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ORGAN BLOWING APPARATUS.

It is only recently that motive power has been substituted for manual labor in supplying wind to church organs, many of which are of mammoth size, requiring from two to six stalwart men to keep the bellows full while the organ is playing, the employment of which manual labor is attended with great inconvenience and expense; for whenever the organist wishes to practice, or the choir to have a rehearsal, the blowers must be obtained if possible, and if not, then the playing must be postponed to a more convenient season; for it almost invariably happens that those who perform this service are otherwise employed during week days, and their services can only be had when they can be afforded most cheaply and conveniently.

An instrument of music costing so much as the organ, and which is as susceptible of constant use without injury as a piano, should be in a condition to be used at any time, and without the trouble of obtaining one or more persons to blow the bellows; in fact, no pipe organ, whether for the church, parlor, or public hall, can be considered complete without some automatic action to supply the wind, thus rendering it as convenient to use as the smaller keyboard instruments.

The advent of the cold water engine has opened a new era for this, the grandest and most powerful of all musical instruments, rendering it as accessible and convenient to use as the piano or flute. We give here with a fine illustration of an organ blowing apparatus, designed by G. W. Lascell, and executed by the Cold Water Engine Company, of Watertown, N. Y., for Christ Church, Brooklyn, E.D. (Rev. Dr. Partridge's), on Bedford avenue, near South Ninth street.

The engine is the Coats & Lascell patent, illustrated in the SCIENTIFIC AMERICAN of July 8th, last, so modified in form as to be peculiarly well adapted to the blowing of church and parlor organs, for which it has proved to be all that could be desired. It has received the hearty endorsement of Messrs. Jardine & Sons, builders of the organ, and all interested, who have examined the apparatus and witnessed its performances.

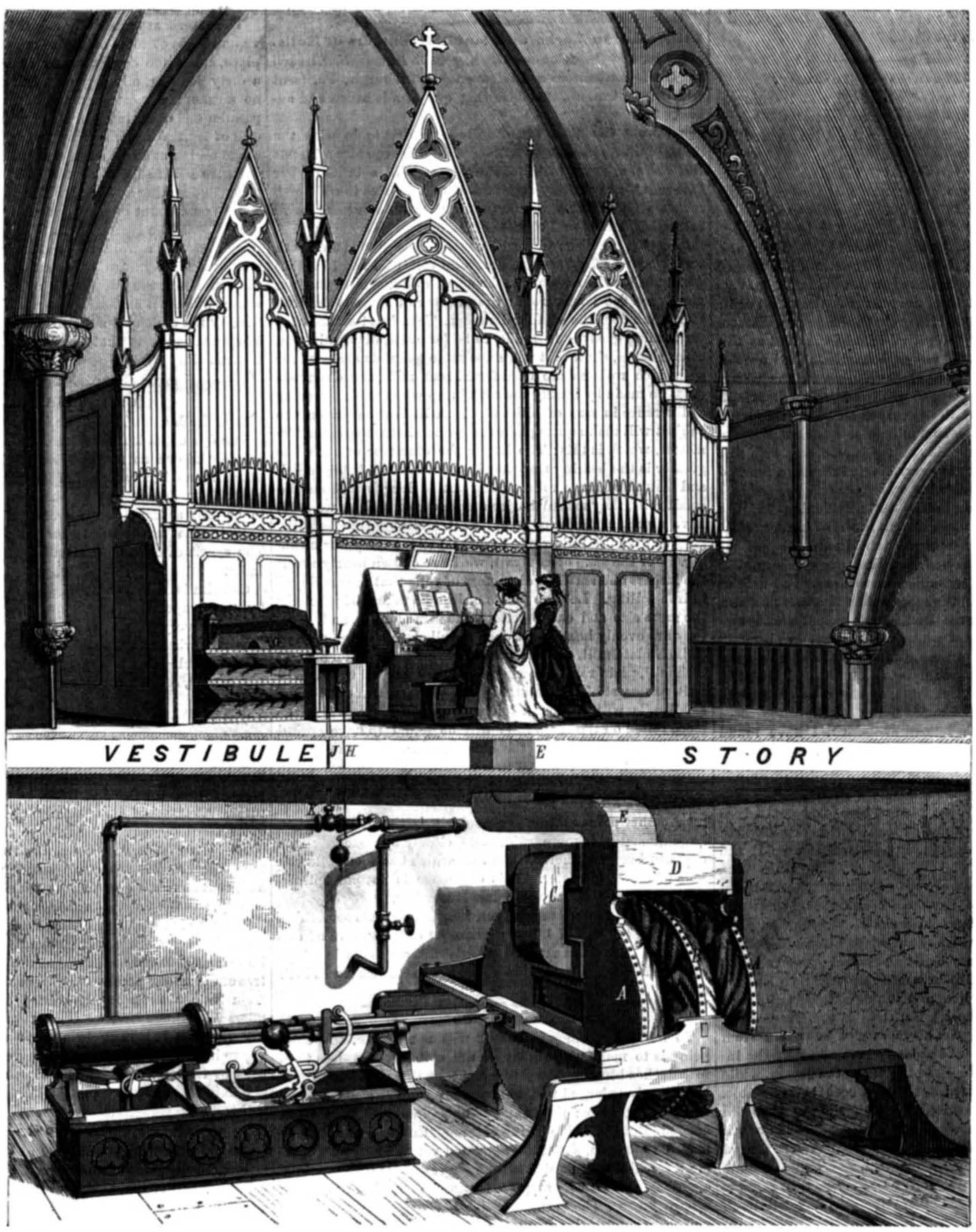
By reference to the engraving it will be seen that, in this engine, the crank has been dispensed with, and a new valve gear substituted for the ordinary eccentric motion, by which it is impossible for the engine to be caught upon the dead centers, or to stop at any point from which it will not readily start again—an important and even indispensable requisite in engines for organ blowing purposes.

The bellows is double acting, with stationary heads, A, and a movable piston, B, the whole covered substantially with leather. As the piston is moved forward or backward, the wind is forced alternately through the pipes, C, to the wind chest, D, at the top of which the trunk, E, is attached, through which the wind is conducted to the organ, as shown in the engraving. A portion of the organ is broken away, revealing a section of the bellows, on the back side of which is a stationary post, F, to which a beam is hinged, which extends across to the front side; and the end resting on a bar, which, with the post in the rear, supports this beam or lever at nearly the highth to which the bellows rises when fully inflated.

On the center of the top board of the organ bellows is a stationary block, G, which, as the bellows rises, comes in contact with the lever and lifts it. To the front end of this lever the governor valve rod, H, is attached, which is connected with the governor valve in the water pipe, so that, when the bellows is filled to the maximum point, the water is gradually shut off by the rising of the bellows, thus slowing the speed of the engine or stopping it entirely, and *vice versâ*, as the exigency of the case may require; thus the organ bellows is made to supply its own needs automatically, and with such a degree of nicety, in the adaptation of want and supply, as no hand blowing can at all approximate. Besides this, the organist is freed from all fear or anxiety, lest the man at the bellows may be careless or inefficient and mar or cut short his performance. In this, the organist is assured that whether he connects the full organ, or uses but a single stop, or however frequent or sudden may be the changes, the bellows is always full, ready for any emergency, provided always that the blowing apparatus is of sufficient capacity. In this case, as in all others of this manufacture, the capacity is more than ample to meet all the demands upon it.

The feeders of this organ discharged 24 cubic feet of wind to one revolution of the hand crank, while the apparatus now attached discharges 90 cubic feet to one revolution of the engine, and consequently is four times the capacity of the original organ feeders. The engine is, therefore, made to move very slowly, it being constantly held in check by the well-filled bellows of the organ, holding the governor valve of the engine nearly shut, allowing it to move but six revolutions per minute at the highest speed, and one and a half as the lowest; consequently the cost of water consumed is reduced to a nominal sum, the organ blowing expense being brought within 35 cents per Sunday for the prolonged services of the Episcopal and Catholic churches, and less than half that for the others.

Within convenient reach of the organist is the hand wheel, I, attached to the upper end of the rod, J, which extends down to the stop valve, K, and by which he starts the engine at the commencement of the service, and stops it at the close. Thus the organist is the engineer; the engine requiring no attention except a little oiling occasionally.



ORGAN BLOWING APPARATUS

All parts of this engine that would come in contact with the corrosive action of water are made of brass, which, with the frictionless balanced valve before described, renders this one of the most effective, economical and, for aught we see, durable machines that could well be devised.

These engines are manufactured by the Cold Water Engine Company, of Watertown, N. Y., to whom our readers are referred for further information concerning them.

Devices for Raising Sunken Vessels.

Thomas Collier, of New York city, has invented improvements in apparatus for raising sunken vessels.

In the application of his system, the hatches will be stopped or closed by two pieces of strong plank, rabbeted at the edges, and covered on the upper surface by sheets of india rubber or other suitable packing, one of which sheets is adjusted between the parts forming the rabbeted joint, while the other laps over the joint, the plank being inserted through the hatch below the timbers, and clamped up to them and the framing of the hatch, by bolts connected to them by eye-bolts, and passing through the cross pieces temporarily inserted in notches in the sides of the frame.

But in the case of the hatch through which the hose for pumping out the water is passed, the bolts are made longer, and are supported by bridges spanning the hatch, one near each end. The planks for this hatch have short tubes permanently fixed in them, projecting at each side, and screw-threaded for attaching the hose, which will be in two sections, one extending below into the hole, with a nozzle or strainer at the end, and the other upward to the pumping apparatus to be adapted for pumping water out and air in. The two pieces of plank are employed for closing the hatches, because they may be admitted through the hatches, while a single piece wide enough for the purpose could not. Stop-cocks in the short hatch tubes are employed to close them in case, by any accident, the tubes above become ruptured, in which condition the water would flow into the hold. The cocks are rigged with cords and pulleys or other apparatus adapted to work them from the deck of the vessel above. The smoke-pipe, or the hole through the deck therefor in case the pipe is carried away, will be closed by a sheet of india rubber, placed over it, and a closed sack, being placed over the rubber is made fast to the deck by a ring or cleats fastened down over the edge in any way to hold the sheet and sack in place when filled with air forced in through a light flexible hose, leading up to the top, which forces the said sheet and the bottom of the sack down upon the deck and closes the opening water tight, the top of the sack being prevented from rising by cords rigged over it. The sack may have a short tube attached to it for admitting water to sink it to the vessel for adjusting thereon, after which the water may be forced out by the air pumped in, and the said short pipe closed. A hole through the side of the hull will be closed in the same manner, as indicated. In either case, when the opening is wide, bars of wood or iron will be placed across to prevent the packing from being pressed in the hole.

The hatch closing apparatus will be found very serviceable in case of storms at sea, as a protection in case the "booby" or other hatch is carried away, as often happens.

