of six parts water and one part commercial hydrochloric acid, and were allowed to remain until all the carbonic acid gas was discharged. They were then washed again, and afterwards strung together and immersed in hydrochloric acid, diluted with six per cent. of hyposulphite of soda dissolved in water. The vessel was then closed, and left for forty-eight hours, when the sponges were taken out, washed and dried. M. Artus tried another experiment, in which the quantity of hyposulphite of soda was doubled. In a third experiment the sponges were, on removal from the bath, treated with hydrochloric acid, subsequently well washed, and then exposed to sulphurous acid gas. The sponges, however, by each of these processes were not thoroughly bleached, and a fourth method was tried. The sponges were well washed in hot diluted soda lye, then placed in a bath of weak hydrochloric acid and hyposulphite of soda, using only half the quantity of hyposulphite that was used in the first experiment, and a very satisfactory result was thus obtained.

A NOVEL PILL-COUNTING MACHINE.

Mr. Rufus Burton, of the Novelty Iron Works has shown us a novel machine for the purpose of counting and boxing pills, percussion caps or other similar articles that require an exact number in each package. The machine itself is so simple in construction that any intelligent child of ten years can work it; in fact by merely turning a crank the pills are counted, deposited in the boxes and pushed out on a platform to be carried away. Two persons are required to attend it, both feed and one also drives the machine by a treadle if so desired; thus saving one person from turning the crank. The space occupied by this machine is about two square feet and it is as easy in its action as a clock. A remarkable feature is the rapidity with which it works, being capable of boxing 36,000 packages in one day of ten hours. There is no mistake about these figures, for the action is entirely mechanical and a certain number of revolutions produce certain results. Mr. Burton has perfected his machine after two years of labor, and is about taking the necessary steps to procure a patent.

One of these machines will count pills enough in a day to physic an army; two of them will supply a continent.

SPECIAL NOTICE.

ALEXANDER SMITH, of West Farms, N. Y., has petitioned for the extension of a patent granted to him on Dec. 10, 1850, for an improvement in the manufacture of two and three-ply carpets.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Nov. 21, 1864.

All persons interested are required to appear and show cause why said petition should not be granted. Persons opposing the extension are required to file their testimony in writing, at least twenty days before the final hearing.

A Great Cannon Foundry.

The *Quarterly Trade Circular*, of Pittsburgh, contains an interesting article, from which we extract a few paragraphs, on the casting of the heavy 20-inch guns, and the details of molding and finishing them:—

"The Fort Pitt Cannon Foundry is very naturally an object of pride to Pittsburghers. Established in 1803, it cast cannon for three wars in which the Government of the United States has been involved. A portion of the guns used on the United States ships on Lake Erie, at Perry's victory, were cast at this establishment. Guns and shells were also cast for the use of our armies in the Mexican campaign; and since the outbreak of the rebellion, in addition to a large amount of guns of the more ordinary caliber, this establishment has made the largest guns in the world.

"At present the establishment is owned solely by Charles Knap, Esq. Since 1849, there have been 2,408 cannon and mortars made in the establishment, of which number 2,038 have been cast since the outbreaking of the rebellion. The following table shows the number and size of the guns cast, together with their weight, and the weight of the ball or shell carried by them. The army guns of 8, 10, 15, 20-inch are popularly known as columbiads:—

No. of Guns.	Size of Bore.	Service designed for.	Weight each Gun.	Shot or Shell.	Weight each Ball.
600	9-inch	Navy	9,100 lb.	Shell	70 lb.
10	10-inch	Navy	16,800 lb.	Ball	70 lb.
50	11-inch	Navy	16,800 lb.	Shell	130 lb.
58	15-inch	Navy	43,900lb.	Ball	450 lb.
1	20-inch	Navy	100,000lb.	Ball	1,000 lb.
300	8-inch	Army	8,400 lb.	Ball	64 lb.
100	10-inch	Army	15,900 lb.	Ball	128 lb.
50	15-inch	Army	50,000 lb.	Ball	450 lb.
1	20-inch	Army	116,497 lb.	Ball	1,000 lb.
260	8-inch	Howitzer	——	Shell	50 lb.
200	8 & 10-inch	Mortars	——	Shell	50 & 84lb.
150	18-inch	Mortars	——	Shell	200 lb.
150	4½-inch	Rifle guns	——	Ball	38 lb.

The balance 6 and 12-pounders.

"The 15-inch army guns enumerated in the above table are 17 feet 9 inches long. The navy guns, 17 feet 5 inches long, and both descriptions 4 feet in diameter at the trunnions. The finishing of such immense guns as the 15 and 20-inch columbiads, is a huge task, and one of great nicety. They are required to be finished inside and out, to a scale furnished by the Government, to whose exact dimensions the inspectors inexorably hold the proprietor of the works. The finishing of a gun is, therefore, necessarily conducted with the same care and completed with as much mechanical skill as a piece of the finest machinery. That our readers may have some idea of the care required and the nice adjustment to be observed in the use of the tools, we state that Government inspectors, if the size of the bore is a 100th of an inch larger than the scale furnished, reject the gun, and nothing remains but to break it up. Of this nicety an idea is further obtained by stating that a 100th is a line not quite as thick as the interstice between the teeth of the finest of those fine-toothed ivory combs used for infants' heads. The fact that but one gun has been rejected out of the large number cast, for such a departure from the scale, is a wonderful certificate to the skill of the workmen employed, and the finish of the machinery used. The guns are also rejected for other defects equally as minute. For instance, we noticed two guns that the inspector had refused to pass, in which the flaw that condemned them was of the circumference of an ordinary lead pencil, not over the 16th of an inch in depth, and situated in the extreme end of the surface of the trunion, a point where even if if it had been as big as an egg, it could not have in any way affected the wear of the gun. We have cited this nice standard, to which the guns must be cast and finished, to be accepted by the Government, to show that althongh at first but a huge mass of iron casting, of from 4 to 50 and 60 tuns in weight, the molds must be prepared and the casting done with the care of a fine bronze, and finished to the nicety of a watch movement, to produce a gun acceptable to the Government.

[Such nicety costs money, and the Government pays ten times as much money for its weapons as it should. A steam boiler is as dangerous in its way as a columbiad; and from the precedent above laid down, the braces inside ought all to be turned a certain size, and have hardened steel pins through them, when steam engines are furnished to the Navy Department.—Eds.

"The castings of these heavy guns are made on what is called the hollow or 'Rodman principle or patent' which not being generally understood by the public, may render a few words of description interesting. On the Rodman principle the flask is sunk in the pit as in solid castings; a tube closed and water-tight at the lower end, and fluted on the exterior for the escape of the gas generated by the metal, forms the base of the core. This tube is wrapped closely, along its entire length, with a sash cord, over which is plastered mud to the depth of three-fourths of an inch. Inside of this tube is a copper pipe for the purpose of conducting water to the bottom of the larger tube, from whence the water rises, filling the entire tube or core, and the surplus passes off from a pipe at the top. After the metal has been poured into the mold of the gun, water is allowed to run through the pipes for twelve hours, when it is stopped off for a half hour or so, during which time the heat of the yet uncooled huge mass of molten metal causes the cord, already mentioned as wrapped round the tube, to be consumed, when the entire core, which it would otherwise, from the shrinking of the metal around it, be impossible to remove, is easily withdrawn. Water is then allowed to run into the thus-cleared bore of the gun, until it is sufficiently cooled to be hoisted from the flask.

"By this process a close-grained interior is obtained, giving greater service to the gun; and being thus cooled from the interior affords the additional advantage of the metal shrinking upon the center, thereby causing a natural banding of the metal around the circle of the bore. Another advantage gained by this method of hollow castings is the avoidance of danger of cracking. A mass of metal as huge as the 15-inch guns cast solid, will crack in seven cases out of ten. This principle of casting was discovered and perfected in the Fort Pitt works by a few of the foremen of the establishment and Lieut. Rodman, when that officer was in charge of the works, and for which he obtained a patent. The value of this method of making guns is further shown by the result of experiments made at these works in casting guns of the same size in pairs, one on the hollow principle and one with the solid core. The result in one pair thus made was that while the gun cast on the solid method burst on the 299th discharge, the one on the hollow plan was fired 1,500 times without any perceptible strain. In another pair, purposely made with very inferior metal, the one cast on the solid plan burst at the 19th round, while the other was discharged 250 times. In another case a hollow cast gun was fired 3,800 times without any injurious results being apparent.

"The establishment in which these immense and in all respects wonderful guns are made occupies a square of ground 428 feet by 260. Of this space the foundry proper is 269 feet long by 90 wide. The boring mill is 338 feet long by 52 wide. The rest of the ground is surrounded by machine-shop, pattern shop, offices, etc., forming a hollow square. There are in use in the foundry for melting purposes, six furnaces and two cupolas. One of these furnaces, most probably the largest in the world, melts a charge of forty tuns of metal at one heat—two others twenty-five tuns each—three others fifteen tuns each, and the two cupolas twenty-five tuns daily each. As high as 309 tuns of metal have been run into guns in a week, without the use of the cupolas, and with but a portion of the furnaces. In the foundry there are six immense steam cranes for handling the guns when cast. Two in the boring mill for similar purposes, beside four large cranes worked by hand. The machinery is driven at the present time by thirty-three steam engines, worked from the steam generated by three pairs of boilers. Six of these engines are in use in the foundry, two at the lathe for finishing the 20-inch guns; two in the machine-shop; and twenty-three in the boring shop.

"The metal used in the casting of the monstrous guns made at this foundry is principally obtained in the Juniata region of Pennsylvania, and the balance from the Hanging-rock region of Ohio. Since the commencement of the war, these works have been continuously running, with but a stoppage of 24 hours in every seven days; and have, in addition to the great number of guns, turned out ten million pounds of shot and shell. There is an average of 280 hands employed in the establishment, whose wages amount to about $5,000 a week. For the few facts we have hastily thrown together in this article, we are indebted to Mr. Joseph Kaye, the foreman of the foundry."

ANOTHER SILK-WORM FROM ASIA.

We translate the following article by M. Guérin de Méneville, from *L'Invention*:—

"For several years the Academy of Sciences has welcomed with interest the communications which I have had the honor to make to it on one of the most important applications of zoology, the introduction and acclimation of new species of silk-worms, the products of which clothe the entire populations of India, China, and Japan.

"My attempts in this direction have been approved, for the immense good which would result from the introduction of these producers of textile fabrics is comprehended in view of the nearly irreparable cotton famine resulting from the deplorable American war.

"All now understand that the silk-worms which live on the ailanthus and on the oak may become auxiliaries susceptible of supplying to a greater or less extent this scarcity of cotton.

"Up to the present time I have attempted the introduction of three species of Asiatic silk-worms living on the oak: the *bombyx mylitta* of Fabricius, from Bengal; my *bombyx Pernyi*, from the north of China; and my *bombyx Lama-Mai* from Japan.

"To-day I have the honor of presenting to the Academy the first specimens received in Europe of a fourth silk-worm of the oak, the *bombyx* (*antherea*) *Roylei*, of Moore.

"Twenty living cocoons of this remarkable species were sent to me by Captain Hutton, obtained from the high plateaus of the Himalaya, on the frontiers of Cachmere. The caterpillar lives on the thick oak leaves, the *quercus incana*, which bears a close analogy with our oaks—*liege* and the holm, and it is evident that they, like the three others, may be fed with the oaks of our forests.

"Its cocoon differs from those of the other three species—as may be seen in the comparative collection which I deposited on the bureau—in having a greater volume, and above all in being surrounded by an envelope also composed of silk of a clear, handsome gray.

"It is evident that this new worm of the oak will be easily acclimated in the center and north of France, for the climate of the elevated parts of the Himalaya cannot differ notably from ours, since many of the vegetables of that central chain of Asia prosper very well among us.

"The twenty cocoons which I received on the 23d of March gave me at first three males that came out on the 7th of April, and I began to fear that I should see them all hatch and perish before the appearance of the females. Finally on the 19th of April, a male and female were hatched at the same time. These two butterflies united themselves together in the night of the 20th—21st, at one o'clock of the morning, and I obtained 108 eggs, a number sufficient to introduce the species, and to permit me soon to present specimens, first to the Society of Acclimation, and then to the agriculturists of all countries where the diverse species of oaks flourish.

"The instructions which I published in my *Revue de Sericiculture Comparee* (1863 p. 33), for the care to be given to my *lama-mai* of Japan, are applicable in all respects to this new species, of which I have the honor to present the first reproductions to the Academy, as I had the honor to present to it in 1858 those that permitted me to introduce the ailanthus silk-worm, which has begun to be acclimated in all the regions of Europe, Africa, America, and even Australia."

Increase of Insanity.—On January 1, 1849, there were 6,931 patients in private asylums, and 7,269 in public. In the former there are now only 4,455, and in the latter as many as 23,830. The Commissioners in Lunacy exercise a watchful care over the welfare of 44,695 persons of unsound or defective intellect.—*The Chemist and Druggist, London.*

Correspondence

The Reduction of Cast-iron by Superheated Steam Experimentally Tested.

MESSRS. EDITORS:—During the month of July the writer commenced a series of experiments upon the action of superheated steam upon the quality of iron, with the following points in view:—

1st, To see whether superheated steam could be used in the place of air for the decarbonization of the iron.

2d, If the chemical interchange would set in between the hydrogen of the superheated steam and the sulphur, in combination with the iron, to form sulphureted hydrogen gas, thus freeing the iron from such a deleterious substance, and correct perfectly what is technically known as red shortness.

3d, To see if the oxygen, if liberated, would unite with the carbon in the iron, producing an intense combustion as much increased in intensity as the ratio of oxygen to the hydrogen in steam exceeds the ratio of oxygen to hydrogen in the atmosphere, the latter principle being involved in the Bessemer or pneumatic method of making steel. If the superheated steam process were successful, it would do away with the blowing engine, as the pressure would be derived direct from the boiler, thus economizing the expense of the engine, and the cost for attendance, &c.

As this matter was solely theoretical, and we could not say how it would act until fairly tried, apparatus was devised for testing the matter thoroughly by experiment. The writers are much indebted to E. B. Ward, Esq., of Detroit, for the apparatus, and the great interest he took in the experiments, which did not concern him particularly, but had an important bearing upon the iron interests, in the prosecution of which he has been so eminently successful.