Other small holes may be stopped by a plug, india rubber washers, and an inflating tube, arranged to admit the air above the washer and pass it snugly to the deck, the flange of the plug being nailed down to the deck.

The Physical Features of Insanity.

Dr. T. B. Tuke, a physician of eminence and learning in the science of mental disease, read a document at the recent meeting of the British Association for the Advancement of Science, in which he said:

"It is generally acknowledged that the intellectual powers are manifested through the gray matter of the cerebrum, and as in insanity these faculties were impaired, exaggerated or perverted, I believe that, by examining the brains of the insane, a hope exists of discovering a road for arriving at a solution of the functional difficulty. The time has passed when the term mental disease, insanity, or madness, conveyed, to the minds of physicians, the idea that the mind or its faculties were the entities which were the subject of disease. By a process of reasoning the pathologist has arrived at the conclusion that the abnormal physical manifestations are dependent upon primary or secondary changes in the nerve tissue; that insanity is a *symptom* of disease, not a disease itself, and that the cause of the disease must be looked for in the brain. Six years ago I commenced a systematic microscopic examination of the brains of the insane, and with this most important result, that in every single instance a marked departure from healthy structure was observed.

"I am not prepared to designate the individual part of the brain specially affected in the different forms of insanity; but I may say generally, that the *corpora striata* are the portions most frequently found affected, and that the cerebellum is the organ least frequently subjected to disease. Further, that the white matter is much more liable to evident structural morbid change than the cortical substance in comparatively recent cases; and that where the intellect has been in abeyance for prolonged periods, the structure of the gray matter of the cerebral convolutions is difficult of demonstration, the layers are found indistinct, as the cells are few in number and generally small in size. In the fifty-three cases of chronic insanity which I have examined, I have found distinct structural changes in the brain of each.

The Beehive.

What does it matter in what kind of hive or box the bees are kept? says a correspondent of the *Gardeners' Chronicle*. It does not matter much during the summer months, if the bees be located in a good district for honey collecting. But we have to provide for one or two contingencies, and not a few drawbacks from the extremes of heat and cold—the sun heat melting the new combs in wooden boxes, as happens even in the straw hives, which are the best substitute for the natural habitat of the honey-bee, because the straw absorbs the moisture within the hive in winter, and, with slight protection from the summer heat and winter rains, has carried through many a stock of bees. But there is the drawback of providing stands for the straw hives, as well as covers from the weather; and then how completely is the state of the interior condition of the hive a dead letter to the owner, while transportation for fresh pasturage for the bees is impossible. Then comes the period for smoking and driving, to save the hives of the bees at the honey harvest, if the old plan of the brimstone match has really been set aside. What a hard task has it been to introduce this "humane system," in spite of the able writings of the Rev. W. C. Cotton, with Mr. Robert Golding's straw hives and pamphlet—or any collateral, or safer, or nadir hiving; or even the "bar-frame plan," with all the German and American adaptations of more recent dates. Writings of the late lamented Mr. Woodbury, who did so much in introducing thoroughly the yellow banded bee, commonly called the "Ligurian bee," and which has become quite a profitable business in America and England, although the first agent, Mr. Neighbour, of London, had the *Apis ligustica*, from Mr. Herrmann, of Switzerland, only in 1859, who called this bee *Apis Helvetica*. But to return to the question of hives. No hive yet introduced by hive masters and sellers has been constructed to meet the wants of the bees, but rather the capricious fancies of bee-keepers, where the maker has to tax his skill and ingenuity to meet these wants, while every season apparently requires a new hive or a new book to be foisted on the public, while the true principles have been lost sight of both for economy and the right management of the honey bee. No hive could be so easily converted, either for the usual profitable keeping of bees, or the scientific observation of the same, as the "bar, frames," by those who wish to combine the two; but they generally fail in their object by their own zeal in finding out a "perfect cure" for all the ills that bee management has to contend with, and the beehive seller and constructor is always ready to assist the "new idea"—to put in a hinge or a bar, or some piece of glass that would surely make the hive a marvel of invention! instead of taking a lesson from the simple wants of the bees. We may then sum up the history of the bee hive with a hop, skip, and a jump,—from the Schirach suggestion to Huber, who used the leaf hive, and the improved bar fixed Grecian hives of Golding, made in straw and circular, to the adapted wood and straw hives of Mr. Woodbury, who introduced the system of compound bar and frame, with the adjusted bar of Mr. Golding, having guide combs affixed, to make the bees build in a perfectly straight line; but none have attempted the first views of the "bar frame hive," which followed on the heels of the Grecian hives, not with any view to multiply bee apparatus, bee houses, or sheds, or the necessity of stands, covers, dividers, or glass frames, except for the ladies and timid bee keepers, but with the single object of an easy mode of inspecting each comb, and protecting the inmates of the hive, and transporting the hive and bees bodily anywhere and at any moment.

Difference in Large and Small Diameters of Rolls.

In No. 4 of *Miscellaneous Rolling Mill Information*, issued by Lewis & Rossiter, Second avenue, Pittsburgh, Pa. (sent free on application), the following question is asked and answered:

"Has not the diameter of rolls somewhat to do with the size of billet necessary to fill a groove of given size? To put the question more plainly before you: Will a billet or bar that will fill to a nicety a groove of certain size in rolls of 8 inches diameter, also as exactly fill a groove of same size in rolls of 12 inches or 16 inches diameter?

"Answer: A billet that will exactly fill a groove in 8 inch rolls will over fill the same groove in rolls of 12 or 16 inches diameter, for the reason that the small roll elongates the iron more than the larger rolls; the larger roll spreads the iron more than does the smaller diameter. Templets that are used for turning grooves in guide rolls for ovals, diamonds, and other shapes, show that when the same templets are used for eight inch rolls as are used for 12 inch rolls, the difference must be made by letting the rolls jump when working, or by a difference in size of billet used. A little thought on the subject will make quite plain the principle that governs the matter, which is this: The larger the diameter of rolls the greater is the bearing that they have on the iron being rolled, and instead of large rolls rolling out in length, as does the small rolls, they make the iron more dense, and, as we said, have a greater tendency to spread it.

"We give the following, to more fully convey our meaning. For the sake of contrast, we have chosen nearly about the largest and smallest diameters of rolls that are employed in iron rolling. Let two pieces of iron be taken, of precisely the same size and cut precisely the same length, and, after they are evenly heated, let one be rolled thinner on a 24 or 30 inch plate mill, and the other to same gage on an 8 or 10 inch mill, plain rolls, allowing each to spread all that it will as it passes straight through. The piece drawn out by the small rolls will be found longer than the other, while the piece rolled on the large rolls will be found to have spread more than that rolled on the smaller rolls. Had the pieces, when rolled, been confined in a groove so that neither could have spread, even then the iron rolled on the smaller rolls would have been the longest.

"Another point touching this subject is, that iron rolled on large diameters is more solid, more closely approaching iron that has been hammered, than that which has been rolled on rolls of small diameter. This difference is not perceptible. may be, in all cases, nevertheless it is a fact.

"In conclusion, we answer, yes, the diameter has something to do with the size of billet necessary to fill a groove of certain size. A billet that will exactly fill a groove in 8 inch rolls will fin when entered in a groove of same size in 16 inch rolls."

Non-Smoking Chimneys.

To build a chimney so that it will not smoke, the chief point is to make the throat of the chimney not less than four inches broad and twelve long; then the chimney should be abruptly enlarged to double the size, and so continued for one foot or more; then it may be gradually tapered off as desired. But the inside of the chimney, throughout its whole length to the top, should be plastered very smooth with good mortar, which will harden with age. The area of a chimney should be at least half a square foot, and no flue less than sixty square inches. The best shape for a chimney is circular or many sided, as giving less friction (brick is the best material, as it is a non-conductor), and the higher above the roof the better.

Manufacture of Paraffin Oil in Scotland.

It is to Reichenbach, who is generally regarded as the discoverer of paraffin, that we are indebted for the name by which this oil is now mostly known. Paraffin is formed from *parum affinis* (little allied, or little affinity—in consequence of its power to resist the action of the strongest acids and alkalies). Paraffin, or coal oil, is made from coal or shale, the precise difference between which is not very easy to determine; at all events, upon a subject on which so many doctors differ, we may well be excused if we do not attempt to arbitrate. We may be safe in saying, however, that the district in Scotland, which produces the valuable mineral from which oil is made, stretches nearly the whole distance from Edinburgh to Glasgow. The quantity of crude oil contained in a tun of coal or shale varies considerably. A really good shale says the London *Grocer*, is reckoned to produce from thirty-five to forty gallons of crude oil per tun, thirty-eight gallons being considered a high average, though we were shown several specimens of coal which were said to contain as much as seventy; but the high price which had to be paid for this rendered it unremunerative in the face of the low prices which are at present obtained for the burning oil. The shale has to undergo the operation of being broken into small pieces before it is put into the retorts. In some cases this is performed by a huge machine, called "the crusher." Once between the wheels of this apparatus, the largest blocks are smashed into the required size, with as little regard to the difficulty of the operation as if they were mere lumps of blackened chalk. Some idea of the power of these machines may be found in the fact that one of them, which we saw in the full work at Addiewell, one of the refineries belonging to Young's Paraffin Light Company, was said to crush between its ponderous rollers about 3,000 tuns per week. In some refineries, however, they still prefer to adhere to the to the more primitive style of breaking by hammer, similar to the mode of preparing stones for macadamised roads. The shale, having been broken into the required size, is put into the retorts, some of which are placed horizontally, others vertically.

The retorts are gradually raised to a dull red heat, when vapors begin to come off which are passed through a series of pipes, called the condensers or coolers, where they form into a dirty looking, oily liquid, very impure, and possessing by no means the most pleasant odor. It is, however, rich in paraffin and other ingredients of more or less value, the process of separating which we now proceed to describe. The crude oil is put into a large cistern, and maintained at a temperature 150° to 160° Fah. for some time. This has the effect of separating a considerable quantity of the tarry matters which, on account of greater density, settle to the bottom of the cistern. The lighter oil is then transferred to an iron still furnished with a worm or condenser immersed in water, and kept at a temperature of about 55° Fah. Heat being applied to the still, the oil distils over, and is condensed in a worm, whence it is passed into a tank or agitator for purification, by the action of sulphuric acid, the subsequent process being analagous to that employed in the rectification of petroleum oils.

Cutch and Gambier.

Says the London *Daily Recorder*:

The dye cutch is from a tree, the *acacio catechu*, and is familiarly known as *terra Japonica*. This latter name originated in an ignorant belief that, primarily, cutch was an earth from Japan, but as that *terra Japonica*, turned out to be only a *terra incognita*, the illusion was dispelled by time, but not so the misnomer, which is current to this day. The acacia catechu abounds all along the coasts of Eastern India.

Catechu is a brown astringent substance, easily obtained by the evaporation of its own inspissated decoction. The process is very simple; the outer bark of the tree is carefully removed, when the interior colored portion of the wood developes itself; this is cut up, dissolved by a heated solution, evaporated, solidified cubicaly, and then packed in boxes for export.

The commercial utility of this article is very great. It is a most facile dye, rich in tannin, solvent in water, and with great affinity for cotton, to which it gives a permanent brown. It is not however limited to this color, or to this material, for it yields blacks, greens and drabs to silk and other manufactures. The fact of its applicability to cotton, however, suggests an important consideration to the producer and importer, and that is, that as surely as the manufacture of cotton goods increases, so surely will the consumption of cutch; and, that as soon as statistics register any question as to its supply, so soon must its value enhance.

Gambier is repeatedly confounded with cutch, and wrongly termed catechu, or *terra Japonica*. Gambier is so called, from its being the inspissated juice of the *uncaria gambir*, a native tree of the Malay peninsula. Its chief source of production is from Rhio, a town in the island of Bintang, about thirty miles from Singapore, which port is the principal place of exportation. It is made in a similar way to cutch, and owing to its richness in tannin and economy in price, is mostly used by tanners, though available for many dyeing purposes and akin to cutch, to which, however, it is much inferior in this respect.

Les Mondes, reports some recent experiments made with a saccharine product, extracted, many years ago, from a plant called *Achras sapota*, indigenous to Martinique. The sugar was found, on an elaborate analysis, to consist of 52 per cent of cane sugar and 45 per cent of milk sugar. This result was obtained by boiling in alcohol of 90 per cent, the milk sugar being found in the condition of an undissolved residue.

MODEL IRON WORKS.

[from Engineering.]

The Round Oak Iron Works are, *par excellence*, the best designed of any in South Staffordshire; they are handsome in their style, and substantial in their construction, while not only have they a fine outward appearance, but they are built in a manner best suited to the laying out of the internal machinary. The works are the property of the Earl of Dudley, a descendant of the famous Dud Dudley, who was the first to successfully smelt iron with pit coal. The site of the present works is also not far removed from the spot where Dud Dudley carried out his operations. The Round Oak Iron Works are situated at Brierley Hill, about two miles from Dudley, close to the Great Western Railway, while at their rear is a canal, so that excellent facilities exist for the transport of material to and from the works. Nearly the whole of the land and minerals lying within a circle of five miles round Dudley are the property of the Earl, and it was with the object of utilising on the spot the very rich materials employed in the construction of iron, with which the district abounds, that the present works were constructed. The celebrated "thick coal," ten yards thick, is worked from his lordship's pits, as is also the rich argillaceous iron stone, from which alone the iron is made at these works. The mine is smelted in the blast furnaces, of which there are two extensive plants, and the limestone, used as a flux, is obtained from the pits and caverns on the estate. The iron produced here is, for certain purposes, unsurpassed, and it commands a higher price in the market than any other made in the district. The whole of the materials used in the building and machinery are raised and manufactured, and the buildings, engines, machinery, &c., were erected by his lordship's own workmen. There are four blast furnaces at the New Level, each supplied with hot air stoves, the blast being furnished by a large condensing beam engine. The blast main has a partition running through its centre, so that it can be used for two separate engines at the same time; it is approached by a circular staircase, and a platform runs the whole length, so that men may have ready access to the valves. The tops of the furnaces are level with the main railroad, which brings the coal and coke from the earl's collieries, and delivers them at the furnace mouths. The limestone and ore are drawn from the canal side up an incline to the top of the furnaces by a beam engine, which also draws the cinders from the falls to the top, whence it is taken away, and tipped down the cinder bank. The Round Oak Works are built in a very substantial manner, of red bricks faced with white, and the eaves of the slated roofs are terminated by cast iron spouting of a very handsome pattern. The slated roofs, which cover the entire works, are supported upon ornamental cast iron columns and brackets. The centre portion of the building is occupied by two forges, and on each side of these are the mills; in close proximity to the mills are two extensive warehouses for stocking the finished iron, and these warehouses form the extremities of the front of the works. The boiler houses, three in number, are at the back, while in the centre of the front of the works is a neat little building, used as the timekeeper's office. At the back of this office are two forges, having about fourteen puddling furnaces in each. The machinery in No. 1 forge is worked by a large rope band from a pulley on the flywheel shaft of a horizontal high pressure steam engine, having a 30 in. cylinder and a 3 ft. stroke, placed between the two forges. This machinery consists of a 6½ ton helve, while in No. 2 forge is a 6½ ton helve, worked by gearing from an intermediate shaft. There are two forge trains, one standing in each forge, worked from either end of the intermediate shaft above referred to. In each of these trains there are three pairs of rolls with all their necessary appliances. Steam is supplied to the forge engine by five cylindrical boilers, 30 ft. long by 5 ft. diameter, and one boiler placed upon cast iron columns and girders over a heating furnace, and connected by a flue to the latter. Besides the machinery already named, there is in one forge a very powerful smith's steam saw, which will cut up to 7 in. or 8 in. rounds and squares, and in the other a massive pair of lever shears used for cropping the edges of the plates. To the 16 in. mill there are three heating furnaces, and to the plate mill the same number, with the addition of a large annealing furnace. A 4-ton Kirkstall Forge Company's patent steam hammer stands at one end of the forges.

Howatson's patent heating furnace has lately been tried here with great success. The speciality of Mr. Howatson's plans consists in his modes of supplying hot instead of cold air to the grates of the puddling and heating furnaces, and he asserts that in one year coal and iron to the value of £187 may be saved in a puddling furnace, and over £450 in a 12 in. mill heating furnace, by the adoption of his system. We are not, however, in possession of sufficiently extensive data to to enable us to form an opinion of the accuracy of these estimated savings under a variety of circumstances. The invention is applied to a heating furnace in the following manner: All the ordinary air passages, such as the opening under the grate at the end of the furnace, and the fuel charging place, are covered over; the former with sheet iron, having a sliding door, actuated by a balance weight at the top, which can be lifted to clean the bars; and the latter with a hanging cast-iron door. By this means all air is kept out from the grate end of the furnace, and all air necessary for combustion is supplied from the stack end. At the bottom of the stack there is a square opening, and, above, several perforations in the brickwork; through these the air enters, and passes into flues surrounding the base of the stack, where it becomes heated by contact with the flues. It is then conducted down, round the neck of the furnace, into a series of parallel passages, from whence it enters the opening under the fire bars, and is used at a high temperature for the combustion of the fuel. In order that the gases generated by the fuel shall be thoroughly consumed, and that there be no smoke, a flue is made in the walls of the fire grate, opening by means of perforations both above and below the bars. The perforations under the bars are covered with a sort of valve, which can be regulated so as to supply any quantity of air as required over the top of the fire, and can stop it altogether when there is no smoke. A handle attached to this valve is placed in front of the furnace near where the man stands. The application of the patent to a puddling furnace is slightly different, as the cold air is first supplied under the bed of the furnace, which it cools and preserves, and then passes round the base of the stack, along the back of the furnace, and is then delivered in the heated state under the grate. The smoke consuming apparatus can be applied as in the heating furnace. By an extra arrangement in the puddling furnace, the pig iron is melted in a separate chamber by the waste heat from the furnace. This chamber is built between the puddling chamber and the furnace neck. The charge of pig iron is put into it, and whilst the puddler is manipulating his charge, drawing the balls, and taking them to be shingled, the pig iron is ready to run down into the puddling chamber. With a heating furnace constructed on this plan at the Round Oak Works, the following results have been obtained: In one week of ten turns, when a 12 in. mill furnace had got into regular working order, a saving of 5 tuns 18 cwt. 0 qr. 17 lb. of coal, 1 tun 2 cwt. 1 qr. 3 lb. of iron, and a loss of 2 tuns 8 cwt. 2 qr. 3 lb. of cinder, the decrease in the latter being accounted for by the saving in the iron. It is also stated that the furnace has worked better, the iron being sooner and more uniformly heated, that the labor of the furnace men is diminished, as less fire required, and that there is every appearance that the brick lining will last much longer than is usual with the ordinary apparatus. A puddling furnace has recently been tested at Mr. Thomas Vaughan's Bishop Auckland Iron Works, and there was a saving during the first week it was in operation of 4 cwt. 0 qr. 9 lb. of coal, and 2 qr. of iron per tun of puddled bar made.

The Round Oak new forges, which are situated at a short distance from the other works, have been built about six years, and were erected with the object of making a sufficient supply of puddled bars to keep in advance of the works. The puddling furnaces, 28 in number, are arranged in a semicircle, the engines, forge trains, helves, &c., being placed as nearly as possible about the centre of the semicircle, by which plan all the furnaces are at almost an equal distance from the helves. The forge engines are vertical and placed side by side, having cylinders 27 in. in diameter, with a stroke of 2 ft. 4 in. Steam is supplied from six cylindrical boilers, 35 ft. long by 5 ft. diameter, which are at some distance behind the engines, and clear of the works. To each engine there is a forge train helve, and a pair of shears. The cam rings are driven by pinions on the flywheel shafts, which work into wheels on an intermediate shaft, and are geared to the cam ring shaft. Each helve weighs 6½ tons. The forge trains and two pairs of cutting down shears are driven from the ends of the intermediate shafts, worked by gearing and cranks.

Experiments with Dualin.

Some recent experiments with this new explosive, made on a section of the New York and Boston Railroad, near Tarrytown, N. Y., seem to prove that, while it is somewhat less powerful, it is far safer than nitro-glycerin.

The experiments were conducted by Mr. A. C. Rand, of the Laflin and Rand Powder Co., N. Y., in the presence of many gentlemen interested in the employment of blasting agents.

In order to demonstrate the non-explosive nature of the compound without the aid of a fulminator, a keg packed with the material was elevated by a derrick to a hight of about sixty feet, and then allowed to fall on a rocky surface. The concussion produced no more effect than would have followed had the keg been filled with common earth. As an evidence of its extraordinary utility in submarine work, a broken package was thrown carelessly into a pond of water, and sunk with the aid of a large stone, having first been connected by means of a wire with a powerful electric battery. On being fired it exploded with tremendous force, almost completely lifting the entire body of water into the air, and tearing away the earth for a distance of several feet at the bottom where the package, containing not more than half a pound of the "dualin," had been deposited. A similar quantity, when placed on the surface of an immense bolder, having been first covered with a little earth, was exploded with the fulminating cap by electricity, blowing the rock to atoms. A moderate charge of powder tamped into a hole six inches deep had previously blown out without affecting the solidity of the stone. Other satisfactory experiments were performed.