Our apparatus consisted of a coil thirty-four feet long, three-eighth pipe, coiled within a foot circle. Around this was built a furnace, where a bright red heat could be brought upon every portion of the coil, by means of charcoal; the furnace was connected with the main boiler in the laboratory by a pipe, in such a way that the condensed steam would not have to traverse the coil. From the coil the pipe led to a Sefstroms furnace driven by a fan, containing a crucible holding a sufficient quantity of molten cast-iron, combined with a large proportion of sulphur. Into this, while in a liquid state, with steam at a temperature of 1200° Fah.—the tuyere at the end of the steam pipe, transmitting the superheated steam, was lowered into the metal. We were disappointed that the molten iron did not evolve gases, and burst into vivid combustion. We were aware that ordinary steam cooled the metal, and therefore was inapplicable for use in the temperature of iron, but we had hoped this might be due to the ordinary aqueous vapor carried forward in the swift mechanical current of the steam, and thought if we could deprive the steam of its moisture—that is, make a perfectly dry steam—that this objection would cease. Such proved to be by our experiments a false deduction, for so soon as steam was introduced, the molten metal passed into a semi-fluid and then a solid state. When the steam was first brought in contact with the metal the iron had the appearance of boiling and was rapidly chilled. As no vivid combustion set in, we considered that it was due entirely to the mechanical displacement under the force of steam. We read in text-books that iron at a red heat decomposes water. We have not succeeded in proving this decomposition to be to such an extent as would render it available in the arts, for so quickly cooled is the iron that the decomposition is so small as to be nearly imperceptible.

We could reasonably infer, if the superheated steam was decomposed by contact with the molten iron, that an oxy-hydrogen mixture on a grand scale would be formed, and a small volcano, generating an intense heat, be created. In order to modify this intensity, ordinary steam could have been introduced along with the superheated steam, then the heat generated would be under the control of the operator. We tried melting the iron under the flame of the oxy-hydrogen blowpipe; a bead was formed, which was metallic iron encased in a shell of oxide of iron. Here there is another point to be viewed, viz.: the iron in the mixed gases is rapidly oxidized, and loss of metal to a great extent incurred. Unfortunately for the iron manufacturers the play of affinities between the elements of steam and iron, with its impurity, are in the wrong direction; combustion is not accelerated, chemical decompositions do not set in, from the fact that the temperature is rapidly lowered, for reasons already given. Since making the above experiments, information relative to the patent lately taken out by Mr. Parry, of England, on this subject, has reached us. His method is to introduce steam as well as air into the molten iron. The steam is introduced until the metal is brought to a semi-fluid consistency, and then shut off, and air forced through, which again increases the temperature, these alternate exposures of the molten metal conducing to desulphurize and purify the metal. From the experiments we have already detailed we are forced to conclude that the superheated steam claimed by Mr. Parry to purify the metal, has had attributed to it the benefits derived from the air blown through; and he has unwittingly placed to the credit of the steam what should have been credited to air. With all the facts we have learned from other sources, added to those we have derived from practical experiment, we are of the opinion that, as yet, the pneumatic or Bessemer process is superior as regards economy, practical working, and ease with which it is managed. We are also led to the firm conviction, deduced from our experiments, that the role played by superheated steam is a mere imaginary one; it does not desulphurize to any extent, or to one-half the rapidity that the pneumatic process does, but, in fact, if any chemical action takes place, it is the oxydation of the metal.

These results are submitted, and are not intended to cast a blight on future experiments, but to show that steam or superheated steam does not play such an important part in the iron manufacture as many have supposed.

DR. S. P. DUFFIELD,
L. M. HART.

Dr. Duffield's Laboratory, Detroit, Mich., Aug. 10, 1864.

[In the most important sense in a scientific point of view, the experiment described above was eminently successful—it settled the point which it was tried to determine.

Before we had finished reading the account we came to the conclusion that the iron would be cooled. The steam, it is stated, was introduced into the molten iron at a temperature of 1200°, while the temperature of the iron could not have been below 2200°. Consequently, if one pound of steam was mixed with one pound of iron, the temperature of the mixture would be a mean between the two, 1700°, provided the specific heat of the two substances were the same. But this is not the case; the specific heat of steam is 0·48, and of iron 0·11, consequently the heat required to raise the temperature of one pound of steam 500°, if taken from iron, would lower the temperature of more than four pounds of iron 500°. As it would not be necessary to lower the temperature of the iron nearly 500° in order to solidify it, unless it was heated far above its melting point, it is probable that in the case of this experiment one pound of steam would solidify more than twenty pounds of iron.

The cooling would be about equally rapid, whether the steam was decomposed or not. When water is decomposed there is just as much heat absorbed, or destroyed, as there is generated when water is formed by the combustion of hydrogen. According to Andrews, one pound of oxygen in burning hydrogen generates 7,607 units of heat, therefore, in decomposiug sufficient water to obtain one pound of oxygen, there would be a destruction of 7,607 units of heat. This is almost if not precisely, the quantity of heat that would be generated by the combination of the pound of oxygen with iron; Andrews's experiments give it a little less, 7,441, and Dulong's a little more, 7,812. If the oxygen set free from the water entered into combination with the carbon of the cast-iron, the heat generated would be less than that absorbed in the decomposition of the water, and the cooling of the iron would consequently be more rapid than if no decomposition of the water took place. One pound of oxygen in combining with carbon to produce carbonic acid, generates according to Andrews, 5,332 units of heat; and according to Favre & Silberman, 5454 units.

There is no doubt that iron at the temperature of red heat will decompose water, but whether it will at the higher temperature of the melting point of cast-iron, has not, perhaps, been positively determined. It is settled, however, that carbon will decompose water at very high temperatures, and the oxygen of the water would consume first the carbon in the cast-iron before it attacked the iron.

That the hydrogen, if set free, would combine with the sulphur of the iron to form sulphureted hydrogen, has been demonstrated in the extensive use of iron for purifying coal gas.

Finally, the results in the above experiment are no indication of the effect that would be produced by the introduction of a small quantity of steam mixed with a large proportion of air. As the oxygen in the atmosphere is uncombined, the heat generated by its combination with the carbon of the cast-iron would not be destroyed, and the metal would consequently be kept in fusion; thus allowing a free commingling of the several substances, and their chemical action upon each other.—EDS.

The Way Cubans destroy Ants.

MESSRS. EDITORS:—In your number of to-day you have an article stating the ravages committed by the ants in California, but you do not say whether any attempts have been made by the gold men to destroy them. Now, as I wish every one to profit by my knowledge, small as it is, I would, if allowed, suggest, through your columns, a remedy which I have tried with success. It is simply to administer them good doses of granulated cyanide of potassium. California being a dry country, as I understand, more so than Cuba at any rate, the application will meet with far better success than in the latter country. The best way to apply it is to roll it in orange or lemon rind. The effect produced is an irritability such that the ants will destroy one another. Arsenic also produces a similar effect, and is administered alike, yet its effects are not as telling.

Another way is employed in Cuba, which is simple in itself yet surprisingly effective. It is to burn them. The way to get at them for this purpose is by putting honey or some other sweet substance in a soup plate, and when filled with ants a burning paper is held over and close to them. This operation repeated often, changing the place every time, destroys them, but it does not destroy them all; the nest remains, and only the working class is attained, whereas by the cyanide of potassium the rind is carried to the cells, the entire community partakes of it, and even when the whole of them do not eat of it, they are still destroyed by their companions' madness.

F. M. C.

New York, August 27, 1864.

Inventors, set your Wits to work!

MESSRS. EDITORS:—We have frequently read of the capture of Paymasters' and Express Co.s' safes, containing large sums of money, by guerrillas, and we have heard of many very large amounts of money narrowly escaping capture while *en route* to the front to pay our troops in the field.

Now cannot some one of your hosts of readers invent some sort of mechanism by which the entire contents of a paymaster's or other safe might be instantaneously destroyed, or canceled in such a manner that would prevent the infernal gangs of robbers and murderers infesting our lines of communication having any benefit thereof?

It seems to me that safes might be so arranged that every greenback in them might be as effectually canceled as if done by the hammer in a bank. Powder will not do, as it will only scatter the bills; paper packed as bills are in a safe is very hard to burn. So your inventors will have to use some device that will cancel one million dollars in the same time and as simply as the spiking of a cannon.

A. F.

Louisville, Ky., August 20, 1864.

THE first salmon caught in the Connecticut river for forty years was taken at Chicopee the other day, and served at the Massasoit House, Springfield.

A Plea for the Cats.

MESSRS. EDITORS:—A late issue of the SCIENTIFIC AMERICAN contains a recommendation (by the *Shoe and Leather Reporter*) to "skin the dogs and cats, and put their hides to some practical use." In this part of the country, the number of yelping curs about a dwelling is considered a sure index of the worthlessness of the owner; and these clamorous, half-starved brutes are well known to render almost impracticable the otherwise interesting and lucrative avocation of the sheep farmer.

But what is the havoc of dogs—and it reaches into the millions—in comparison with that committed by those pestiferous little burglars, rats and mice, named by naturalists, most appropriately, the *mus* family; for truly, what their teeth spares, their filth mars? What are all the ravages of prowling dogs, or the midnight orgies of cats, to the inroads of these indefatigable depredators, that dispute with man his very home and daily bread—that, cunning as they are voracious, get the hang of the traps almost as fast as invented, and snuff poison afar off? What though the performances of poor puss, in a strictly operatic point of view, be not joyous but grievous, has she not ever proved herself the only creature possessed of any rights which the *mus* family have felt bound to respect?

No! Mr. *Shoe and Leather Reporter*, catch, skin and tan every dog and rat you can, and joy go with you, but we cannot spare a single mouser.

GEO. H. KNIGHT.

Cincinnati, Ohio, Sept. 1, 1864.

[Appearances are deceitful. Mr. Knight's cats may be all that he claims for them, but those in this vicinity would, we think, be improved by skinning. Fine gloves are made in Paris from rat skins, and the sewers yield a handsome income from the rats slain therein. Now that "kid" gloves cost $3, perhaps a wholesale slaughter of the cats and dogs may bring down the price.—EDS.

THE WAY MATCHES ARE MADE.

The Wallingford (Conn.) *Circular* gives the following interesting account of a visit to the match factory of Mr. P. T. Ives, in that village:—

"The match timber is purchased in New York city, and shipped here in small (gross) bundles, about two feet in length, and of the right size and form. The best wood for matches is said to be clear white pine, which possesses the softness required for the manufacturing process, together with the necessary stiffness and inflammability. The wood is slit into splinters of the right size, by a grooved hand-plane. This labor is performed more cheaply in the city than the manufacturers can get it done at home. These bundles of splinters are first cut six times in two, leaving them the length of two matches. These cut splinters are next wound, or set, by an ingeniously-contrived hand-machine, on to common webbing, making a circular block or wheel about one foot in diameter, and containing about 800 splints. This stick-setting machine, as the workmen call it, is a very interesting piece of mechanism and a great labor-saver. The 'setting process' was formerly executed entirely by hand, requiring ten or twelve girls to perform the same labor that is now done by two machines, run by a blind man and two small boys. The splinters are put horizontally into a sort of hopper in regular order—the little boys arrange the webbing, the blind man turns the crank, and the splinters are wound up in the webbing in the most rapid and perfect order. Not a splinter is allowed by the inexorable machine to fall out of the ranks.

"The next process is that of dipping. The wound or 'stuck' splinters are first dipped in brimstone, and then in a composition of phosphorus, glue and whiting. The glue is the adhering element of the compound, and the whiting is used to give body and brittleness to it. These three substances are found to make the best compound thus far discovered for match-making.

"Phosphorus is mainly imported, we were informed, from France. This substance was first discovered in 1769 by Brandt of Hamburg; but the process of obtaining it was very difficult and expensive. About the year 1680 it was first used for igniting sulphur matches. In 1769 it was discovered to be an ingredient of bones, and afterwards it was found in various rocks, especially in combination with lime, But it is now, we understand, mainly obtained from the bones of animals and human beings. The production of this article in England and France in 1853 was estimated at 300,000 pounds, and its consumption is said to be almost wholly for matches.

"After the splinters are dipped, first one end and then the other, in both brimstone and the phosphoric compound described, they are placed on racks to dry. They are then unwound from the webbing and cut in two once more, and are ready for boxing.

"The match boxes are manufactured mostly outside of the factory, by boys and girls of the village, and at an apparently very low figure. The materials are all prepared at the shop; and the box-makers receive only seventy cents per thousand for the smallest boxes, and one dollar and twenty-five cents for the larger ones.

STATISTICS.

"Mr. Ives employs three men, three boys, and five girls, and turns out daily about one hundred and fifty great gross of matches. He uses annually about 600 pounds of phosphorus; six tuns of brimstone; five tuns of straw board for boxes; 1,200 pounds of wrapping paper; eighty reams of paper for covering boxes, not counting that used by the printers in making the labels for them; and from forty to fifty thousand bundles of match-splints.

WAR PRICES.

"Six years ago phosphorus was worth eighty cents per pound, now nearly two dollars; brimstone has risen from two and a half cents per pound, to six and one-fourth; match-splints from twelve to twenty-three cents per gross; straw board from fifty-five to one hundred and twenty dollars per tun; covering paper from one dollar and seventy-five cents to four dollars and a quarter per ream. Matches have risen in price proportionally, and the manufacturer's profits are as great as ever. The new tax on matches will nearly double their prices.

DRAWBACKS.

"The phosphorus produces an exceedingly unpleasant odor, which pervades the entire factory, and is pronounced by physicians very unhealthy. We saw posted upon one of the doors of the factory, an account of the terrible experience of a girl in New York city, occasioned by diseases contracted in a match factory; and we read that in Germany the attention of the Government has been called to the subject, on account of the alarming extent to which diseases there prevail in match factories. But the workmen in this factory did not seem to regard their work as particularly unhealthy.

"After the matches are first dipped they are very liable to catch fire from spontaneous combustion, or from the slightest accidental friction. The phosphorus itself has to be kept in water to prevent its consumption. It is difficult to manage it in warm weather, and, on this account, during the hottest season, the workmen are employed nights, and lay by during the day.

MATCHES IN OLD TIMES.