The effectiveness of the dualin as compared with powder was proved by placing an ounce of the latter in a mortar loaded with a ball weighing over fifty pounds. On the charge being fired, the ball rose lazily in the air to a hight of perhaps not more than twenty-five feet. An ounce of dualin was then carefully weighed and placed in the mortar underneath the ball. The battery having been applied, the iron missile was sent flying toward the clouds, reaching an altitude of at least four hundred feet.

The dualin, which, as our readers are aware, is a preparation of finely comminuted wood and nitro-glycerin (see page 170, Vol. XXII., of the SCIENTIFIC AMERICAN), in appearance resembles pulverized vegetable matter, and is a remarkably light substance. On coming in contact with fire, whether the quantity of dualin be large or small, it burns rapidly, with a fierce flame, evincing no explosive features whatever. A box filled with the compound was thrown into a bonfire, and, on being ignited, passed off in a volume of flame, leaving the receptacle almost intact.

Protection against Fire.

One of the most important elements of our civilization is the power to preserve treasures against destruction by the elements. It is only during the present generation that this power has obtained a recognition in the arts proportionate to its importance. Fireproof buildings, safes, and vaults, for the preservation, not only of momentous public records, but of all considerable accumulations of money, of precious goods, and of documents, are now devised with all the ingenuity of our ablest inventors, and constructed with all the practical skill of our most expert artisans. The result is not only that the libraries and public records of this age will be saved to history, but that the accumulation of wealth from year to year will go on more securely and rapidly. Destructive as was the Chicago fire last week, it would have been doubly so but for the protection afforded to jewels, books of account, money, records, deeds, and the like, stored in safes and vaults.

On the other hand, it is evident that the work which ingenuity and enterprise have to do in protecting property against fire is as yet not half done. The devices which enable our best safes to hold their contents unharmed, for many hours amid a furnace heat, are not applicable to large buildings, and nothing else has been found to take their place. At Chicago whole blocks which had been built at great cost to be "fire proof" gave way to the flames almost as soon as mere wooden sheds. Stone walls "chipped" and fell, iron beams broke or softened and bent, iron shutters were melted off or else blown off, and all the woodwork, or the inflammable goods, within the best of these structures seemed to burst into fire before the heat which the wind directed upon them like the flame of a blast furnace.

The indestructible building which will protect inflammable contents against destruction when a great mass of fire is poured upon it from outside is not yet invented, and is perhaps impossible. But the building which, with its contents, is perfectly safe from fire except when the city around it becomes a furnace, is well known; and if one street were built in this way it would be a complete barrier to the fire; half a city on either side of it might burn, and the ruin might be stopped at this street even against a gale of wind. Had Lake street, or Madison or Monroe, from the river to the lake, been made of buildings like that of the Chicago *Tribune*, the fire of Monday would have ended there, and the northern half of the city would have been saved.

This is a subject which demands attention, not only from landlords and builders, but from all cities. The same kind of security which the bank has in its vaults or the merchant in his safes is to be sought by cities in making, if not each house, at least each section of the city, proof against the spread of fire from any other section. Where land abounds, wide avenues and frequent parks are, for many reasons, the best possible protection. But where land is too scarce and dear for these, as it now is in all New York south of Fifty-ninth street, fire proof streets seem to be the only remedy. A little care in building for ten years to come, and a small addition to its expense, would make it nearly impossible for a fire to cross Broadway; and the same principle might gradually be applied to twenty or more cross streets below Fourteenth, so that no large part of New York could under any circumstances, be burned by one fire. In rebuilding Chicago, it is evident that something like this ought to be done at once.

FIRE SAFES.

There will be lessons to be learned from the Chicago fire concerning the value of safes and vaults, and the true principles of constructing them. The public at large has taken too little interest in this subject; but now that a hundred thousand people have suddenly lost everything except what these contrivances saved to them, the question how and why so much was saved, and how much more might have been saved, becomes interesting to all men. We are as yet without details as to the fate of the several kinds of safes employed there; as to the construction of those which did best, and of those which disappointed the hopes of their owners; but these are matters which must attract attention soon, and on which the public are entitled to be well informed. It is known that the Custom House vault failed entirely to protect its contents. We do not know who built this vault for the Government, nor what officer accepted it. But the fact is a grave one, as showing the incompetency or dishonesty of some man in a high place of trust, and it ought to be investigated at once.

The occurrence of this fire, with the impossibility, in most cases, of saving even the most valuable papers, unless they were already deposited in a fireproof place, is likely to lead the people of other cities to prepare against such an emergency by a more extended use of safes. It becomes the makers of these to study the results of the Chicago fire with care, and to remedy the defects which it may have revealed in any of their work. In particular, they must learn not to sell as "fireproof" any safe whatever which is too small really to protect its contents against a great heat; for it is certainly the small sized safes which have chiefly failed, and it is of the first importance for them to remember that it is the enormous price of their goods which has hitherto prevented the more common use of them; and that, in order to serve the community to the utmost, and thereby to enrich themselves most effectually, their immediate end in view must be to sell the safes at the very lowest price consistent with good workmanship and security—that is to say, at a much lower price than at present.—*New York Evening Post.*

THE London *Athenæum* hears that Mr. Darwin is engaged on a work in which the facial expression of animals will be one of the chief topics discussed.

Improved Thrashing Machine.

The accompanying engraving will give our readers an idea of an improved thrashing machine, in which the thrashing drum is provided, on its outer surface, with separated ribs or thrashers, *a*, extending from end to end of the drum, and so constructed that each rib will present, to the material being thrashed, an obtuse angular front surface, and a receding curved or convex back surface.

The drum is made light near its center, and heavy at its perimeter, to increase its momentum and steady its motion.

Above the drum is placed a concave cap, C, which is also provided with ribs extending, as on the drum, from end to end, and constructed with flat rectilinear thrashing sides and convex backs, as shown. These are so arranged, relatively to the ribs on the drum, as, it is claimed, to operate to the best advantage in thrashing grain without injury to the straw.

The ribs of this concave are made separately, and bolted to braces upon a sheet metal backing, and, to combine strength with lightness, they are grooved or made concave on the backs, which meet the sheet metal backing.

The feed rollers are made with spiral bands extending over their peripheries, as shown.

The two central bands, or braces, which support the ribs of the concave, have their front ends turned upward, to aid in supporting a detachable chimney or funnel, through which dust and other light particles escape from beneath the front edge of the concave cap.

The material is fed in very uniformly by the feed rollers, which enable a person little skilled to do the feeding in a proper manner.

It is claimed for this machine: That it requires not more than half the power to do the same work that is used by spike thrashers. That it separates the grain, grass seed or flaxseed, thoroughly, without injury to the grain or breaking of the straw. That by the adjustability, up or down, of the concave cap, it may thrash all kinds of grain, clover, millet, and other seeds, beans, peas, etc., in a perfect and rapid manner. So perfectly is it said to spare the straw, that it requires a keen eye to detect the difference between a sheaf of thrashed and unthrashed straw.

This machine, which has been christened the Lone Star Thrasher, was patented September 13, 1870. Circulars containing further information may be obtained of E. E. Roberts & Co., brokers in patent rights, 15 Wall street New York.

Ammonia as a Motive Power for Street Cars.

The use of ammonia as a motive power involves some very nice scientific and mechanical principles. That the general reader may comprehend the peculiar difficulties met with in the attempts to render this substance available for the propulsion of machinery, we will enumerate its leading characteristics.

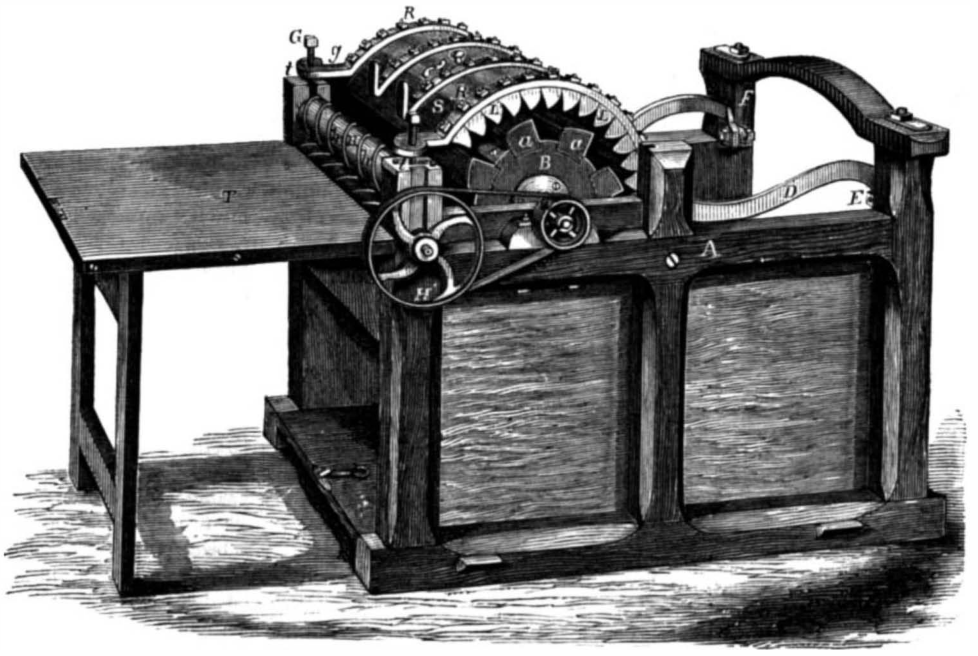
Ammonia is composed of three parts—by weight—of hydrogen and fourteen parts of nitrogen. These substances do not directly combine to form ammonia; that is, there has yet been discovered no way by which they can be made to combine when placed directly together, but when the hydrogen is presented to nitrogen at the moment of its liberation from water, the oxygen of the latter being abstracted by the oxidation of some other substance, the combination takes place, and ammonia is formed.

This reaction takes place in the decomposition of various vegetable and animal substances, and in the progress of many industrial operations, of which latter the most notable, in this respect, is the manufacture of illuminating gas. In distillation of coal at the gas works, large quantities of ammonia are produced, combined with sulphur and carbonic acid; and, the resulting carbonate and sulphide of ammonium being treated with sulphuric or hydrochloric acid, sulphate or muriate of ammonium is formed, the commercial name of the latter being muriate of ammonia, or sal ammoniac.

From the two latter salts, ammonia may be freed by heating either of them in contact with a paste made of water and quicklime, sal ammoniac being the salt principally used for the purpose. The ammonia passes off as a gas, is collected in water, for which it has such a strong affinity, that, when the temperature of the water is maintained at 59 degs. Fah., it will absorb 727 times, and at 32 degs., 1,050 times its volume of the gas.

The solution of ammonia in water, containing about 670 volumes of the gas, forms the *aqua ammonia* of commerce, and it is this substance that inventors have sought to utilize in ammonia engines, it possessing peculiar advantages for the purpose, as well as presenting many difficulties, to such an application, which we will point out.