"The *Cyclopedia* tells us that among rude nations fire was obtained by rubbing together two pieces of dried wood; and the practice among civilized people was to procure it by the flint and steel, catching the particles of steel struck off and rendered red hot by the friction, on dry and highly inflammable tinder. To this, succeeded the use of phosphorus in 1680, which was rubbed between folds of brown paper, till it took fire, and it was then made to ignite a stick, one end of which had been dipped in sulphur, and which may be considered the earliest form of the common match. The cost of the phosphorus, however, prevented its general use either in this form or in several others contrived for the same purpose. One of the most successful of these was to partially burn a bit of phosphorus in the confined air of a small vial, the effect of which was to line it with the oxide of phosphorus; the vial was then corked, and when required for use a sulphur match was dropped into it; the match was thus ignited by the chemical action produced, or by afterward rubbing it on a piece of cork. We next read that small sticks of wood dipped first in sulphur, and then in a composition of chlorate of potash, flowers of sulphur, calophony, gum or sugar, and cinnabar for coloring, were sold as chemical matches. Accompanying them in the box was a vial containing sulphuric acid into which the match being dipped, it was instantly ignited by the chemical action between the acid and chlorate of potash. The other ingredients were added simply on account of their combustible qualities. To this, in 1829, succeeded the use of the lucifer match, invented by Mr. John Walker, chemist, at Stockton-upon-Tees. Mr. Walker manufactured but few of these himself, but Prof. Faraday learning of them, procured some, and brought them into public notice. Their useful properties were soon perceived, and their manufacture rapidly increased, till it became an important branch of industry in Europe and the United States.

"The reader will remark that the match-factory of our village is comparatively a small affair—no steam or water-power being employed, and only eleven hands. It is, however, a fair sample of numerous work-shops found in our New England villages.

"In contrast, it might be mentioned that one match manufacturer in Herkimer county, N. Y., is said to have consumed within the last eighteen years 2,225,000 feet of lumber, producing 6,500,000,000 matches. There is also another very large manufactory in Lewis county of the same State. In these factories nearly every process is executed by machinery. Splints are exported from the United States to the West Indies and South America, where the manufacture of matches has been established within a few years past. The matches themselves are largely exported to the East and West Indies, Australia, China, Mexico, South America, the Pacific coast, etc. The total amount manufactured in the United States is estimated at 7,000 gross of boxes daily, containing 35,700,000 matches, and worth $3,000. So saith our authority, the *American Cyclopedia*."

What the Correspondents say of the "Monitors."

The editors of three of the leading city dailies, the *Evening Post*, *Tribune*, and *Herald*, sitting in their offices a thousand miles from the scene of conflict, have denounced the monitors as inefficient in the battle of Mobile Bay, but all three of the correspondents of those papers, who were eye-witnesses of the fight, show conclusively by their narratives, and state distinctly, that the victory was won wholly by the monitors. We gave last week the statements of the *Tribune* and *Evening Post* correspondents; here is what the correspondent of the *Herald* says:—

"The monitor *Chickasaw* received one plunging shot through her deck; otherwise she and her consorts of that class passed through the action uninjured, always excepting the *Tecumseh*. No one was injured on any of them. The turrets of all of them, save one, refused to revolve, for some unexplained reason soon after the action commenced, and they were worked by yawing the vessels about to bring their guns to bear, the same as with other vessels; but it is a slow process with boats that handle no easier than do these craft. Their ability to repel rifle shot of heavy caliber, was, however, fully shown, and their powerful guns being thus taken into close range of the enemy with impunity, were of great service. Indeed, the *Manhatlan* made the only penetrating shot into the *Tennessee*, and the *Chickasaw* compelled the same vessel to surrender. It was, therefore—and it is but just to put the fact on record—the monitors that finally beat the boasted *Tennessee*, as the first monitor beat the prototype of that vessel, the *Merrimac*, earlier in the war, in Hampton Roads. This fact, while it is creditable to those vessels as a class, does not by any means prove that no improvements can be made upon them."

AT a fire in Aberdeen, last week, the women of the neighborhood stood in the harbor nearly up to their armpits, dipping water for the service of the engines. —*Canada Paper*.

[It would seem as though a little common sense was wanted in Aberdeen. Why not put the engines in the water instead of the women?

A FEW days since, a carrier pigeon flew from Exeter railway station to Camden-grove, England, a distance of 171 miles in little over five hours. [Wild pigeons have been shot at the North with rice in their crops.—EDS.

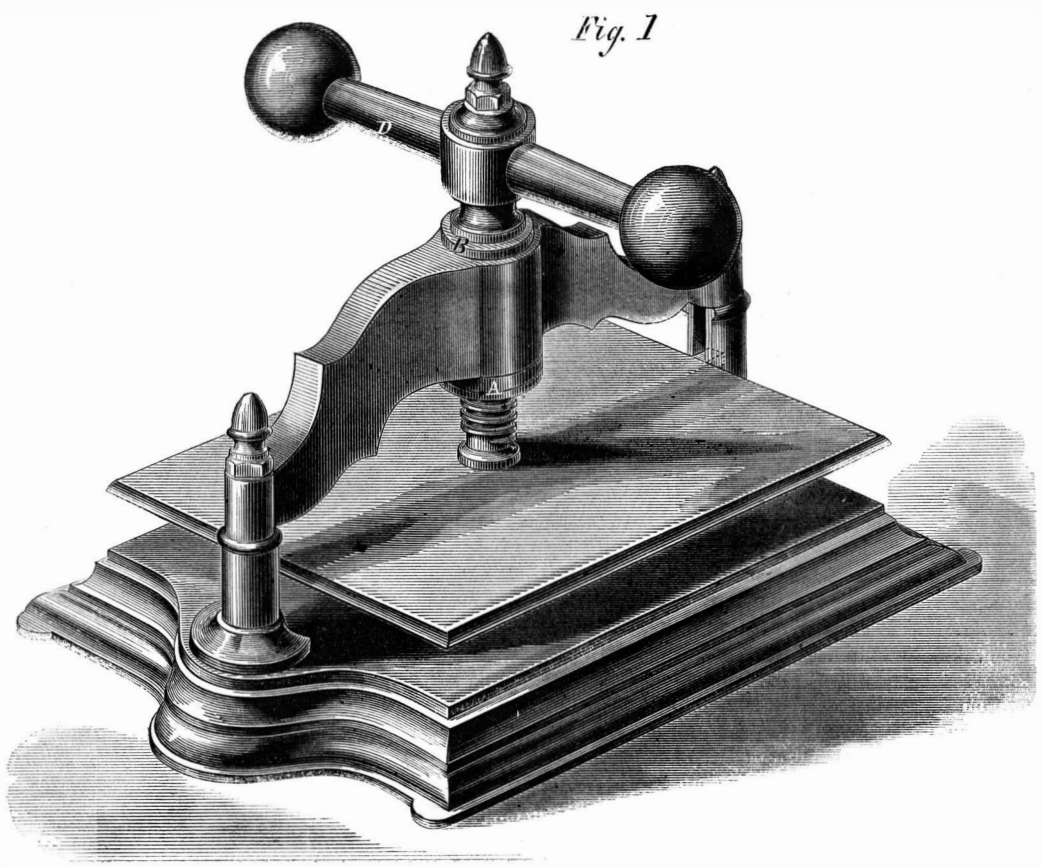
A block of silver, in the shape of a writing desk weighing two hundred pounds, and valued at $4,322, was lately sent from Nevada to the Sanitary Commission.

Copying Press.

Copying presses, as ordinarily made, have the thread the screw works in cut in the clamp so that when the thread wears by frequent working, the press is useless until a new clamp is provided at great expense. In the press shown herewith the thread is cut in a bush or thimble, A, (see Fig. 2); said thimble being fitted to the clamp, B, and there secured. The bolt, C, screws into the thimble, which is hollow down to the screw, and the handle, D, is held in place by the bolt; so that when the thimble is revolved, by turning the handle, the screw of the press is drawn up in the hollow of the thimble. By the use of this thimble greater economy of construction and repair is attained, and the improvement can be applied to old screw presses. The entire patent is for sale.

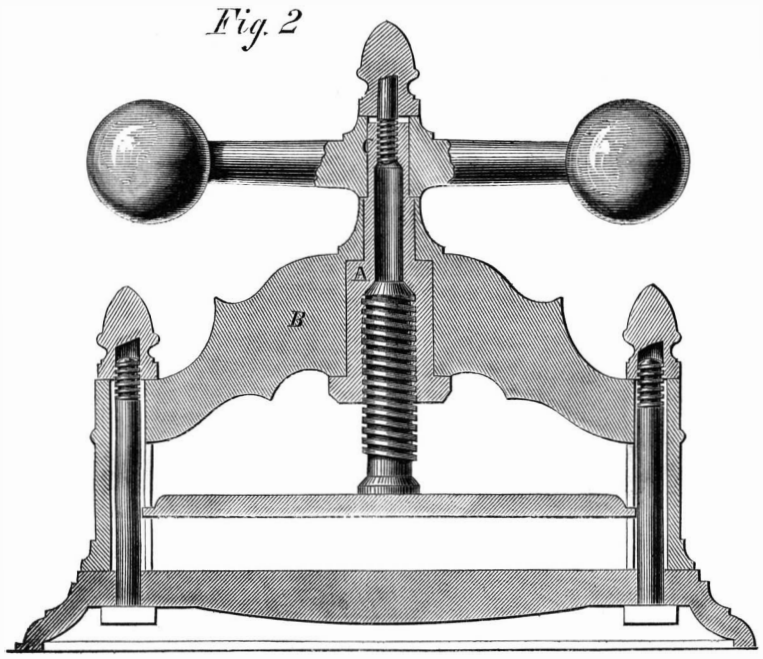
It was patented on June 21st, 1864, by G. C. Taft, of Worcester, Mass., and assigned to T. H. Dodge, of the same place, of whom all further information can be had.

Fig. 1



TAFT'S COPYING PRESS.

Fig. 2



Home Amusements

Social amusement is almost as necessary as bread and butter to the well-being of young persons. It is pleasing to notice the gradual change that is taking place in the practical forms of home amusements. The old kind of card-playing ceases to be the exclusive occupation for the leisure hour, and in its stead we have the "Geographical Games," or "The Checkered Game of Life," and many others, so contrived that while they intensely amuse they also impart excellent instruction to all the players. Take the "Game of Life" for example: "It is played on a board having the same number of squares as a chess or checker-board, and unlike most games, the principles of chance and science are so intimately united, that any child who can read can play, and yet it is as capable of furnishing amusement to adults as backgammon or any similar standard game. This game represents, as indicated by the name, the checkered journey of life, and is intended to present to the minds of the young, the various vices and virtues with which they will come in contact in their journey through life, and to illustrate the effects of each, in a manner that will make a lasting impression on their minds, the whole being embodied in an attractive and entertaining amusement, well calculated to interest youth and adults."

We are gratified to notice in this connection the success of a large publishing house at Springfield, Mass.—under the firm of Milton, Bradley & Co.—devoted almost exclusively to the publication of games of the character to which we have alluded. Their catalogue is quite large, and the style of publication superior.

Strength of Wood and Iron.—Experiments have shown that a 3-inch oak plank is equal in strength to a ths-inch iron plate.

The Sad Story of the "Great Eastern."

The result, produced by whatever cause, may be thus stated:—£1,000,000 has been spent and nothing remains for the shareholders, original or preferential, or for the bondholders; £15,000 realized at public sale for the ship will be hardly sufficient to pay the preference creditors and the law expenses. Everything available, including office furniture, was sold before the directors disqualified themselves, though they did not forget to send in claims for a half year's fees in arrear; and all that is left besides the balance of the £25,000 after paying expenses and preference claims, is £15, which is in the hands of the official liquidator. The ship has been bought for this ridiculously small sum by a new company, of which three of the late directors of the Great Ship Company are the principal shareholders and directors. Surely this is a state of things which deserves, nay demands, inquiry, especially just now, when limited liability companies are increasing in number so rapidly; for if the limited company can with impunity waste all the property entrusted to their care and leave a large amount of debt, without anything whatever to meet it, and without any legal responsibility or accountability, some new provisions are most assuredly required. No private trader in times past could waste his creditor's property without incurring any responsibility; and it appears impossible that when the accounts of the company are rendered to the Court of Chancery, some persons can escape severe censure. The ship was designed and built for the Eastern or Indian trade. Every appliance and fitting was destined for a long voyage; the capacity for cargo, the space allotted for fuel, the smallness of her power compared with her tunnage, her size, her hight between decks, and special attention paid to ventilation, were all considered for a long and mainly tropical voyage. But the directors into whose hands she fell, either ignorant of the suitability of the ship for what she was intended, or wedded to other views, decided upon placing her on short voyages in northern latitudes, where the arrangements applicable to tropical climates became a source of discomfort, where her capacity for fuel was unnecessary, where her splendid accommodation for first and second-class passengers was useless, where her speed was not so superior to every rival as to give her any practical advantage, and where indeed every special peculiarity in her construction, size, power and economy of management became rather sources of loss than of advantage.

I will assume that when the directors first attempted to divert her from the original destination, they believed it would be beneficial to the shareholders; but on what principal of profit they kept her on the American line, when each of the eleven voyages produced a large loss, exclusive of the heavy staff expenses at Liverpool and New York, is quite unaccountable. This system of losing by every voyage was persisted in by the directors, notwithstanding continual warnings and the actual result published in their balance sheet.—*London Builder.*

Artificial Tails for Horses.

A London paper thus describes a new method of decorating horses wanting dignified tails:—

"It often happens that two carriage horses may be perfect matches in all respects but their tails. The one may have a fine flowing caudal appendage, and the other may be curtailed of his fair proportions. In such cases the art is called in; the groom matches the flowing mane with an equally flowing tail. The false tail is cunningly placed on in the following manner: The caudal stump is shaved, and the false hair is fitted on to it by the crupper, and detection is impossible. There is scarcely a first-class stable in London, where many carriage horses are kept, that these false tails are not an absolute necessity of their getting-up, and they must be seen hanging on the walls as a matter of course, and are looked upon, in short, as only a part of the harness.—*London Review.*

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Scientific American.

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NEW YORK, SATURDAY, SEPTEMBER 10, 1864.

Contents:

(Illustrations are indicated by an asterisk.)

ENGLISH AND AMERICAN RAILROADS.

Several acres of paper have been written over to show the superiority of English over American railways in "permanent way." When some young and conceited Englishman lands in this country, and obtains a situation on one of the newspapers which are owned and edited by Englishmen or Scotchmen in this city, he generally devotes his time to prying out and publishing invidious comparisons against the country in which he prefers to live, and in favor of that which he has chosen to quit. Even some of our own engineers have, on visiting England, been so impressed with the massive bridges and deeply balasted tracks of the railways, that they have immediately set to work to produce ponderous volumes in praise of the British system.

Now, the truth is, if the same men—the engineers and directors—who constructed the railroads in England had had the management of constructing a system of railroads in this country, they would have built the roads essentially in the same way as that in which the American engineers and directors have built them. The circumstanees of the two countries are entirely different, and the shrewd business directors and able engineers of each country have wisely adapted their operations each to the circumstances of their particular case.

England has twenty millions of inhabitants crowded together on 50,000 square miles. They have been accumulating property for a thousand years, and capital has become so abundant that only three per cent per annum can be obtained for its use. Millions of dollars are constantly lying idle, awaiting some safe and paying investment. In this country there are thirty millions of people scattered over 3,000,000 of square miles. The country is comparatively new, and the accumulations of capital are small. What little capital there is, is wanted for innumerable purposes in the development of the boundless resources of this vast region. Every dollar that is offered for loan is eagerly grasped at by a hundred applicants.

Railroads are so very useful that it was wise to appropriate such portion of our highly prized capital as was absolutely necessary to build them, but to use a single dollar more than was necessary would have been the hight of folly. When the Western railroad was constructed, from Worcester to Albany, the stock was taken by the merchants of Boston from public-spirited regard for the prosperityeof their city, and at enormous sacrifice of their individual interests. Hundreds of thousands of dollars worth of the stock were sold by the men who subscribed for it at eighty cents on the dollar immediately after subscribing. We have known some of these merchants struggling in poverty with their refined and cultivated families, who attributed their bankruptcy to the withdrawal of capital from their business for investment in the stock of the Western railroad. This was in the richest city and the most densely populated State in the Union.

The consulting and resident engineers of this road were Major McNeill, Major Whistler, and Capt. Swift; they all graduated with high honors at West Point, they were members of the Engineer Corps of the United States Army, and they were not only as accomplished, but as thorough, engineers as ever lived. Nothing would have suited these gentlemen better than to turn arched culverts over all the brooks, and to construct all the masonry of hewn stone. They struggled hard with the directors to have the road graded all the way for a double track, but it was impossible to raise the money. They accordingly built the road as well as they could with the means at their command, and neither culvert nor abutment upon the line has ever fallen, or ever will fall. The masonry, though rough, will stand as long as the granite hills from which it was quarried.

Some of the most intelligent of the English engineers have expressed their appreciation of the practical sense shown by the American engineers in the construction of our railroads. Those writers who rail against the narrow cuts and wooden bridges on our roads, instead of proving the superior thoroughness of English engineers, merely display their own ignorance of the controlling circumstances of the case.

A COMMON FAULT.

No piece of work can be properly turned on a bad center. It is a very common thing to see jobs in large shops centered for turning by the use of a center punch, and in many cases a very stubbed, blunt ended, triangular-pointed one at that. Some slovenly workmen think that a center punch which is not fit for anything else, is good enough to use for turning, and a most extraordinary collection may at times be seen on lathes.

We have repeatedly advocated the use of the drill for centering work, and we here reiterate this advice: no job however trivial should ever be turned without it. Even screw bolts, which, after they leave the shop may never come within a thousand miles of it again should be carefully centered. Principle is the point aimed at, for when a workman gets in the habit of doing work properly it will be almost second nature to him: when he gets careless he uses a center punch on all kinds of work indiscriminately. When work is centered with a drill there is no possibility of its becoming untrue unless chipped with a round-nosed chisel on purpose; but with a center punch there is no likelihood of its *ever* being true, especially if a punch with an end like a carrot is employed, as is sometimes the case. It often occurs that work is turned, in a lathe which has centers worn off at the point. When the drill is not used the center in the work turned wears just the shape of that in the spindle of the tail stock; now if the work so turned be put in a lathe which has sharp, true centers it cannot be turned at all unless it is re-centered, which in all likelihood makes it run like an eccentric. Have good drills and drill the centers deep, so that the end may be cut off even, and the body will remain true; with these precautions there is no possibility of doing bad work, so far as the centering is concerned.

MANIPULATION OF METALS.

There are many occasions where a knowledge of some simple alloy or a peculiar solder would save hundreds, yes, thousands of dollars, just as a life may be saved by merely tying a pocket handkerchief tightly above a bleeding artery. It is only a few years ago that the valve-stem on the engine that runs the *Herald* presses broke in the dead of night, when but half the edition was run off. This was a dilemma, indeed, for a valve-stem is not made in half an hour, neither can it be bought at a hardware store like a pound of nails. The engine was injured in a vital part, and unless it was mended the entire edition would be stopped and incalculable loss sustained. Fortunately for the proprietors there was one of the employes present who understood the manipulation of metals, and he informed the bystanders that if they would collect their spare silver he would restore the broken part to a condition of usefulness.

It was done.

The stem was brazed with silver solder, and the engine performed until morning, so that the whole edition was successfully run off. But for the presence of the adept referred to, and his knowledge of this simple process, very great loss would have been incurred.

Some of our readers may be caught in just such a predicament and we therefore append a formula for a solder which will braze steel. It is as follows:—Silver 19 parts; copper 1 part; brass 2 parts; if practicable charcoal dust should be strewed over the melted metal in the crucible.

A good article of yellow brass is extremely desirable for fine work in telescopes and optical instruments generally. A metal that works free and soft under the tool, and is capable of receiving a fair luster from the burnisher, is always in request. A good yellow brass can be made from the following metals: That denominated "watchmaker's brass" is made of one part copper and two parts zinc. German brass is equal parts of copper and zinc; the addition of a little lead makes the metal work easier and less liable to tear under the tool.

In all these mixtures the zinc must be added last as it is a volatile metal and fuses at a much lower heat than the copper; the melting point of which is 4587 degrees, while that of zinc is only 700 degrees.

Iron and brass must be united by spelter, which is equal parts of brass and zinc. When the joints are cleaned and wired together fine powdered borax is applied to them as a flux. The solder is then dusted on in the form of a powder, or fine filings, and melted in, either with a blow-pipe or by being placed in a charcoal fire. Care must be taken not to melt the brass to be brazed. The solder of course has a much lower fusion point than the metals to be joined, else they would both run at the same time.

A simple method of case-hardening small cast iron work is to make a mixture of equal parts of pulverized prussiate of potash, saltpetre, and sal ammoniac. The articles must be heated to a dull red, then rolled in this powder, and afterwards plunged into a bath of 4 ounces of sal ammoniac and 2 ounces of the prussiate of potash dissolved in a gallon of water.

These simple rules are practical, and will give good results with good workmanship. If the cast iron is overheated and burned, the unskilful workman must not blame the formula for his failure; or if he put on such a blast as to blow the solder out of the joints, when brazing, and instead of making a joint spoils the job, he must not charge it upon us, but keep a brighter look out in future. Good rules are useless unless put in force and practiced with skill and intelligence.

CAN THE COUNTRY AFFORD THE WAR?

The wealth of any country is composed of the wealth of the several individuals in the country. Where there are no money-making men in a nation, the nation will have no wealth. When this country was inhabited by the Indians it had the same natural resources that it has now, but there were no accumulators among the Indians, and their aggregate property in wigwams, moccasins, bows, arrows, deer-skins, clothes, and other forms of material wealth over the whole vast area of what is now the United States, probably did not equal in value that which is now piled in the warehouses of a single acre in this city.

A very small portion of the wealth of the country has been brought into it from abroad, or obtained from its gold mines at home; it has been created within our own borders in the way in which all of the wealth of the world has been created. A shoemaker takes a piece of leather worth two dollars, and fashions it into a boot worth five dollars; by judicious cutting, sewing and hammering, he imparts to the material an increased value of three dollars. This operation is a sample of the way in which all material wealth has been produced; it is by increasing the adaptation of some portion of matter to the gratifica-

tion of our desires, by some change in its condition, or form or location.

John Jacob Astor said that it took him longer to make the first thousand dollars of his fortune than it did to make any hundred thousand afterwards. It is the same with the other individuals that make up the community. The possession of capital increases their power of producing and accumulating wealth. A number of persons possessing 13,000 millions of dollars would increase their property more rapidly than they would when they possessed but 6,000 millions. It is therefore probable that in 1859 the wealth of the loyal States was increasing at the rate of 800,000 millions per year—the average for the whole decade being 600 millions per year. This is quite equal to the cost of the war.

It seems, therefore, that if arrangements could be made to hand over the increase of wealth to the Government, the country could support a war as gigantic as this for an indefinite period of time, without any diminition of the national wealth.

TURPENTINE AND NAPHTHA IN PAINT.

When a piece of wet cloth is hung up in the air, the water which it had absorbed is evaporated, and floats away in the atmosphere. The cloth is dried by the removal of the moisture. But in the drying of paint there is no removal of moisture. The linseed oil absorbs oxygen from the atmosphere, and is changed from a liquid oil to a solid rosin. In the place of losing by evaporation, it gains in weight. It is, perhaps, hardly more proper to call the process "drying," than it would be to speak of iron drying when it cools from the liquid to the solid state, or of water drying when it freezes into ice.

Spirits of turpentine is a solvent of linseed oil, and when it is mixed with paint it renders the mixture more fluid, thereby facilitating the spreading of a thin and even coat over the surface. It is very volatile, and soon evaporates, but a small portion is converted into resin by the absorption of oxygen, the same as the oil, and therefore it adds slightly to the body of the paint. In evaporating it opens the paint to the action of the atmosphere, and thus hastens the process of solidification.

The lighter portions of those hydrocarbons which unite to form petroleum, are solvents of linseed oil, and therefore serve to render paints more fluid. They are also volatile, and evaporate from the mixture when exposed to the air. But none of the hydrocarbons of petroleum absorb oxygen, or change to resin. Naphtha, therefore, adds nothing to the solid body of paint.

THE WORLD AT WAR.

The whole world seems to be in a state of convulsion. Germany and Denmark are still in arms—England looks on uneasily, France is kept quiet only at the point of the bayonet. Poland is always under the Russian heel. Italy, Austria and Spain, watch the progress of events vigilantly. Russia is rapidly constructing an iron-clad navy. The Swedish navy is already on a war-footing, and one squadron has gone to sea. All the great Powers of Europe mistrust each other's intentions; and it would seem that only a slight provocation was needed to precipitate the whole eastern Continent into war.

It is the same on this side of the Atlantic. Besides our own great struggle for national life, Mexico is torn by intestine troubles, Chili and Peru are at loggerheads, and the South American States generally are in a chronic state of uproar and confusion. The whole world seems tending to war most rapidly.

The Screw Propeller and Twin Screws.

Benjamin Franklin Bache, son of the philosopher and editor of the *General Advertiser*, published in 1758, is entitled to the credit of suggesting the screw propeller, and its double application to propelling vessels. In his journal of November 17, 1791, the following paragraph occurs:—

"Let the steam act in turning an axis, bearing a number of thin metal vanes fixed like the vanes of a windmill, in the proper angle, and let these vanes act under water at the bow or stern of the boat, as most convenient. By the rotary motion of the axis the vanes would all continually screw themselves into the water, and give motion to the boat. All the power would here propel the boat, and the continued action of the vanes give the advantage of accelerated motion. It might perhaps be found more convenient to apply the force of two sets of vanes, one fixed on each side of the boat. This might, without much complexity, be done."

FURTHER PARTICULARS CONCERNING THE REBEL RAM "TENNESSEE."

Some additional information concerning this ship having come to hand, we place it before our readers. It is an official report from our naval officers to Admiral Farragut:—

UNITED STATES STEAM SLOOP "RICHMOND,"
Inside of Mobile Bay, Aug. 13, 1864.

SIR:—In obedience to your order of the 6th inst., hereto appended, we have the honor respectfully to report that we have made a strict and careful survey of the iron-clad casemated steamer *Tennessee*, captured from the rebels in the engagement in this bay on the morning of the 5th inst., by the fleet under your command, and submit as follows, viz:—

ARMAMENT.

The armament of the *Tennessee* consists of six rifled guns, called by the rebels Brooke's rifles. The two pivot guns are seven and one-eighth inch bore, and the four broadside guns are six-inch bore. These guns are reinforced abaft by two wrought iron bands two inches thick respectively. Weight of projectiles ninety-five and one hundred and ten pound solid shot. The pivot guns are fitted on wooden slides, with a rack let into them. On an arm attached to the carriage there is a pinion for running out the gun, and by raising the arm the rack is thrown out of gear to allow the gun to recoil. The arrangements for working the battery and the implements and machinery employed appear to be very good.

MACHINERY.

The machinery of the vessel consists of two geared "non-condensing engines;" cylinders twenty-four inches diameter and seven feet stroke, with poppet, valves arranged as is the usual mode on board of Western river steamers. These engines were taken out of the river steamer called the *Alonzo Child*. They are placed fore and aft in the vessel, geared to an idler shaft by spur gearing, with wooden teeth, and from the idler shaft to the propeller shaft by bevel cast-iron gear.

BOILERS.

There are four horizontal flue boilers, twenty-four feet long, placed side by side, with one furnace under the whole of them; the products of combustion returning through the flues are delivered into one smoke-pipe. The engine and fire-rooms are insufferably hot, and very badly ventilated.

INJURIES RECEIVED IN THE ACTION.

The injuries to the casemate of the *Tennessee* from shot are very considerable. On its after side nearly all the plating is started, one bolt driven in, several nuts knocked off inside, gun-carriage of the after pivot gun damaged, and the steering rod or chain cut near that gun. There are unmistakable marks on the after part of the casemate of not less than nine eleven-inch shot having struck within the space of a few square feet, in the immediate vicinity of that port. On the port side of the casemate the armor is also badly damaged from shot. On that side, nearly amidships of the casemate, and between the two broadside guns, a fifteen-inch solid shot knocked a hole through the armor and backing, leaving on the inside an undetached mass of oak and pine splinters, about three by four feet, and projecting inside of the casemate about two feet from the side. This is the only shot that penetrated the wooden backing of the casemate, although there are numerous places on the inside giving evidence of the effect of the shot.

There are visible between forty and fifty indentations and marks of shot on the hull, deck and casemate, varying from very severe to slight—nine of the deepest indentations on the after part of the casemate evidently being eleven-inch shot, and the marks of about thirty of other callibers on different parts of the vessel. There are also a few other marks, being, however, merely scratches or slight indentations of the plating.