This solution is colorless, and strongly alkaline, is acrid to the taste, and so caustic that it blisters the skin if applied to it. It freezes into a gelatinous mass at 40 degrees below zero of the Fahrenheit scale, and liberates ammoniacal gas rapidly when exposed to the air, the escape being greatly accelerated by heat, so much so that ebullition is produced at 122 degrees Fah. A solution of the strength of 20 degrees Beaume boils at 140 degrees.

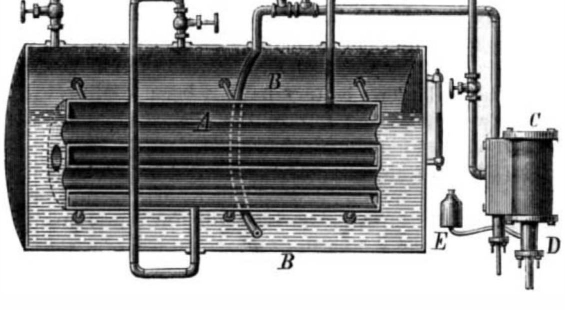


THE LONE STAR THRASHER.

Its capacity for heat is only one fifth that of water, and three pounds of coal will produce four gallons of the liquefied gas, which, heated to 232 degrees Fah., affords a pressure of six and one half atmospheres. To obtain the same pressure from steam requires a temperature of 320 degrees, the relative volumes of the ammoniacal gas and the steam, at this pressure, being 983 for the former and 295 for the latter.

AMMONIA ENGINE FOR STREET CARS.

Fig 2



The same amount of coal that will convert three volumes of water into steam at 212 degrees, will produce four equal volumes of liquefied ammonia.

To those familiar with these facts, it has long been evident that this gas possesses great theoretical advantages over steam as a motive power, but in its use the following difficulties have been met with:

The material is much more expensive than water, and, consequently, it is not permissible to allow it to escape, as waste, after it has performed work; as steam exhausts into the open air, or is condensed by contact with water, and then allowed to waste. More than this, small leaks that, in the use of steam, are of little or no importance, in ammonia engines are sources of great loss, as every atom that escapes is not merely a waste of heat, as in the steam engine, but a waste of a costly material. Besides, when steam escapes, it is harmless and bland, while ammonia is acrid, and acts corrosively on all brass or copper attachments or ornaments. This last property forbids the practical use of any metal but iron and steel in the construction of ammonia engines.

The adoption of this material as a motor, therefore, involves its indefinitely repeated use with such a minimum of waste as will not counterbalance the great economy of fuel, necessary for its production, over that required for steam.

As high pressures are necessary, it has been difficult to prevent leakage, and, in most devices of the kind under consideration, the waste has been so great as to render them useless for practical purposes.

Another difficulty has been the liquefaction of ammoniacal gas in large quantities; but, in the application of ammonia to ice making machines, this part of the problem has been practically solved, a pressure as high as sixteen atmospheres having been maintained in some of them, while, for a motive power, it will not be necessary to exceed ten pounds.

The principle upon which the theoretical utility of ammonia, as a motor, is based, may be thus stated: As the gas is absorbed by water its latent heat becomes sensible, and the temperature of the solution consequently rises. This heat may again be used for the expansion of liquid ammonia into a gas, under great pressure—the pressure thus generated being converted into work behind the piston of an engine. The heat thus transformed into work cannot be recovered and utilized as heat, and, consequently, to maintain the efficiency of the combination, additional increments of heat must be supplied, from external sources, to be again converted into work, and so on.

This is accomplished in a very effective manner by Dr. Emile Lamm, of New Orleans, who has also attacked the practical difficulties of the problem with great success.

We give, herewith, engravings illustrating the application of his ammonia engine to a street car, which, it is asserted, was successfully propelled by it for a distance of seven miles, with an expenditure of only one and sixteen one hundredths cubic feet of ammonia, notwithstanding the somewhat unmechanical and clumsy mode of transmitting the power from the engine to the wheels, rendered necessary by the fact that the engine and the car were not made for each other, and were simply brought together for the purpose of demonstrating the practicability of the method.

Dr. Lamm states that, on the trip mentioned, the gage registered at the start 120 pounds, and was the same at the end of the trip, at no time indicating a variation of more than ten pounds to the square inch; and this has since been confirmed by over 300 trips.

The detailed drawing, Fig. 2, is simply a duplicate of the engine and generator, and is lettered for reference.

Let the reader now bear in mind that, when heat is employed for liquefying ammonia, the latter possesses, through its intense affinity for water, the property of reproducing, at a distance from the furnace and still employed in its condensation, a force equivalent to the heat used in such condensation, the latent heat of the gas appearing anew, as sensible heat, in the water of re-absorption, and being again transferred to the liquefied gas.

In the mode of effecting this circle of interchanges the essence of Dr. Lamm's invention lies. To obtain the full dynamical effect of the expansion of vapors or gases, it is necessary to add as sensible heat the same amount which may be extracted from them as latent heat.

Now, the liquefied ammonia, which parted with its latent heat during condensation by pressure, is placed in the inner shell, A, through which tubes traverse, the whole being inclosed in an outer shell, B. The fountain communicates with the valve chest of the cylinder, C, in the same way as the steam induction pipe of a steam engine connects the boiler and the cylinder. In the outer shell, B, is placed some of the water or weak solution of ammonia that was left in the boiler of the still, of a suitable temperature to generate the required pressure at starting. This heat exists, then, in the liquefied ammonia as expansive force, and passes out with the gas to the cylinder, where, a portion having been converted into work, the remainder passes, with the exhaust gas, back to the weak solution in the shell, B, where, the latter becoming instantly condensed, the heat is again rendered sensible and passes through the walls of the tubes, to generate expansive force, and so on, the total loss of heat for a given amount of work being the equivalent of the work performed, *plus* that which may have radiated from the shell during the performance of the work; while the loss of the material itself is only that due to whatever leakage has taken place.

This succession of conversions is one of the most beautiful examples of the correlation of forces to be found in any mechanical motor. The theory, upon which the engine is constructed, is sound, while the difficulty of controlling so subtle a gas under high pressure has also been met in an ingenious manner by the use of oil packed stuffing boxes.

One of these is shown at D, Fig. 2. An annular chamber surrounding the piston rod is kept supplied with oil from the chamber, E, through a suitable pipe; this forms a practically impassable barrier to the escape of free ammonia. The oil becomes more or less saponified by the action of the ammonia; but this does not interfere with the usefulness of the packing, or the proper lubrication of the moving parts.

In the Transactions of the American Institute, 1865-6, page 436, the new ammonia engine of M. Tellier, of France, is described. This distinguished chemist invented a means of storing and using mechanical power, by compressing ordinary ammoniacal gas to the liquid state, and applying it for propelling omnibuses and other vehicles, in places where steam power was not admissible. The small vessel containing liquid ammonia (and gaseous ammonia above it) may be compared to an ordinary steam boiler. When the valve is opened, a portion of the gas, having a tension, at 60° Fah., of about 200 pounds per square inch, presses against a piston within a cylinder filled with common air. This movement of the piston transmits power through a crank, and, at the same time, condenses the air before it in the cylinder. At the completion of this stroke, a little water is injected into the cylinder, behind the piston, when the ammonia is instantly absorbed by the water and a vacuum is produced. The pressure behind the piston being thus removed, the compressed air on the other side of it is brought into play; thus the piston comes to its original position and the crank has completed one revolution. After the ammoniacal water has been drawn off, the piston is ready to receive another charge of ammonia. It will be perceived that this apparatus would work more steadily if two cylinders were used. M. Tellier proposes to use three. This arrangement, or any other in which a gas passes from the liquid state at a nearly uniform pressure, has many advantages over that employing atmospheric air as a secondary motor."

This was the ammonia engine alluded to in our editorial of September 23d, in which we stated that a successful trial of it upon an omnibus in Paris had been reported. Dr. Lamm informs us that the trial, though sought, was never made. Even if it were, our readers will see that the engine of M. Tellier is radically different in principle from that of Dr. Lamm, and no more resembles the latter than the steam engine of Savary resembles the modern steam engine.

Dr. Lamm's invention was patented July 19, 1870. Full information regarding it may be obtained from the Ammonia Propelling Company, New Orleans, La.

Ray's Improvement in Wheels for Vehicles.

The object of this invention is to strengthen the fellies or rims of wagon and carriage wheels at the joints, or where the felly segments abut together. The invention consists in the use of a fish plate, curved longitudinally to fit the inside diameter of the felly, and also transversely to fit the inner surface of the felly, of a length sufficient to receive and support the ends of the first spoke or more, on either side of the felly joint.

The plate is made of metal and let into the wood, so that its outer surface is even with and corresponds with the inner surface of the felly, or it may be used without cutting the fellies. The plate extends far enough in either direction from the joint to receive a spoke on each side, holes being formed through it for the tenon of the spoke. Screw bolts pass entirely through the tire and rim, and hold the plate firmly to the felly.

It is well known that the weakest part of the felly of a wheel is at the joint; and various devices have been adopted to strengthen the felly at these points. The fish plate, used as described, confines the ends of the segments, and forms a strong arch, supported by the spokes at the joint, for withstanding the heavy blows dealt upon every portion of the rim of the wheel. It is a cheap, simple, and seemingly effective arrangement. This improvement has just been patented by William F. Ray, of Fort Wayne, Ind.

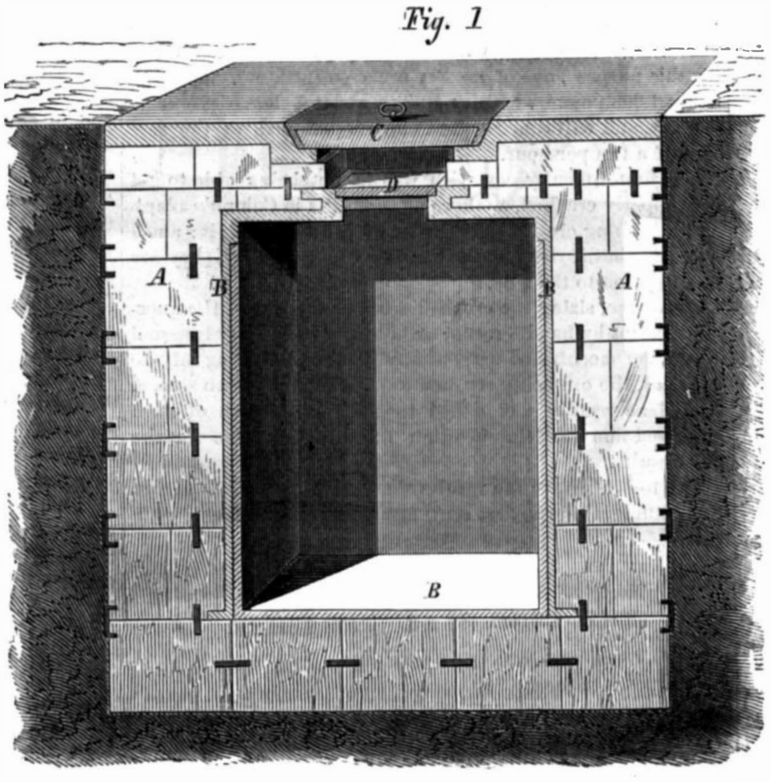
IRELAND'S VAULTS FOR THE SAFE KEEPING OF VALUABLES.