The smoke-stack was not shot away, although it is not improbable the heavy ramming by the *Monongahela*, *Lackawanna* and *Hartford* had previously prepared it for its fall. Three of the wrought-iron port shutters or slides were so much damaged by shot as to prevent the firing of the guns.

There are no external visible marks or evidences of injury inflicted upon the hull of the *Tennessee* by the severe ramming by the *Monongahela*, *Lackawanna*, and *Hartford*; but inasmuch as the decks leak badly, and when there is a moderate sea running in the bay, her reported usual leakage of three inches an hour being now increased to five or six inches an hour, it is fairly to be inferred that the increased leakage is caused by the concussion of the vessels.

The *Tennessee* is in a state to do good service now. To restore her to the state of efficiency in which she was when she went into the action with this fleet on the 5th instant, it will be necessary to overhaul much of the iron plating on the port and after sides of the casemate, and replace some of it. The iron gun-port slides or shutters, which were damaged, must be either removed or repaired. A new smoke-stack is required, and additional ventilators should be fitted. Blowers are required to produce proper ventilation in the engine-room and on the berth deck.

When these small repairs and additions shall have been made, the iron-clad *Tennessee* will be a most formidable vessel for harbor and river service, and for operating generally in smooth water, both offensively and defensively. The original of this report is accompanied by sectional views of the *Tennessee*, and a sketch showing the effect of shot on the outside. We are, very respectfully, your obedient servants.

THORNTON A. JENKINS, Captain.
JAMES ALDEN, Captain.
WM. E. LEROY, Commander.
T. WILLIAMSON, Chief Engineer.

Rear Admiral D. G. FARRAGUT, Commanding West Gulf Blockading Squadron, United States flagship *Hartford*.

Plumbago on Lake Superior.

According to the Detroit *Advertiser*, another extraordinary mineral discovery has been made on Lake Superior, being no less than a rich mine of plumbago (graphite). It was found on the tract of the Marquette Silver Mining Company, and it is said that Prof. Cassels, of Cleveland, who has made an assay, pronounces it the best plumbago he ever saw, and if it is plentiful, the mine is worth more than any gold mine in the country. Capt. Sweet, who is familiar with the ground, says the mine is very rich. The only mine of pure plumbago fit for the best quality of pencils is at Cumberland, England, the working of which is conducted with extraordinary secrecy. There are several mines of very inferior graphite found in this country, the product of which is used in the manufacture of crucibles, and for other uses in manufactures. None of it is fit for pencils. The Silver Lead region of Lake Superior must be a wonderful place if all the "discoveries" located on it amount to anything. Lead, silver, gold and plumbago appear to put the discoverers in doubt as to which they shall mine for first. Iron is close by and copper not far off. All that is needed now to complete the discoveries is tin.

A Troublesome Person in Chemistry.

A writer in the *North British Review* tells an amusing story, illustrative of the unwillingness to receive new truths which is characteristic of some minds. Long after Sir Humphrey Davy became famous in London circles as the "young chemist" who attracted larger audiences to his lectures at the Royal Institution than perhaps any purely scientific man had ever done before, there was a certain professor of chemistry in the college at Aberdeen who systematically passed over his discoveries. Some bolder spirits among the Doctor's colleagues at length aroused his attention to the subject; and the professor was compelled to take notice at last of Davy's great discovery of potassium. Accordingly at his next lecture he began by saying: "Gentlemen—Both potash and soda are now said to be metallic oxides—the oxides, in fact, of two metals called potassium and sodium, by the discoverer of them—one Davy, in London, a verra troublesome person in chemistry." [The above is extracted from "The Temple Anecdotes," an admirably arranged and judiciously edited collection of anecdotes, now being published by the Messrs. Groombridge, London.—EDS.

GUNNERY CATECHISM.

From a valuable little book under this title in use in the navy, we extract the following article. It is of very general interest; particularly, however, to inventors and others experimenting with ordnance or projectiles. We are indebted to Commander H. A. Wise, the accomplished director of the Ordnance Department, for the book:—

Q. What are the essential qualities in a good gun?

A. Accuracy, range, and penetration.

Q. What are the relative values of these three qualities?

A. Accuracy is always essential; and range combined with accuracy is also of the first importance. Without accuracy range is of little value. Penetration, as an expression of force, is also of great importance, but depends very much on the character of the projectile used.

Q. On what do these three qualities depend?

A. In spherical solid shot directly upon the charge of the gun and calibre of the shot.

Q. And why? How does range so depend, for instance?

A. Because upon the charge depends the initial velocity; and upon the mass of the shot depends the power to maintain that velocity by overcoming the resistance of the air; and the mass is always in proportion to the cube of the diameter or calibre.

Q. How does the accuracy depend on them?

A. Supposing the gun to be properly aimed, accuracy depends on the power to reach the object fired at; in other words, on the velocity and the power of preserving it.

Q. How does penetration depend on them?

A. Penetration depends on the momentum of the shot, and this momentum is a compound of the weight (or mass) and velocity.

Q. Is it the same with shells as with solid shot?

A. Not exactly. A shell having less weight than a solid shot of the same calibre, has less power of overcoming resistance, and much therefore depends on the internal character of the shell.

Q. How is it with rifled projectiles?

A. These depend on many other causes for success, besides the charge and calibre—such as the mode of rifling, shape and character of projectiles, the proportion of its length to its weight, etc.

Q. What are the principal causes which affect the accuracy of spherical projectiles, or in other words, make them deviate from their proper or normal path?

A. Those which act on the projectile while it is in the bore of the piece, and those which act upon it after it has left the bore.

Q. What does the first class of causes include?

A. All that affects the initial velocity, and gives rotation to the ball.

Q. What does the second include?

A. The action of the air.

Q. What are the principal causes that affect the initial velocity?

A. Variations in weights of powder and ball, the manner of loading, the temperature of the piece, and the balloting of the ball along the bore.

Q. What is the principal cause of deviation?

A. The rotation of the ball combined with the resistance of the air.

Q. Suppose the ball is truly spherical and homogeneous—that is, the center of gravity is in the center of its figure, how is rotation produced?

A, By the balloting or bounding of the ball along the bore, owing to the windage.

Q. On what does the direction of rotation depend?

A. On the side of the projectile which strikes the surface of the bore last—if it strike on the upper side, the front surface of the ball will move upward; if on the lower side, this surface will move downward.

Q. On what does the velocity of rotation from this cause depend?

A. On the windage, or depth of the indentations in the bore, the charge being the same.

Q. Suppose the center of gravity does not coincide with the center of figure, how does the rotation take place?

A. It generally takes place around the center of gravity; and the deviation is said to be produced by eccentricity.

Q. State the action of this cause in general terms?

A. The front surface of the ball moves toward the side of the bore on which the center of gravity is situated; and knowing the position of this center of gravity, it is easy to foretell the direction in which the ball will rotate.

Q. In the case of an eccentric ball, when is the velocity of rotation greatest?

A. When the line joining the center of gravity and figure is perpendicular to the axis of the bore.

Q. How is the range affected by rotation in a spherical and concentric ball?

A. It is shortened or lengthened, as the motion of the front surface is downward or upward.

Q. How is the range affected by rotatien in a spherical and eccentric ball?

A. By the position of the center of gravity (or the heavier hemisphere) in the bore. If placed upwards the range is increased, downwards it is decreased.

Q. Can you give an example from experimental practice of the results of placing the center of gravity in different positions in the bore?

A. Yes; the following results were obtained by the experiments of Rear Admiral Dahlgren:—

Placed 90 degrees up, the range was 1,415 yards.

Placed 90 degrees down, the range was 1,264 yards.

Placed inwards, the range was 1,329 yards.

Placed 45 degrees up and in, the range was 1,360 yards.

Q. With navy shells, how is the position of the center of gravity uniformly fixed and determined?

A. Formerly it was the habit to strap them to the sabots with the fuse at an angle of 45 degrees, and in loading, the fuse was always to be placed upwards in the bore. This sometimes the loader failed to do—and to fix the center beyond all mistake the shells are now strapped with the fuse out and in the axis of the bore.

Q. Does the position of the center of gravity affect the ricochet?

A. Yes. The number of grazes are increased or diminished, by placing it up or down in the bore.

Q. How are projectiles affected by the wind?

A. The deviating effect of the wind depends on its force, and its direction with regard to the plane of fire.

Q. What projectiles are less affected in their flight by this cause?

A. Large and heavy projectiles, moving with high velocities.

Q. Why are the chances of inaccuracy in firing at long ranges much greater than when firing at short ones?

A. The greater the elevation, the more curved will be the path of the shot, and the effect of any error in pointing is increased by the distance; while the balloting of the shot in the bore and the position of the center of gravity of the shot will have more time to act in causing deviation, as will also the wind, or partial currents of air.

Q. What is meant by the term "initial velocity?"

A. The velocity with which a shot leaves the gun.

Q. With a charge of one-third the weight of the shot, what is this supposed to be?

A. About 1,600 feet in a second.

Q. Does a wad, or ramming home the charge, affect the initial velocity?

A. No. The velocity is the same whether the charge is rammed, or a wad used or not.

Q. Then what is the use of the wad?

A. To prevent the shot from shifting in the bore of the gun.

Q. Is the initial velocity always the same from the same gun?

A. No. It depends upon the kind and weight of powder and projectile, the elevation and temperature of the piece when fired.

Q. What is meant by the term "remaining velocity?"

A. The rate with which a ball moves at any given point in its flight, after it has been subjected to the resistance of the air.

Q. What is "striking velocity?"

A. That with which a ball strikes the object.

Q. What is the flight of a shot through the air called?

A. Its trajectory, or the path of the shot.

Q. If a gun placed several feet above a horizontal plane is fired at an object distant 1,000 yards, and at the same hight above the plane, how will the ball move if not acted upon by other force?

A. It will continue to move in the direction of that object through equal spaces in equal times—forever.

Q. What other force is it then that acts upon the ball immediately on its leaving the gun, and prevents this movement?

A. The force of gravity, which is always constant, and draws the ball to the earth with an accelerated velocity.

Q. In the case of a ball fired from a gun several feet above the plane, at an object 1,000 yards distant, how soon will it reach the plane?

A. In precisely the same time as it would if let fall perpendicularly from the muzzle to the plane.

Q. In defining "remaining velocity," you mention the resistance of the air—suppose this force is removed and does not act against the ball, what is the result?

A. In that case, large and small, heavy and light balls, when fired with equal velocities and elevations, would have equal ranges.

Q. If fired with different velocities?

A. Then the ranges would be directly as the velocities.

Q. But as the resistance of the air is always active in retarding the ball, upon what description of balls does it thus act with most effect, and under what conditions?

A. It acts with greater effect in retarding small balls than large ones. With greater effect upon balls of little density than upon those of great density. And with greater proportional effect upon balls moving with high velocity than upon balls moving with low velocity.

Q. What is the measure of the air's resistance?

A The difference of pressure before and behind the ball.

Q. Explain how the air retards small balls more effectively than large ones?

A. The absolute resistances they both meet are (velocities being equal), as the extent of their surfaces, which are as the squares of their diameters. But their powers to overcome resistance are as their weights, which are as the cubes of the diameters.

Q. Give an example?

A. Take two balls, one of 3 inches and one of 6 inches diameter. The resistance then is as 9 to 36, or 1 to 4—while the power to overcome it is as 27 to 216, or 1 to 8.

Q. How are dense balls less retarded by the air than light balls of equal diameter?

A. Because although surfaces being equal resistances are equal, yet the power to overcome this resistance being as the weights the denser ball is less retarded.

Q. How are balls moving with low velocity retarded by the air less than those moving with high velocity?

A. When a ball moves with high velocity the air is condensed in front of it, and rarefied behind it; hence it is constantly pressed back by an increased force which is not balanced from behind. When moving with low velocity, this is not the case, the pressure of the air in front and behind is nearly equal, and the ball meets with less resistance.

Q. What is the momentum of a ball?

A. Its weight multiplied by its velocity when fired.

Q. What is the direct result upon the gun of this momentum given to the shot?

A. All the momentum the shot has in one direction, the gun takes in an opposite direction.

Q. What is this termed?

A. The recoil of the gun.

Q. How is the velocity of this recoil determined?

A. Divide the momentum of recoil by the weight of gun, and the quotient is the velocity of recoil.

Q. If both leave the gun at the same rate, which will have the greatest penetration, a large ball or a small one?

A. The large one, the penetration being in proportion to the diameters.

Q. With shot of equal diameters?

A. Then the penetrations are in proportion to the charges.

Q. In the event of a gun being likely to fall into the hands of an enemy, how may it be rendered unserviceable?

A. By driving a nail or rat-tail file into the vent and breaking it off. By firing a shot against the trunnions and breaking them. And brass guns are

rendered unserviceable by firing a shot against the chase, which indents them and prevents loading.

Q. How can you ascertain the distance of an object by means of the tangent sight of a gun, the hight of the object being known?

A. Point by line of metal to the top of the object; then raise the tangent scale till the top of it and the notch on the muzzle are in line with the foot of the object, and note the length of tangent sight required. Then, by similar triangles, as the length of tangent sight thus required, is to the length of the gun so is the hight of the object to the distance required. This, however, can only be done from a fixed battery on shore.

Q. In pointing guns by the tangent sights, is the trajectory of the ball affected by the hight of the gun above the plane?

A. No. The trajectory is the same whether the gun is fired from the top of a hill, or from the valley below. The use of the tangent sight in aiming has no effect on the trajectory.

The Seven Thirties--What are They?

We trust that a large portion of our readers have pondered the appeal of Mr. Fessenden, our new Secretary of the Treasury. The purport of it is that the people of the United States, acting as a body through their agent the Government, wish individuals to lend them two hundred millions of dollars for three years, at seven three-tenths per cent annual interest, payable every six months. For this they offer Treasury Notes—that is, in reality, notes drawn and endorsed by every man in the country. The loan is wanted for a great national purpose, to effect which every man, unless he be a traitor at heart if not in act, is solemnly pledged.

The appeal is addressed not merely to a few great capitalists, but also to the many whose aggregate means constitute the mass of the wealth of the land. The notes upon which this loan is asked are from $50 upward. Every man who has fifty dollars can take part in this loan. Apart from patriotism and the duty which all owe to their country, no investment is so desirable as this.

It is secure. Every dollar of every man's property is pledged for the punctual payment of the interest, and of the debt when due. The security is increasing in value. For some years before the war we were earning 1,000 millions a year more than we spent. During the three years of the war, owing to the high prices and constant demand for labor, we have earned more than ever before. No man who could or would work has been idle; and, except for the war, we have spent less than before. The total valuation of the property of the United States, according to the census of 1860, was $16,159,000,000, of which $10,957,448,956 was in the loyal States. This valuation, according to the usual rule of assessment, was not more than two-thirds of the actual cash value of the property. The increase of property in the loyal States during the last ten years was over 126 per cent, on an average of 12 6-10 per cent per annum. In three years of the war we of the United States have certainly earned 3,000 millions more than we have spent apart from the war. The cost of the war may be set down at 2,000 millions. Deducting this from our net earnings, the people who are security for this loan are 1,000 millions richer to-day than they were when the war broke out.

No other investment can be so easily convertible. The man who has a Treasury note for $50, or $100, or $1000, can turn it into money more readily, and upon better terms, than if it were invested upon bond and mortgage, or in railroad stocks.

The interest offered is higher than can be realized from any other safe and convertible investment. It is, morover, readily collectable when due. To each note are affixed five "coupons," or interest tickets, due at the expiration of each successive half year. The holder of a note has simply to cut off one of these coupons, present it to the nearest bank or Government Agency, and receive his interest; the note itself need not be presented at all. Or a coupon thus payable will everywhere be equivalent when due to money.

Thus, while this loan presents great advantages to large capitalists, it offers special inducements to those who wish to make a safe and profitable investment of small savings. It is in every way the best Savings' Bank; for every institution of this kind must somehow invest its deposits profitably in order to pay interest and expenses. They will invest largely in this loan, as the best investment. But from the gross interest which they receive they must deduct largely for the expenses of the Bank. Their usual rate of interest allowed to depositors is 5 per cent upon sums over $500. The person who invests directly with Government will receive almost 50 per cent more. Thus the man who depotits $1000 in a private Savings' Bank receives 50 dollars a year interest; if he deposits the same sum in this National Savings' Bank he receives 73 dollars. For those who wish to find a safe, convenient and profivitable means of investing the surplus earnings which they have reserved for their old age or for the benefit of their children, there is nothing which presents so many advantages as this National Loan.

It is convertible into a six per cent gold-bearing bond. At the expiration of three years a holder of the notes of the 7·30 loan has the option of accepting payment in full or of funding his notes in a six per cent gold interest bond, the principal payable in not less than five nor more than twenty years from its date, as the Government may elect. For six months past these bonds have ranged at an average premium of about eight per cent in the New York market, and have sold at 109 to-day (Aug. 12th), thus making the real rate of interest over ten per cent; and besides, to make the inducement greater, Congress by special act exempts its Treasury notes from State and municipal taxation. Could Shylock ask more? Was patriotism ever so liberally rewarded?—*Harper's Magazine.*

Useful Receipts.

For making Architectural Ornaments in Relief.—For making architectural ornaments in relief, a molding composition is formed of chalk, glue, and paper paste. Even statues have been made with it, the paper aiding the cohesion of the mass.

Cement for Ivory, Mother of Pearl, etc.—Dissolve one part of isinglass and two of white glue in thirty of water, strain and evaporate to six parts. Add one-thirtieth part of gum mastic, dissolved in half a part of alcohol, and one part of white zinc. When required for use, warm and shake up.

Fusible Metal.—1. Bismuth, 8 parts; lead 5 parts; melt together—melts below 212° Fah. 2. Bismuth, 2 parts; lead, 5 parts; tin, 3 parts—melts in boiling water. 3. Lead, 3 parts; tin, 2 parts; bismuth, 5 parts; mix—melts at 198° Fah.

Remarks.—The above is used to make toy-spoons, to surprise children by their melting in hot liquors; and to form pencils for writing on asses's skin, or paper prepared by rubbing burnt hartshorn into it.

Silvering Powder for coating Copper.—Nitrate of silver, 30 grains; common salt, 30 grains; cream of tartar, 3½ drachms; mix, moisten with water, and apply.

Alloy for Journal Boxes.—The best alloy for journal boxes is composed of copper, 24 pounds; tin, 24 pounds, and antimony 8 pounds. Melt the copper first, then add the tin, and lastly the antimony. It should be first run into ingots, then melted and cast in the form required for the boxes.

To Galvanize.—Take a solution of nitro-muriate of gold (gold dissolved in a mixture of aquafortis and muriatic acid) and add to a gill of it a pint of ether or alcohol, then immerse your copper chain in it for about fifteen minutes, when it will be coated with a film of gold. The copper must be perfectly clean, and free from oxide, grease, or dirt, or it will not take on the gold.

Composition used in welding Cast-Steel.—Borax, 10; sal ammoniac, 2; flour of sulphur, 1 part; grind or pound them roughly together; then fuse them in a metal pot over a clear fire, taking care to continue the heat until all spume had disappeared from the surface. When the liquid appears clear, the composition is ready to be poured out to cool and concrete; afterward being ground to a fine powder, it is ready for use.

To use this composition, the steel to be welded is raised to a heat, which may be expressed by "bright yellow;" it is then dipped among the welding powder, and again placed in the fire until it attains the same degree of heat as before, it is then ready to be placed under the hammer.

Staining Wood and Ivory.—Yellow.—Dilute nitric acid will produce it on wood.

Red.—An infusion of Brazil wood in stale urine, in the proportion of a pound to a gallon for wood; to be laid on when boiling hot, and should be laid over with alum water before it dries. Or, a solution of dragon's blood, in spirits of wine, may be used.

Black.—Strong solution of nitric acid, for wood or ivory.

Mahogany.—Brazil, madder and logwood, dissolved in water and put on hot.

Blue.—Ivory may be stained thus:—Soak it in a solution of verdigris in nitric acid, which will turn it green; then dip it into a solution of pearlash boiling hot.

Purple.—Soak ivory in a solution of sal-ammoniac into four times its weight of nitrous acid.

Glue.—Powdered chalk added to common glue strengthens it. A glue which will resist the action of water is made by boiling 1 pound of glue in 2 quarts of skimmed milk.

Imitation of Mahogany.—Plane the surface smooth, and rub with a solution of nitrous acid. Then apply with a soft brush one ounce of dragon's blood, dissolved in about a pint of alcohol, and with a third of an ounce of carbonate of soda, mixed and filtered. When the brilliancy of the polish diminishes, it may be restored by the use of a little cold drawn linseed oil.

Prepared Liquid Glue.—Take of best white glue 16 ounces; white lead, dry, 4 ounces; rain water, 2 pints; alcohol, 4 ounces. With constant stirring dissolve the glue and lead in the water by means of a water-bath. Add the alcohol, and continue the heat for a few minutes. Lastly pour into bottles while it is still hot.

Marine Glue.—Dissolve 3 parts of india-rubber in 34 parts of coal-tar naphtha—aiding the solution with heat and agitation; add to it 64 parts of powdered shellac, which must be heated in the mixture, till the whole is dissolved. While the mixture is hot it is poured upon metal plates in sheets like leather. When required for use, it is heated in a pot, till soft, and then applied with a brush to the surfaces to be joined. Two pieces of wood joined with this glue can scarcely be sundered.

Good Lacquer for brass.—Seed lac, 6 ozs.; amber or copal, 2 ozs.; best alcohol, 4 galls.; pulverized glass, 4 ozs.; dragon's blood, 40 grs.; extract of red sandal wood, obtained by water, 30 grs.

Pale Lacquer for tin plate.—Best alcohol, 8 ozs.; turmeric, 4 drs.; hay saffron 2 scs; dragon blood, 4 scs.; red sanders, 1 sc.; shell lac, 1 oz.; gum sanderach, 2 drs.; gum mastic, 2 drs.; Canada balsam, 2 drs.; when dissolved add spirits of turpentine, 80 drops.

Lacquer for Philosophical Instruments.—Alcohol, 80 ozs.; gum gutta, 3 ozs.; gum sandarac, 8 ozs.; gum elemi, 8 ozs.; dragon's blood, 4 ozs.; seed lac, 4 ozs.; terra merita, 3 ozs.; saffron, 8 grs.; pulverized glass, 12 ozs.

Brown Bronze Dip.—Iron scales, 1 lb.; arsenic, 1 oz.; muriatic acid, 1 lb.; zinc (solid) 1 oz.

Let the zinc be kept in only while it is in use.

Green Bronze Dip.—Wine vinegar, 2 qts.; verditer green, 2 ozs.; sal-ammoniac, 1 oz.; salt, 2 ozs.; alum, ½ oz.; French berries, 8 ozs.; boil the ingredients together.

Olive Bronze Dip, for brass.—Nitric acid, 3 ozs.; muriatic acid, 2 ozs.; add titanium or palladium; when the metal is dissolved add 2 galls pure soft water to each pint of the solution.

To bronze Gun Barrels.—Dilute nitric acid with water and rub the gun barrels with it; lay them by for a few days, then rub them with oil and polish them with beeswax.

For tinning Brass.—Water, 2 pailsfull; cream of tartar, ½ lb.; salt, ½ pint.

Shaved or Grained Tin.—Boil the work in the mixture, keeping it in motion during the time of boiling.

Skilled Mechanics and the Draft.—The Provost Marshal General states that the Secretary's order in reference to skilled mechanics is to be strictly construed by commanding officers. The sub-districts will not suffer on the draft from this cause, as such skilled mechanics as may be drafted and permitted to remain at the arsenal will be counted on the quotas the same as if sent to the front.

Force of Tornadoes.

The force with which tornadoes move is well illustrated by an occurrence which recently transpired on a western railroad. An entire train was blown bodily from the track, causing severe injuries to the passengers. The *Cincinnati Gazette* gives the following account of the disaster:—

"The 4:20 train on the Indianapolis railroad, which left this city Friday afternoon for Chicago, was blown from the track, at a point near Wirtnell's Bridge, 15 miles below Lawrenceburg, by one of the most terrific tornadoes that has ever visited this section of the country. As the train approached the bridge above-named the atmosphere seemed filled with branches of trees and missiles of various kinds the wind had taken up in its path, and the engineer, thinking the bridge unsafe, increased the speed of the engine so as to reach the protection of the hills beyond. He was too late, for the hurricane, resistless in its energy and overwhelming in its power, lifted the entire train into the air and hurled the rear portion of it over a steep bank, the baggage car, which was very heavily laden, being whirled diagonally across the track and the rear of the first passenger car, still unoccupied, being suspended over the precipice at the side of the track. The train which happened to arrive at such an untimely moment, in the very focus of the wild hurricane, was heavily loaded with passengers, many of them being bound for the Chicago Convention; yet, strange to relate, notwithstanding the increased speed with which the train was moving and the hight of the embankment down which the cars were hurled, not one person was killed. This may be considered a most miraculous escape, two of the cars being completely wrecked and jammed to pieces; the seats dislocated and shattered to fragments, and everything left in the most chaotic condition. From thirty to forty individuals were more or less injured, and two ladies, names not known, probably fatally, one of them, it is thought, having suffered a dislocation of the spine."

The Relative Destructiveness of Shot and Shell.

M. Dufour, a surgeon of the French navy, has published an interesting account of the wounded seamen who were brought to the naval hospital at Cherbourg, after the engagement between the *Alabama* and the *Kearsarge*. One of the first remarks suggested by reading M. Dufour's statement is that the greater number of wounds were caused not by cannon shot or shell, but by splinters from the ship. It has been observed by naval surgeons that since the use of shells in naval engagements the destruction of human life has been much greater than when round shot alone was used. It has been learnt from the same sea engagement that it is an error to suppose that the plating of wooden ships protects the crew from the splinters scattered about. The increasing caliber of the guns used in modern warfare requires a greater number of men to serve them, and it follows that one shot may cause more destruction by striking a compact group of men. This was the case on board the *Alabama*. A shell fired from the *Kearsarge* falling among 19 men who were serving one of the *Alabama's* guns, killed or wounded 15. The *Alabama* fired altogether 270 shots, of which the greater number were fired from howitzers. There were but 163 shots fired by the *Kearsarge*. Nobody appears to have been killed by the round shot—all the injury was inflicted directly or indirectly by the shells. The captain of the *Kearsarge* very soon ceased firing from his four 32-pounders, which produced little effect, and used his two 11-inch howitzers and a rifled 20-pounder placed forward. The victory was gained by these three pieces alone.

Important to Agricultural Machine-makers.

Some correspondents of the *Prairie Farmer* have been agitating the question of the importance of better workmanship in agricultural machinery. One writes from Canton, Mo.:—"The grain crop was very heavy this season, and machines few, consequently every machine was taxed to the utmost. And I venture to say in consequence of the delay by breakage, enough grain has been lost to pay for half of the machines. In my humble opinion, we have two serious evils in harvesting machines. The small pieces are made too frail, and there are too many patents. If three or four of the chief makers would combine and make a machine which would have all the best features of each united, we should have a machine as near perfect as is possible. As it is now, nearly all have a few good features, and a good many poor ones."

And the editor justly remarks:—"A machine intrinsically better must in the long run be outstripped in sales, by one less meritorious, if the one must lie idle a good share of its time waiting for repairs, while the other is able to work without intermission, from the fact of a supply of parts being constantly near at hand. Wherever the fault lies—whether with manufacturers or agents—it should be remedied."

[The first suggestion of the correspondent is doubtless true, the second one is silly. The number of patents has nothing to do with the workmanship on a machine, and no one is obliged to buy a bad one. There are good and poor mowers and reapers, and if the farmer purchase one of an approved pattern he will have no trouble.—EDS.

Manifold Uses for Leather.