The accompanying engravings illustrate an improved burglar and fireproof vault, for the safe keeping of valuables. Two kinds are shown in our engraving, involving, however, the same principles of construction.

Fig. 1 shows the vault designed for banks, insurance offices, counting rooms, etc., and Fig. 2, a design for use in dwellings, for the safe keeping of plate, jewels, money, documents, etc.

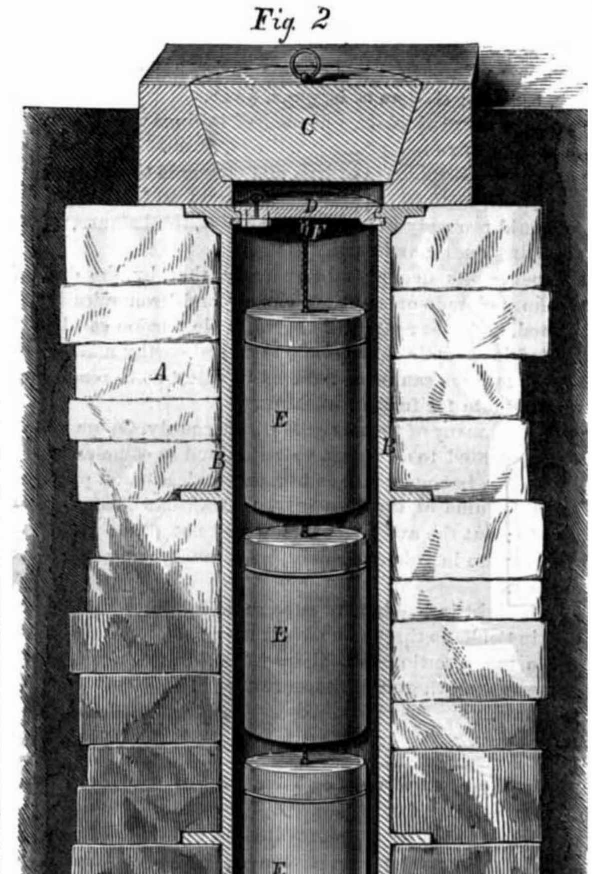
The vault, in both cases, is constructed principally of masonry, and placed below ground, so that, in case of fire, all the heat to which it can be exposed will be by downward radiation, through the thick wall of masonry and through the entrance, which is constructed to defend the interior of the vault against heat, as shown in Fig. 1, in which A represents the stone masonry; and B an iron frame, composed of a top plate and four corner parts or rods, which descend from the top, and are bent outward at right angles, the hooks thus formed engaging with the stone work as shown.

Fig. 1



IRELAND'S VAULTS FOR STORING VALUABLES.

Fig. 2



The masonry is bound together by iron straps, as shown, thus making a very solid structure.

The square vault, Fig. 1, has a cement lining.

The entrance is closed by an external lid, C, and an internal one, D, the air space between the two forming a non-conducting medium, through which heat can only with great difficulty, traverse.

The inner lid is of metal, and is provided with the proper locks and bolts. The external door or lid is made of an iron frame, filled with hydraulic cement.

In Fig. 2, A represents the stone masonry; B is an iron tube, having flanges formed thereon, at proper intervals, which interlock with the masonry, as shown. Within the tube or cylinder, B, are suspended, by a wire rope, chain, or other suitable support, the cylinders or cases, E, for the reception of articles. The chain or rope is suspended from a staple by a hook of fusible metal, F, which, should the heat endanger the articles in the upper case, melts and allows the cases to fall as far as the length of the tube will admit, thus removing the top case from the heated lid, D, and insuring the safety of its contents.

The style of construction, adopted by Mr. Ireland, gives great solidity to the masonry, affording obstruction to the operations of burglars, while it employs comparatively little iron work; and thus can be used with less expense than other vaults. Being completely surrounded with earth, and the iron work not being continuous, heat cannot be conducted to the interior.

We are told that a small safety vault for a dwelling, constructed on this plan, has been subjected to intense heat for four hours and a half, without the first trace of injury to its contents.

The invention was patented May 30, 1871. For further information address Geo. H. Ireland, Somerville, Mass.

Sensible.

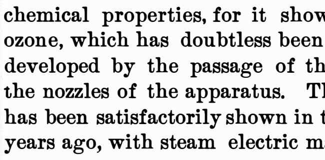
The American Educational Monthly says that the High School of Springfield, Ohio, graduated the young ladies of its last class in calico dresses, as pleasing to the eye of taste as to the hand of economy. This was brought about by the thoughtful suggestion of the superintendent and the hearty acquiescence of the girls themselves, on the only ground on which high schools can be long perpetuated, namely, that being supported by taxation they must be open to all classes in society, and confer their advantages upon the poorest of their pupils, without prescription by fashion or creed, expenses or anything else.

[For the Scientific American.]

STEAM VERSUS DISEASE.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY UNIVERSITY MEDICAL COLLEGE, NEW YORK.

While experimenting with the apparatus of which I gave a description in the last number of the SCIENTIFIC AMERICAN, I have often been surprised by the agreeable coolness, experienced whenever the hand happened to pass through the mixed column of air and steam that issued from the nozzle of the vacuum tube. The reader will remember that when steam, under a high pressure, is thrown from the nozzle of the tube, G, through the larger nozzle, F, a vacuum is formed in the tube of which this nozzle is the termination, and through the lateral tube, K, this vacuum may be applied for various purposes.



If, now, the connection is removed, and air permitted to pass freely through K, a mixture of air and condensed steam is thrown with considerable violence from the opening at F, and this current, brought into contact with the surface of the body, produces an agreeable sensation of coolness, which would, I think, not only be a grateful application in the treatment of all superficial inflammations (as erysipelas), but would, by its soothing action on the nerves, aid in modifying or removing the diseased condition.

In addition to the pleasant sensation imparted by the issuing column of steam and air, I find that it also possesses chemical properties, for it shows the presence of traces of ozone, which has doubtless been produced by the electricity developed by the passage of the current of steam through the nozzles of the apparatus. That ozone may be so formed has been satisfactorily shown in the experiments made, many years ago, with steam electric machines, where the characteristic ozone, or electric odor, as it was called, was produced in a marked degree. This trace of ozone renders it probable that such a steam air current might also be applied with good results to every kind of foul or gangrenous ulceration; and, if proper modifications were made to secure as great a supply of electricity as in the steam electric machine referred to, I see no reason why we may not look forward to the use of ozone, so developed, in the purification of the wards of hospitals, and the disinfection of the holds and decks of fever stricken ships.

THE CHICAGO FIRE.—How it could be that neither buildings, men, nor anything could encounter or withstand the torrent of fire, without utter destruction, is explained by the fact that the fire was accompanied by the fiercest tornado of wind ever known to blow here, and it acted like a perfect blow pipe, driving the brilliant blaze hundreds of feet with so perfect a combustion that it consumed the smoke, and its heat was so great that fireproof buildings sunk before it almost as readily as wood.

Correspondence.

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

A Practical Engineer's Experience with Boilers.

To the Editor of the Scientific American:

The subjects of steam and boiler explosions appear to form a complicated and vexed question. I am one of the few Southerners that served a regular apprenticeship at a mechanic's trade. I have had fifteen year's experience with steam, and I propose to give my opinion in regard to explosions, etc.

I ran a boat in Mobile Bay for about seven years; and changed water from fresh to salt, two or three times in as many hours, and frequent foaming (in the boiler) was the consequence. I found it very necessary to be always on the watch. I have known the gages to show an abundant supply of water one minute, and none the next.

On one occasion I ran in the bay until the water in the boiler became very salt; then changed it in Dog River, where the water was quite fresh. I concluded to pump my boiler quite full before stopping, where we expected to remain several days. I put on a full pump of water nearly half an hour before stopping; and, as I thought, had three full gages; but, on cooling off, and opening the boiler, to my surprise, the water was only about half over the flues. Now I contend that, had the fires been kept up, and the water neglected by the engineer, until the steam and boiler had attained an intense heat (which it would have done in a very short time), then, on the first opening of the throttle or safety valve, it would cause a rising of the water in the boiler; and the water, so raised or thrown into the steam that had become so intensely heated, would have instantly flashed into power, and explosion would not be more certain if the boiler was filled with gunpowder and touched off. This I believe to have been the case with the *Ocean Wave*, at Point Clear wharf, in Mobile Bay, a short time ago.

In such cases as this, the strength of boilers has but little to do with it, except that the stronger the boiler, the worse is the explosion. I see in your paper that the Hartford Steam Boiler Company's inspector comments considerably on the strength and test of boilers, and has treasured up, in his office, a piece of boiler, only $\frac{1}{30}$ of an inch thick. I have run with 75 pounds pressure, when the boiler was so thin that I could and did push my knife blade through it; and often, when it was cracked so badly that it would not hold water, I have rolled up a wad of oakum and white lead, and jammed it into the crack, and went on with a full head of steam. I have never yet had any accident which did the slightest damage.

Hence, you see, Mr. Editor, how ridiculous is the idea of having inspectors arrested, where the fault is that of the engineer. But what can we expect? No high minded, honorable man wishes to be classed with those whom the Government has declared (by its lock safety valve) to be dishonest, and not worthy to be trusted. It would have been better to have offered a handsome premium to those who would keep their engines and boilers in the best condition, with the fewest accidents. The money for such purposes should be deposited, in money or securities, by engineers, on receiving their licenses; and be forfeited at once, without any trial, whenever any serious accident happened to a boiler in their charge. I for one left off steam boating when the lock valve was introduced.

Mobile, Ala. U. A. BARLOW.

Public Steam Supply.

To the Editor of the Scientific American:

Remembering your very favorable reception some time back of my suggestion for a public steam supply, through the streets of our large cities, I thought I would again call your attention to the subject, and especially to the very favorable opportunity now offered for the introduction of such a scheme in the rebuilding of Chicago.

Steam is the great motor of all civilized nations, and its use would be greatly increased if it could be obtained conveniently and at a reasonable expense.

But when each tenant or dwelling has to keep up a separate fire, and run all the risk of a boiler explosion, its use must be comparatively limited.