The old saying, that there is "nothing like leather," is amply verified in the thousand and one little articles of feminine decoration which Madam Fashion has recently decreed for her daughters' wear. In my up-town stroll the other day, I paused before the tastefully arranged window of a fancy store, wherein were displayed the usual miscellaneous collection of ornaments, trimmings, etc., which go to make the sum total of such an establishment, and I thought as I noted how freely the material, leather, had been used in their construction—O that mother Eve, as she perambulated Eden in her primitive garment of fig leaves, could have foreseen how skillfully her sons and daughters should convert the skins of such animals as those over which she held dominion, into the multitude of articles both useful and ornamental, which meet our eye on every side, and supply onr needs at every step. Could she have seen the girdle, formed to encircle the slender waist of some fair damsel—the coquetish little bow which fastens the collar of your fashionable belle, the trimming of her dress, the rosettes upon her hat, the buttons scattered in delightful confusion over her garments, or arranged in mathematical precision, in rows containing twelve, eighteen, or twenty-four, as fashion and taste shall dictate, the gauntlet, to shade the delicate wrist, the bracelet, for its adornment, the anklet, to protect the ankle, the page to elevate the trailing skirts from contact with muddy crossings, the reticule, the fan for subduing summer's heat— these, and many other ornaments too numerous to mention, and all made of leather, so embossed, and stitched, and pinked and otherwise decorated as almost to lose its identity, yet leather still, are additional evidence of the truth of the saying at the head of our paragraph.—*Shoe and Leather Reporter.*

To fry a Beefsteak.

An exchange says:—"Put into a pan a steak chopped and rubbed freely with butter, or beef dripping, or good lard. Pour into the bottom of your pan a tea-cup of boiling water. Set the pan over coals, and cover it with a hot lid; when it has cooked tender and brown, take it up, sprinkle it with salt and pepper, and keep it hot."

[This is a good way to spoil a beefsteak. The gridiron is the proper utensil for the purpose; but when this cannot be had a steak can be well cooked in a frying-pan by the following method. Put the frying-pan on the fire with melted lard or pork fat. Let the fat get so hot that a piece of bread put in browns immediately. Then put the beef in and cook it three or four minutes, according to size. The fat should boil. By this method the juices of the meat are retained, and the exterior is brown and inviting. Putting a beefsteak into a cold pan with a cup of boiling water stews it, and the flavor is in the water while the meat is tasteless. That is the way to make beef-tea.—EDS.

OUR PATENT AGENCY.—Some idea of the large amount of business done through the Scientific American Patent Agency may be formed, when we state that during the past single week patents for *sixty-four cases*, prepared by us, were officially passed for issue.

Recording Votes by Machinery.

It would appear that the long sought-for desideratum—a perfect mechanical contrivance for taking the ayes and nays—has been invented in France. Upon the desk of each member of a legislative assembly are placed two knobs, one white and the other black. Near the speaker's chair, in full view of the house, is an indicating table pierced with holes corresponding to the name of each voter. When the Speaker announces that the vote is about to commence, each member presses one of the knobs upon his desk. Instantly a white (aye) or black (nay) disk appears upon the indicator at the hole marked with his name. Beneath these holes are two larger ones, intended to give the addition of the votes for and against. When the speaker declares that the ballot is closed, he touches a button near him, for the double purpose of preventing any further vote, and of setting in motion the machinery, which in a moment performs the addition of the votes cast. At once the number of ayes is shown in the large aye hole upon the indicator, and the number of nays in the corresponding nay hole. The clerks have only to glance at the indicator and declare the number to the chair. In case of a secret vote, secrecy is secured by an ingenious arrangement of the engineer, by which the vote is transmitted to any hole but that next the voter's name. The machine is worked by a galvanic battery. It is to be adopted in the French Corps Legislatif.

THE PATENT CLAIMS.

Owing to a strange inadvertence on the part of the clerks in the Patent Office, our usual list of patent claims was not forwarded for this number; they will appear next week.

A PAPER substance to be used for bookbinding has just been invented in England. It appears to receive gilt impressions with the distinctness of morocco, and as it can be washed with soap and water when dirty, it may be surmised that hereafter the phrase "musty literature" will fall into disuse. It is said that its cost will be something like one-half of the present price of embossed cloth.

COMBUSTIBLE GOODS ON RAILWAYS.—A merchant in Houndsditch, London, has been fined £20 for having sent by the North-western line a package containing highly combustible goods ("Blazing Fusees"), without giving notice that they were dangerous.

TRANSPARENT JAPAN.—Oil of turpentine four ounces, oil of lavender three ounces, camphor one-half drachm, copal one ounce; dissolve. Used to japan tin, but quick copal varnish is mostly used instead.

AN exchange says:—"The village of Fredonia, N. Y., has been lighted for many years by gas obtained from the earth by means of boring. When the supply becomes deficient they sink a new gas well."

MESSRS. MUNN & CO.:—It affords me much pleasure to bear testimony to the able and efficient manner in which you discharged your duties as Solicitors of Patents, while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and I doubt not justly deserved) the reputation of energy, marked ability, and uncompromising fidelity in performing your professional engagements.

Very respectfully, your obedient servant,

J. HOLT

Hon. Wm. D. Bishop, late Member of Congress from Connecticut, succeeded Mr. Holt as Commissioner of Patents. Upon resigning the office he wrote to us as follows:

MESSRS. MUNN & CO.:—It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency; and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully, your obedient servant,

WM. D. BISHOP.

THE EXAMINATION OF INVENTIONS.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a written reply, corresponding with the facts, is promptly sent, free of charge. Address MUNN & CO., No. 37 Park Row, New York.

As an evidence of the confidence reposed in their Agency by inventors throughout the country, Messrs. MUNN & CO. would state that they have acted as agents for more than TWENTY THOUSAND inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of inventors and patentees, at home and abroad. Thousands of inventors for whom they have taken out patents have addressed to them most flattering testimonials for the services rendered them; and the wealth which has inured to the individuals whose patents were secured through this office, and afterwards illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! Messrs. MUNN & CO. would state that they never had a more efficient corps of Draughtsmen and Specification Writers than those employed at present in their extensive offices, and that they are prepared to attend to patent business of all kinds in the quickest time and on the most liberal terms.

PRELIMINARY EXAMINATIONS AT THE PATENT OFFICE.

The service which Messrs. MUNN & CO. render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there; but is an opinion based upon what knowledge they may acquire of a similar invention from the records in their Home Office. But for a fee of $5, accompanied with a model, or drawing and description, they have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a patent, &c., made up and mailed to the inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through the Branch Office of Messrs. MUNN & CO., corner of F. and Seventh streets, Washington, by experienced and competent persons. Many thousands of such examinations have been made through this office, and it is a very wise course for every inventor to pursue. Address MUNN & CO., No. 37 Park Row, New York.

HOW TO MAKE AN APPLICATION FOR A PATENT.

Every applicant for a patent must furnish a model of his invention if susceptible of one; or, if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the Government fees, by express. The express charge should be pre-paid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by a draft on New York, payable to the order of Messrs. MUNN & CO. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & CO., No. 37 Park Row, New York.

Patents are now granted for SEVENTEEN years, and the Government fee required on filing an application for a patent is $15. Other changes in the fees are also made as follows:—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filing application for Design (seven years)	$15
On filing application for Design (fourteen years)	$30

The Patent Laws, enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

The law abolishes discrimination in fees required of foreigners, excepting natives of such countries as discriminate against citizens of the United States—thus allowing Austrian, French, Belgian, English, Russian, Spanish and all other foreigners, except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms. Foreigners cannot secure their inventions by filing a caveat; to citizens only is this privilege accorded.

CAVEATS.

Persons desiring to file a caveat can have the papers prepared in shortest time by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & CO., No. 37 Park Row, New York.

REJECTED APPLICATIONS.

Messrs. MUNN & CO. are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of their Washington Agency to the Patent Office affords them rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Their success in the prosecution of rejected cases has been very great. The principal portion of their charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted, are invited to correspond with MUNN & CO., on the subject giving a brief history of the case, inclosing the official letters, &c.

FOREIGN PATENTS.

Messrs. MUNN & CO., are very extensively engaged in the preparation and securing of patents in the various European countries. For the transaction of this business they have offices at Nos. 66 Chancery lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. They think they can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through their agency.

Inventors will do well to bear in mind that the English law does not limit the issue of patents to inventors. Any one can take out a patent there.

Circulars of information concerning the proper course to be pursued in obtaining patents in foreign countries through MUNN & CO'S Agency, the requirements of different Government Patent Offices, &c., may be had, gratis, upon application at the principal office, No. 37 Park Row, New York, or any of the branch offices.

SEARCHES OF THE RECORDS.

Having access to all the official records at Washington, pertaining to the sale and transfer of patents, MESSRS. MUNN & CO., are at all times ready to make examinations as to titles, ownership, or assignments of patents. Fees moderate.

INVITATION TO INVENTORS.

Inventors who come to New York should not fail to pay a visit to the extensive offices of MUNN & CO. They will find a large collection of models (several hundred) of various inventions, which will afford them much interest. The whole establishment is one of great interest to inventors, and is undoubtedly the most spacious and best arranged in the world.

MUNN & CO. wish it to be distinctly understood that they do not speculate or traffic in patents, under any circumstances; but that they devote their whole time and energies to the interests of their clients.

COPIES OF PATENT CLAIMS.

MESSRS. MUNN & CO., having access to all the patents granted since the rebuilding of the Patent Office, after the fire of 1836, can furnish the claims of any patent granted since that date, for $1.

THE VALIDITY OF PATENTS.

Persons who are about purchasing patent property, or patentees who are about erecting extensive works for manufacturing under their patents, should have their claims examined carefully by competent attorneys, to see if they are not likely to infringe some existing patent, before making large investments. Written opinions on the validity of patents, after careful examination into the facts, can be had for a reasonable remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention and being informed of the points on which an opinion is solicited. For further particulars address MUNN & CO., No. 37 Park Row, New York.

EXTENSION OF PATENTS.

Many valuable patents are annually expiring which might readily be extended, and if extended, might prove the source of wealth to their fortunate possessors. Messrs. MUNN & CO. are persuaded that very many patents are suffered to expire without any effort at extension, owing to want of proper information on the part of the patentees, their relatives or assigns, as to the law and the mode of procedure in order to obtain a renewed grant. Some of the most valuable grants now existing are *extended patents*. Patentees, or, if deceased, their heirs, may apply for the extension of patents, but should give ninety days' notice of their intention

Patents may be extended and preliminary advice obtained, by calling or writing to MUNN & CO., No. 37 Park Row, New York.

ASSIGNMENTS OF PATENTS.

The assignment of patents, and agreements between patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Agency, No. 37 Park Row, New York.

UNCLAIMED MODELS.

Parties sending models to this office on which they decide not to apply for Letters Patent and which they wish preserved, will please to order them returned as early as possible. We cannot engage to retain models more than one year after their receipt, owing to their vast accumulation, and our lack of storage room. Parties, therefore, who wish to preserve their models should order them returned within one year after sending them to us, to insure there obtaining them. In case an application has been made for a patent the model is in deposit at the Patent office, and cannot be withdrawn.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with patent property or inventions to call at our extensive offices, No. 37 Park Row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid) should be addressed to MUNN & CO. No. 37 Park Row, New York.

Notes and Queries

A. M. R., of Mo.—To find the centrifugal force of any body, multiply the square of the number of revolutions per minute by the diameter of the circle in feet and divide the product by 5780. The quotient is the centrifugal force in terms of the weight of the body.

S. H. B., of N. Y.—Ordinary tubular boilers have from 12 to 15 feet per horse-power. It is a very confusing thing to speak of the horse-power of boilers since the term itself is an undetermined quantity. It is much better to speak of a certain size of boiler for a certain size cylinder. In the best English locomotives the dimensions given by Bourne are as follows:—Cylinder 18 by 24 inches, driver 8 feet, length of fire-box inside 53 inches width 63 inches, hight above bars 63 inches, number of tubes 305, diameter outside 2 inches, length 11 feet 3 inches, area of fire grate 20 square feet, heating surface of tubes 1,627 square feet.

F. P. M., of Pa.—We do not know what the cement you speak of is prepared from, but a very fine marble cement is made by soaking plaster-of-paris in a strong solution of alum, after which it is baked in an oven and then ground to powder. The powder is then mixed with water and applied as wanted. It sets very hard and takes a brilliant polish. It may be mixed with metallic colors, such as red-lead, so as to produce an imitation of marble.

Mr. William Painter, of Fallston, Md., desires the address of S. C. H., of Elmira, N. Y., a manufacturer of blacking.

G. E. M., of Pa.—If you will forward $1 50 we will purchase the tool we described in "Mechanical Inspirations," and send it by express. We do not make a practice of doing this, but in your case we make an exception for once.

C. H. C., of Md.—Appleton & Co., 443 Broadway, New York. We can furnish Vol. X. bound for $3. Your best course in order to supply yourself with the desired information will be to make an excursion to Washington. You will find all the volumes of the SCIENTIFIC AMERICAN in the Patent Office library; and you can have access to all patents upon the subject.

J. A. McN., of Mich.—The specimen of *confervæ* you send us is useless for paper-makers; it has a fiber but no strength. We do not know of any special machines for working mother-of-pearl.

G., of U. S. N.—We should have explained that when a body is raised slowly, the power required to overcome the inertia is inappreciable, and must be disregarded in reckoning the work done. But when the velocity is appreciable, it must be considered in computing the work. This part of the work is in proportion to the square of the velocity.

R. B. C., of Conn.—One thousand copper to fourteen tin is said to be the alloy from which the ancients made tools which would cut hard metals.

C. B. T., of R. I.—A tincture of iodine diluted with half its bulk of water will produce a superior brown tint on the barrel of your fowling-piece.

C. C., of Mass.—The brass letters must stick to your window if you prepare the cement properly. Try this formula: Resin 150 parts, wax 30, burnt ochre 30, and calcined plaster 2 parts. Apply warm and you will have no further trouble.

W. P. R., of Vt.—The welding point of iron is from 12,000 to 13,400 degrees. Cast-iron melts at from 17,000 to 20,000 degrees of heat.

B. M., of Maine.—The weight of your castings can be found by multiplying the width in quarter inches by the thickness in one-eighth inches. The result is in pounds per foot of length. We have never tested this rule but it is said to be a good one.

B. & S., of R. I.—The tables you sent us were acceptable, and will appear soon.

H. J., of Wis.—We know of no steam pistons packed with hemp now-a-days. The practice is obsolete. Metallic packing is so much better that the two admit of no comparison.

P. B. R., of Maine.—This correspondent says that in chipping he strikes his hand instead of the chisel, which hurts him very much, and he wishes to know what he had better do about it. Our advice is to keep at it. Hit away! It is better to hit one's hand than nothing. A little chalk on the chisel head is sometimss applied by novices, but practice is better still, and in time our correspondent will doubtless do as heavy execution on his work as he now does on his hand.