But, in beginning anew, as must be done in Chicago, what possible reason can there be for going on under the old primitive system, such as would be adopted in the first settlement of a town?

There are plenty of instances where steam is conveyed 1,500 or 2,000 feet with perfect ease and success.

The loss of heat in the transmission to distant points is the first question that arises in the minds of most persons. Upon careful examination, this loss will be found to be exceedingly small in comparison to the ordinary waste in a building. For instance, a two inch pipe would be quite sufficient to supply all the steam for heating and cooking in a large house. The temperature of that pipe, with sixty pounds pressure, would be about 311 degrees With any ordinary protection, the loss of heat from such a pipe for each distance of twenty-five feet front would be less than the usual waste from a single range or stove fire.

There would be every opportunity for the most perfect isolation and protection of such pipes, in carrying them through the street.

One other use to which steam could be applied, I believe, to advantage, would be the extinguishing of fires. A reasonably tight room could be thoroughly saturated with moisture of condensed steam in a very short time, sufficiently to smother any fresh fire. Of course it would be of no use against a large fire in an open space.

I hope the attention of our wide-awake, intelligent and energetic Chicago friends may be called to the idea with sufficient distinctness to give them an opportunity of considering it fairly before they rebuild the city.

New York city. L. W. LEEDS.

How to Concentrate Colorado Gold and Silver Ores.

To the Editor of the Scientific American:

I believe I can in no better way answer the above question than by giving the results of experiments, made by myself, for solving the problem of the best system of treatment for Colorado gold and silver ores.

In the summer of 1870, I visited Colorado, for the sole purpose of demonstrating the practicability of economically concentrating Colorado gold and silver ores. I took with me, for this purpose, one of my dry ore concentrators, weighing about 1,000 pounds, which requires about $\frac{1}{8}$ horse power to work it, and will concentrate Colorado gold ores at the rate of half a tun per hour.

The first difficulty met with was in not being able to get ore properly crushed, as there are no mills in Colorado adapted to crushing ore for the purpose of concentrating it; and I may add that if there are any in the whole country, they are an exception to the rule.

Of course, sizing the crushed ore was also out of the question, except by hand screens; and consequently forty tuns and over was concentrated without any sizing or grading of the particles, the ore being crushed to pass an eight mesh screen. It will be readily understood that the association of such large and fine particles together was not favorable for the best results.

The following are the results obtained from six lots of ore from different mines, first concentrated without sizing:

	Value of Original Ore.	Headings.	Tailings.
Lot No. 1	$27·00	$85·00	$7·25
Lot No. 2	35·20	83·43	13·72
Lot No. 3	25·37	98·93	10·99
Lot No. 4	12·54	79·59	3·62
Lot No. 5	46·66	163·42	9·05
Lot No. 6	18·80	110·13	4·27
	$165·57	$620·50	$48·90

I then tried the experiment of sizing the tailings, to determine how low in value they might be reduced, under proper and favorable circumstances.

	Value of unsized tailings.			Value of sized tailings.
Lot No. 2	$13·72	reduced in	value to	$2·56
Lot No. 3	10·99	"	"	2·25
Lot No. 4	3·62	"	"	2·28
Lot No. 5	9·05	"	"	3·23
Lot No. 6	4·27	"	"	2·07
	$41·65			$12·39

The average value of six lots of ore was $27·00; six lots of headings, $106·41; six lots of tailings, $8·15.

The average value of five lots of unsized tailings was $8·33; average value of five lots of sized tailings, $2·48.

The amount of sulphurets of iron and copper in the several lots varied from 15 to 40 per cent of the total weight. The average would probably be about 20 per cent, the balance, 80 per cent, being quartz and earthy matter.

The experiments demonstrated clearly that, by the dry process, the Colorado ores can be closely and economically concentrated, and that nearly all the valuable portion can be concentrated in one pile, free from quartz and earthy matter, and that the tailings can be so reduced in value as to render them unprofitable for further working.

The ore from many of the mines of Gilpin county, Colorado, can be concentrated to as high a value as, and in some cases higher than, Mr. Lee mentions (in his communication on page 261, current volume of the SCIENTIFIC AMERICAN), namely, $150 per tun; but the average value would not probably be over $125 per tun in gold and silver, no account being taken of the copper.

Mr. Lee is right in looking for success in mining gold and silver ores in Colorado through concentration; and Mr. Church is correct in his assertion that there is nothing to prevent very successful and thorough concentration of Colorado gold and silver ores.

New York city. S. R. KROM.

Sudden Rise of Pressure in a Steam Boiler.

To the Editor of the Scientific American:

Being a constant reader of your valuable paper, I notice a letter in No. 16, dated October 14, headed "A Leaf from a Practical Engineer's Experience;" in which it is said that the steam gage of the boiler arose from eighty to one hundred and forty pounds in four seconds, and that the writer raised the safety valve and kept it open until the mud and foam rose high in the air. Now, Sir, if he had been much of an engineer, would he have allowed his boiler to have become so filthy? I am running a boiler myself, and I find that it never foams when I do my duty in keeping it clean.

New York city. A. MITCHELL.

Dust Rings for Watches.

This is a new dust excluder, to be applied to watches between the top and bottom plates of their works, for the purpose of preventing impurities from entering the works. The under side of the top plate of the works of a watch is beveled at the edge, the beveled portion extending to a shoulder. The dust excluder is made of a metallic spring band, which is laid around the train so as to rest against the beveled portion of the top plate, or against a similar bevel of the bottom plate, or both. The ends of the spring band are either made to overlap, or fastened to a cast arch, which is set between the top and bottom plates, and bulged out to admit the protruding main wheel. This arched casting abuts with its rounded ends against the ends of ears formed on the top plate One end of the band is secured to the cast arch by a screw, and the other end is slotted and fitted over a screw projecting from the arch, the screw being tightened on the narrow part of the slot. When the band is used alone, the screw or connecting pin projects from one end through a slot in the other. The spring power of the band crowds it against the bevel, and serves, therefore, to properly exclude the dust.

The improvement is the invention of George Hunt, of Springfield, Mass.

Condition of Chicago.

It is estimated, upon what may be regarded as good authority, that the fire covered over 2,000 acres in the heart of the city; over twenty thousand buildings were destroyed, and ninety-three thousand persons dispossessed of their homes; ninety thousand buildings are left standing, fifty thousand people have left the city, and two hundred and eighty thousand remain. Five grain elevators were burned, with one million six hundred thousand bushels of grain; eleven elevators remain uninjured, containing five million bushels of grain. One half the entire pork product was burned, with the same proportion of flour. Eighty thousand tons of coal were consumed, and about the same amount is on hand. Fifty million feet of lumber were burned, and two hundred and forty million feet remained unharmed—nearly one quarter enough to rebuild the waste places. The stock of leather was reduced one quarter, the value of that burned being about $95,000. The greater portion of the stocks of groceries, dry goods, and boots and shoes were burned up, with more than one half the ready made clothing, but the quantities destroyed were scarcely equal to three weeks' supply, and are being rapidly replaced. About ten per cent of the currency was burned. A careful average of these larger items with smaller ones shows that the city has suffered a loss of not less than twenty nor more than twenty five per cent on her total assets, real and personal. The terrible personal experiences published in the Eastern papers are stated, almost without exception, to be fabrications. The banks are all in full operation.

Reduction of Nitrate of Silver by means of Charcoal.

A very simple method of reducing nitrate of silver, analagous to that some years ago mentioned by the late Mr. Hadow, is given by Mr. C. F. Chandler. If crystallized or fused nitrate of silver be placed upon glowing charcoal, combustion forthwith takes place, the silver remaining behind in a metallic form, while nitrous oxide and carbonic acid are freely given off. The nitrate of silver is fused by the heat developed by the reaction, and is imbibed through the pores of the charcoal; as every atom of consumed carbon is replaced by an atom of metallic silver, the original form and structure of the charcoal are preserved intact in pure silver.

By proceeding in this manner, it is possible to produce silver structures of any desired size, possessing in every way the original form of the wood. A crystal of nitrate of silver is in the first place put upon a piece of charcoal, and a blow pipe flame is then applied in the vicinity, in order to start the reaction in the first instance; and, as soon as combustion commences, crystal after crystal may be added as these, one after another, become consumed. The silver salt is liquefied, and penetrates into the charcoal, where it becomes reduced. Pieces of silver may in this way be prepared of one or two ounces in weight, which exhibit all the markings and rings of the original wood to a most perfect and beautiful degree

Inhaler and Vaporizer for Administering Anæsthetics and Medicated Vapors.

Ethelbert E. Duncanson, of Chicago, Ill, has invented a new and improved anæsthetizer, vaporizer, and inhaler, which will greatly assist in the proper adminstration of medicinal gases and vapors.

The inhaler consists of a truncated cone, made of metal or other material, with the outline of the base fitted to be applied to the face of the patient so as to cover the mouth and nose, the edge being turned and protected, by a cushion of chamois leather or other substance, so as not to injure the face on application. It is divided near the center by a horizontal diaphragm, so as to form two compartments connected by a valvular opening, the upper being fitted with a basin, shield and sponge; the sponge to be moistened, saturated, or wet with chloroform, ether, or other anæsthetic, or medicated liquid, the vapor being drawn by inhalation through the opening left around the lower margin of the shield, the shield itself protecting the patient from any moisture in the sponge by shedding that excess or droppage into the space below. The vapor passes into the lower chamber through a passage having a valve, connected to the diaphragm and opening inward toward the face of the patient, and then enters the lungs by inhalation. The expiration from the lungs, passing into the lower chamber, is conveyed by a lateral valve, to an open air valve, closing at the time, thus saving waste of the agent employed, and preventing it from being saturated with noxious gases passing from the lungs, the out-breathing not passing through the sponge, but by the aforesaid valve in the side of the lower chamber, thus forming it is claimed, the simplest and most scientific instrument yet in existence for anæsthetizing and inhaling purposes.

A slide is placed on the side of the lower chamber opposite the valve for the admission of atmospheric air, by raising or lowering which the density of the vapor can be graduated to any desired strength, thus hastening or shortening the rapidity of action at the administrator's pleasure, or as the necessity of the patient may require. A movable cover is placed on the top for the easy saturation, removal, or cleansing of the sponge and basin. The top has an opening in the center, for admission of air or insertion of the flexible pipe attached to the vaporizer or the tube or valve used for inhaling purposes.

This vaporizer consists of a simple vessel, of any material, with a close fitting cover and small tube in the center of the cover for attachment or connection between the inhaler and the vaporizer; the attachment consisting of an india rubber or other tube passing from the pipe on the vaporizer to the apertures in the cover of the inhaler.