W. J. A., of Pa.—You will do well to have a copy of the patent you refer to. Expense five dollars.

H. asks if anybody has ever invented a thoroughly safe bottle for concentrated ammonia? ANS.—We do not know of any patent for this especial purpose. Here is a good chance for the ingenious.

Money Received

At the Scientific American Office, on account of Patent Office business, from Wednesday, Aug. 24, 1864, to Wednesday, Aug. 31, 1864:—

W. G. H., of Ind., $20; H. W., of N. Y., $45; J. T. P., of Ind., $20; E. G. W., of Vt., $20; G. W. B., of N. Y., $40; E. D., of Maine, $35; J. C. S., of Maine, $40; S. M. B., of Mich., $20; J. E. H., of Mich., $20; F. A. B., of N. Y., $45; A. R. A., of England, $45; W. H. H., of Ill., $20; J. A. W., of N. Y., $20; S. L., of N. J., $20; J. J. K., of Ill., $20; A. A. K., of Minn., $20; W. H. H., of N. Y., $20; J. H. P., of Ohio, $20; C. S. B., of Mass., $20; E. M., of Conn., $25; N. H. B., of N. Y., $15; J. B. W., of N. J., $20; A. W. H., of N. Y., $20; C. F. B., of N. Y., $40; B. O. G., of Conn., $15; H. M., of N. Y., $10; L. M. D., of N. Y., $16; F. & B., of R. I., $25; G. F. W., of Maine, $40; W. & McG., of Iowa, $15; N. D. H., of Conn., $15; E. H. T., of Conn., $31; D. A., of Pa., $30; E. L. P., of N. Y., $50; J. G., of R. I., $20; J. T., of N. H., $45; S. L. H.. of N. Y., $40; P. J. F., of N. Y., $20; L. E., of N. Y., $15; H. S. S., of Mass., $45; S. F. W., of Iowa, $20; J. G., of N. Y., $45; J. S. T., of N. Y., $20; W. M., of N. Y., $20; F. S., of Pa., $20; H. F. T. H., of Wis., $20; V. & L., of Minn., $20; W. & T., of Conn., $45; B. H., of N. Y., $20; J. & I. N. T., of Ind., $20; G. M., of Ill.. $50; D. B. L., of N. Y., $20; H. C, E., of Pa., $20; A. J. A., of Mich., $45; R. & K., of N. J., $15; J. S., of N. Y., $15; J. H., of N. Y., $20; J. J. S., of Conn., $16; H. B. H., of Mo., $25; D. D., of Ill., $12; H. B. S., of Wis., $15; I. & W., of Ill., $25; T. W. H., of Ill., $15; M. C. D., of Ohio, $26; J. B. H., of N. Y., $15; J. M. S., of Conn., $16; J. F. R., of Conn., $30; P. S. F., of N. V., $35; O. C. B., of Iowa, $10; D. O., of Ill., $20; J. A. C. H., of Mo., $16; P. W., of Mich., $15; E. P. S., of Mo., $16; M. J. S., of N. Y., $10; L. A., of N. Y., $16; W. L., of N. Y., $25; A. B., of N. Y., $28; C. L. G., of N. Y., $40; G. W. B., of Ohio, $16; L. G. K., of Mo., $15; S. & B., of Wis., $15; R. P., of Iowa, $16; J. F. C., of N. Y., $30; T. N. M., of Mich., $16; G. W. M., of Mich., $16; W. B., of Iowa, $25; S. & L., of Pa., $16; B. S., of N. Y., $45; M. W., of N. Y., $15; J. B., of N. Y., $25; W. R., of N. Y., $25; W. H., of Del., $20; E. H., of N. Y., $25.

Persons having remitted money to this office will please to examine the above list to see that their initials appear in it and if they have not received an acknowledgment by mail, and their initials are not to be found in this list, they will please notify us immediately, stating the amount and how it was sent, whether by mail or express.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office, from Wednesday, Aug. 24, 1864, to Wednesday, Aug. 31, 1864:—

W. H., of N. Y.; S. H., of N. Y.; S. L. H., of N. Y.; P. F., of N. J.; C. B., of Cal.; E. H., of N. Y.; W. L., of N. Y.; J. B., of N. Y.; A. B., of N. Y.; J. C. S., of Mass.; F. & B., of R. I.; H. B. H., of Mass.; I. & W., of Ill.; J. & W. F., of N. J.; L. G. K., of Mass.; J. F. R., of Conn.; D. A., of Pa.; T. W. H., of Wis.; J. F. C., of N. Y.; P. S. F. of N. Y.; C. B., of Cal.; R. D., of Mich.; G. F. W., of Maine; W. B. of Iowa; D. & F., of Pa.; R. O. A., of Maine.

TO OUR READERS.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

MODELS are required to accompany applications for Patents under the new law, the same as formerly, excepton design patents, when two good drawings are all that are required to accompany the petition, specification and oath, except the Government fee.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given ; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgement of our reception of their funds.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and enclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

Back Numbers and Volumes of the "Scientific American."

VOLUMES III., IV., VII., IX AND X., (NEW SERIES) complete (bound) may be had at this office and from periodical dealers. Price, bound, $2 25 per volume, by mail, $3—which includes postage. Every mechanic, inventor or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding VOLS. III., IV., V., VI. and VIII. are out of print and cannot be supplied.

Binding the "Scientific American."

It is important that all works of reference should be well bound The SCIENTIFIC AMERICAN being the only publication in the country which records the doings of the United States Patent Office, it is preserved by a large class of its patrons, lawyers and others, for reference. Some complaints have been made that our past mode of binding in cloth is not serviceable, and a wish has been expressed that we would adopt the style of binding used on the old series, *i. e.*, heavy board sides covered with marble paper, and morocco backs and corners.

Believing that the latter style of binding will better please a large portion of our readers, we commenced on the expiration of Volume VII., to bind the sheets sent to us for the purpose in heavy board sides, covered with marble paper and leather backs and corners.

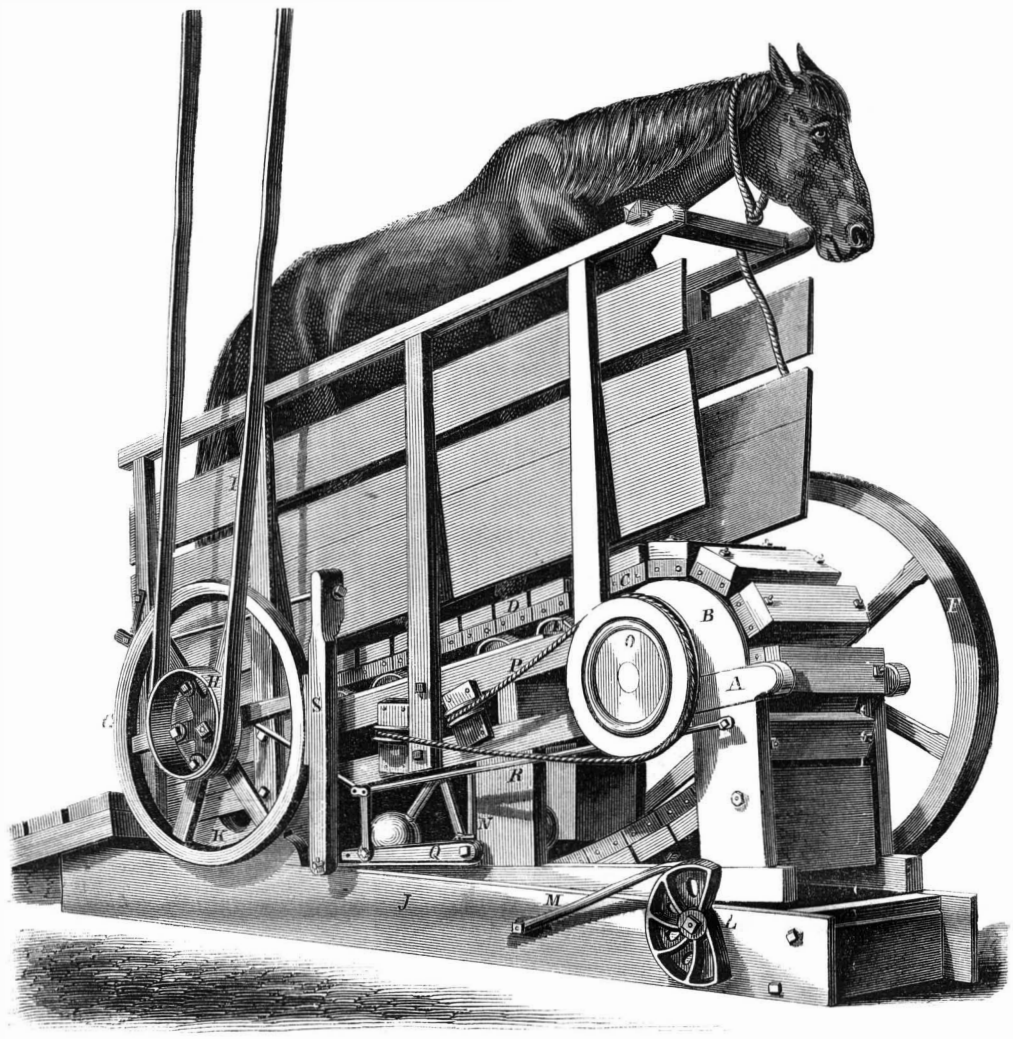
The price of binding in the above style is 75 cents. We shall be unable hereafter to furnish covers to the trade, but will be happy to receive orders for binding at the publication office, No. 37 Park Row, New York

RATES OF ADVERTISING.

TWENTY-FIVE CENTS per line for each and every insertion, payable in advance. To enable all to understand how to calculate the amount they must send when they wish advertisements published we will explain that ten words average one line. Engravings will not be admitted into our advertising columns, and, as heretofore, the publishers reserve to themselves the right to reject any advertisement they may deem objectionable.

Horse-power Machine.

Machines driven by horse-power are very common in many parts of the country where neither steam, water, or wind are available or desirable. Such machines are used to impart motion to other machinery, and circular saws, lathes, and other tools may be cheaply operated by them. The engraving published herewith represents an improved horse-power, which



HUNT'S HORSE-POWER MACHINE.

has some novel features worthy of attention. Appended is the inventor's description:—

A is the wooden frame-work of the machine, and B, a wooden pulley, over which the endless floor runs. This pulley, and a similar one placed at the other end of the frame, A, has a face nearly equal to the width of the floor on which the horse works.

C is an endless chain, one on each side, but only one is shown. This chain is composed of cast-iron links, six inches in length, having grooves running the whole length of their under sides, in which are wrought-iron links, connecting with the cast links by rivets. The chain is flexible in one direction, but stiff and rigid in all others; thereby, doing away with the numerous small rolls and railroad track generally used in machines of this character, and lessening the friction.

D is the wooden platform composing the floor on which the horse walks; the pieces composing it are hollowed out on the under side to fit the curve of the pulley, B, and are fastened to the endless chain by bolts.

The rolls, E, support the endless chains; there are six rolls on each side. The pulley, F, drives the iron balance-wheel, G, by means of a belt. H is another pulley, and I, a belt for leading off the power to the desired point.

J is an additional frame in which the machine sets, supported at K, by a bearing, and at L, by a pair of cams, one under each side. By these cams the front end of the frame, A, can be raised or lowered, being held in the desired position by the pawl, M, thus giving a greater or less inclination to the floor without altering the tension of the belt, I. This can be done while the machine is in motion.

A common governor, N, is driven from the pulley by the belt, P; also connected by the lever, Q, and rods, R, to the brake, S. This brake acts on the face of the balance-wheel G. An increase of speed in the machine causes the balls to rise and work the levers, pressing the brake on the wheel, G, and checking the motion. By this arrangement small machines can be run with the regularity of a steam engine.

On the opposite side of the machine is a binder-brake, so arranged, that in case the driving-belt should come apart, or slip off the pulley, the machine is stopped immediately, preventing any injury to the horse or the machine, and making it safe to leave the horse at work in care of any person.

This machine has but twenty journals, against some eighty in other powers of this class; each journal runs in a proper journal box, fully protected from dirt. It does not require oiling oftener than once a day, making a large difference in favor of this horse-power.

In places where a light power is required for but a portion of the time, this class of machines has advantages over steam-power, as they are worked with less cost, and require less care, than an engine. It is claimed that this particular machine contains improvements in construction, in addition to the apparatus for self-regulating, which makes it a superior one. For further particulars, or for purchase of rights, apply to the inventor, D. W. Hunt, 28 Second street, San Francisco, California.

Is Home-made Bread cheaper than Baker's?

A correspondent of the Boston *Transcript* makes the following statement:—"By repeated experiments in my family I have found that in making domestic bread—using yeast prepared in the house—a pound of good flour will yield very nearly two pounds of bread. The only addition made to the flour was about a tablespoonful of Indian meal, water and salt, to two three-pound loaves. A pound of flour never failed to yield a pound and three-quarters of bread. Then I made this estimate: A barrel of flour of 196 pounds made 343 pounds of bread; 343 pounds of bread, if bought of the baker in pound loaves, at five cents, would have cost me $17 15. My barrel of flour cost me at the time of these trials between $7 and $8. This is an argument for baking one's bread instead of buying it. Even at present prices much money would be saved by baking at home.

"But it used to be rare to find a five-cent loaf that weighed over 14 ounces. Therefore buying bread was still more expensive than my calculation makes it. In these times five-cent loaves weigh 10 or 10½ ounces, sometimes less, so that the price a purchaser of baker's bread actually pays for a barrel of flour is enormous. When flour is even $12 per barrel the cost of five-cent loaves is equal to paying $25, the loaves weighing 10½ ounces. I think sticklers for very white flour make a miss in their domestic economy. I never buy it, if flour with a shade of dark is perfectly sweet, and I never buy the highest priced flour, yet I do not see but I have very nice bread.

"In these days it is very well for all to economize in that which we can, 'just as well as not.' If there is money to spare, there is suffering enough to use it all up."

A New Invention wanted.

A correspondent of the *Shoe and Leather Reporter* asks the following question:—"Can spent tan, by some cheap process, be pressed into cakes and dried for winter use? Any invention bringing this about would prove advantageous to all tanners who have more spent tan than is needed for boilers, &c."

FROM THE STEAM PRESS OF JOHN A. GRAY & GREEN.