The bottom of the vaporizer being fixed above a lamp or on any other heating surface, the medicine, water, or any other agent to be administered in the form of a vapor or steam having been previously placed inside, the sponge is removed from the inhaler; and the connection by means of the tube between the vaporizer and inhaler, being established the vapor or steam passes abundantly and efficiently to the nose, mouth, throat, or lungs, either or all, as may be required.

It is claimed that this improved instrument furnishes a cheap, convenient, and efficient apparatus, which greatly economizes the material used and administers it in such a way that the vapor cannot become charged with the impurities discharged from the lungs.

IMPROVEMENT IN EARTH CLOSETS.

A very simple and excellent improvement has been lately patented in this country by Mons. Goux, of Paris, France, which promises to give a new impetus to the earth closet system, and widely extend its employment.

The earth closet, as commonly made, consists of a tub or holding vessel, to receive the excreta, and another vessel or holder containing dry earth; there is also a lever and valve arrangement, so connected with the earth chamber that when the lever is operated a small quantity of earth is thrown down upon the excreta, which is thus deodorized. This plan although valuable, is, in practical use, attended with some little trouble, as the chambers must be frequently looked after, the contents of one, when full, removed, and the other chamber filled when empty.

The improvement of Goux consists in lining the interior wall of the tub or excreta holder with earth, or any other suitable deodorizing absorbent; and thus prepared it is ready for use, requiring no further attention until it becomes filled, when its contents are removed to the manure heap, and a fresh earth lining substituted. The earth lining absorbs the noxious effluvia and liquids, and the closet thus made is odorless. There is no machinery about it. It is admirably fitted for family use, and it presents this striking advantage, that its products form a manure of the highest value, which may be collected and transported without nuisance to any body. The product is, in fact, odorless, although it is a rich fertilizer.

This form of earth closet has been extensively introduced in London, where a company has been formed and a large and profitable business inaugurated. The company employs a large number of drays and men, who go around to regular customers, removing the filled tubs and substituting fresh ones, a work of only a minute in each case, with nothing disagreeable about it. The fertilizer thus produced and collected brings the highest prices, and the demand is much greater than the supply. In this country the invention is now being introduced, and may be seen in operation at the establishment of A. L. Osborn, 424 Canal street, New York.

Sheet Metal Knobs for Tea-pots.

Sheet metal knobs for teapots aro at present usually made in two pieces of eqnal size and shape, each piece being first cut and then struck into proper form, the two then being united by lap joint and solder. The manufacture of such knobs involves five distinct operations, the last of which is difficult and tedious. The appearance finished knob is never perfect, as the joint is always more or less visible. This inveetion consists in forming the knob from one single star-shaped piece of metal by bending the arms of the same and striking up the center, so that the edges of the arms will come in contact with each other.

By the means described a knob is made by but three manipulations, to wit, those of cntting, striking up, and final bending of arms. If the arms are to be curved transversely to make the knob of conical instead of pyramidal form they can be so made by striking them in the desired manner at the beginning of the operation. The improvement has been patented James Britton, of Williamsburg, New York.

Shall we send our Children away from Home to be Educated?

The *College Courant* published at New Haven says on the above subject: The notion is quite prevalent that it is a good thing for children to go away from home while acquiring their education, so that they may see the world and learn how-other folks live. There is doubtless much to be learned in seeing the world, and we would, by no means, deprecate the enlargement of mind which comes by travel; but the natural place for children is home, and their best society that of their parents and brothers and sisters. The teacher of a boarding school has the double office of teacher and parent, and, however well he may fill the former, it is impossible for him to fill the latter to the perfection which the parent can, and often does attain. The child almost knows instinctively that the love of a parent is disinterested, that his advice is without any selfish motive, and that his command must be obeyed; he therefore trusts his parent with a confidence, and obeys him with a good will, which he is not ready to yield to a stranger. It is the duty, therefore, of parents to keep their sons and daughters together at home till their minds are well disciplined by study, their principles well established, and their habits formed, and then they can safely see the world, and profit by the lessons it teaches. The high schools enables us thus to do. The young men and women graduating from our high schools find the same incentive to action in society that they found in the school, and do not leave behind them the forces which thus far have impelled them. There is no such violent change as must occur when one graduates from a school exclusively devoted to one sex.

The Pennsylvania Steel Company.

The Pennsylvania Steel Company, one of the most important industrial establishments in the country, has its works on the Susquehanna, about three miles below Harrisburgh. Its Bessemer department was started in June, 1866, and the annual product of Bessemer steel is about 18,000 tons. The building now consists of a melting building 81 by 52, and 39 feet high, with a hipped roof and lantern 18 by 44 feet. Adjoining and divided by a thick wall is the converting room, 114 feet long by 100 feet wide and 25 feet high in the clear, for a pair of five tun converters. Connected is the engine room, containing a pair of engines of 500 horse power for driving enormous air condensing pumps for the air-blast. Specimens of all the iron are carefully tested before it is allowed to go into the furnace. A visitor to the works describes the operations as follows:—

The iron is first melted in blast or cupola furnaces, of which there are five, located in the second story of the melting building—one of which is reserved for melting the Franklinite iron separately. While the iron is in process of melting, the workmen kindle a fire of hard coal inside the converters—it being necessary to prepare them for business in that way. Three fourths of a tun of coal is thus consumed each time a converter is used after being cooled off. The converter is of iron, made in parts and bolted together; it is lined with fire brick and a mortar of pounded quartz; it is egg-shaped with an opening at the top, like the neck of a crooked squash cut short. It is suspended on trunnions, with ratchet apparatus propelled by hydraulic power for turning it at will on its side or bottom upwards. It has a false bottom, and through the inner bottom are ten holes about five inches in diameter. Over these holes are placed what are called *tuyeres*, made of fire-brick clay and hollow; the nozzles are pierced with a number of small holes to allow the influx of air. These tuyeres are about thirteen inches long; all around them to their tops is rammed moistened earth, well mixed with pounded quartz. This double bottom, after being prepared, is bolted to its place on the converter. Connected with the space between the upper and lower bottom of the converter is a large iron pipe leading from the air cylinder of the force pumps. Ten tuns of the melted metal are first drawn from the furnaces into a huge ladle in the room adjoining the converting room. Five tuns being a charge, there is enough to supply the two converters at once. All being ready, the enormous charge is, poured from the ladle, through an iron trough lined with a mortar of crushed quartz, into the converter, then horizontal. Instantly the blast of air is let on, and the converter slowly resumes its upright position, while a tempest of fiery cinders pours from its crooked neck. When horizontal this neck serves as a tunnel to receive the metal; when upright, it deflects the stream of fiery cinders into the wide-mouthed chimney. And now the molten iron, already heated to 3,000°, is urged by the furious blast to an unknown temperature.

The 500 horse power engines drive 6,000 cubic inches of compressed air per minute through the surging mass. The carbon in the air unites with oxygen, and, as combustion proceeds, the boiling mass grows hotter and hotter; impurities rise to the top and pass off in liquid slag, or in streaks of red and yellow gas, and finally in thick, full, white, roaring dazzling flame.

The foreman knows by the flame each instant change. In fifteen to twenty minutes the flame is thinner with a bluish tint, and then the hidden hydraulic power turns the huge converter slowly down until it is again horizontal. A quantity—I think about 7 per cent—of melted Franklinite iron containing carbon and manganese is poured in, and again the boiling and surging is renewed; but only for a brief half minute or less, and then all is quiet. The melted pig iron has lost about 17 per cent of its weight, and has become a homogeneous mass of liquid steel that pours out into the ladle, under its roof of slag, smooth, shining, and almost transparent.

Each filled ladle now takes half the charge into the converter; and from the ladle it is drawn into iron molds set on the outer limits of a depressed semi-circular area which surrounds one side of the converters. The molds are set with the large end down on an iron floor covered with loam. When cooled, the mold is raised by an immense hydraulic crane, and the enclosed ingot is jarred out by repeated blows of a sledge hammer. The ingot is then weighed and transported on a truck running on a tramway to the rail mill or rolling mill.

At every stage the iron is weighed, before it is melted, after it is melted, and after it is converted into steel. The steel rails are also weighed and tested. The ingots weigh about 1,600 pounds each.

In the rolling mill the usual process of heating the ingots, of hammering and drawing out through rolls is gone through with. In these works there is ample floor space and hight. There are eight frames arranged in pairs, with room for more, at one end and in one wing, with the boilers over them and sheet iron chimneys outside the building. In the center of the space between the furnaces and the rolls' there is ample room for piling ingots, and a hydraulic crane for unloading them from the converting room cars and loading them on the furnace buggies. So ample are the arrangements of the rolling mill that it can roll twice as fast as the Bessemer works can turn out the steel, and that part of the establishment is about to be duplicated. The ingots, heated from the furnace, are placed under a twelve tun steam hammer, and after being drawn out to twice their length, are cut in two, and are then passed through the rolls which draw them into proper length and shape. Passing from the rolls to a carraige, each rail is cut into lengths of 30 feet by swiftly revolving circular saws. They are straightened partially while hot, and completely when cold, under a straightening press.

Growth of the Petroleum Trade.

According to the annual report of the New York Chamber of Commerce, just issued, the exports of petroleum in 1870 were 37 per cent greater than those of the previous year, and nearly all this increase, or 33 per cent, is accounted for by the shipment from the port of New York. The total export from the United States in 1870 was 141,208,155 gallons, against 1,500,000 in 1860, and 99,281,000 gallons in 1868, showing an increase of nearly 42,000,000 gallons in two years. The first sale noticed for export was in May, 1861, when 100,000 gallons were sent to foreign markets. Antwerp, which has since led all other ports in the importation of petroleum, took in that year 5,671 gallons, increasing the amount in the following year more than 800,000 gallons. Great Britain took 579,000 in 1861— and in 1862 increased her importation to 3,238,000 gallons.

The continued growth of this trade for ten years—from 1,500,000 gallons in 1860 to 141,000,000 in 1870—is a wonderful exhibit, not only on account of the rapid development of the oil interest, but also because the yearly increase has been steady. The daily average product of the Pennsylvania oil district in December, 1867, was 10,400 gallons; in the same month of 1870, it was 15,214 gallons—a fact which shows the inexhaustibility of the wells in that region. In regard to the home consumption, it is estimated that it is equal to one half the quantity exported—making in round numbers an aggregate consumption of 11,000,000 gallous annually. This enormous amount, reckoning the price at an average of twenty cents per gallon, represents a value of more than $42,000,000 for a single year—certainly a remarkable return for a product unknown to commerce ten years ago.

Lint.

Next to cotton, the vegetable fiber most extensively used for textile fabrics is flax, the Latin name of which is *linum*,—hence come the names of linen and lint. The fibers of cotton and flax, viewed under a microscope, will be found to be different; the fiber of cotton is angular, or bladed, while that of flax (linen) is perfectly round and smooth. It is this difference in their natural formation that constitute the superiority of linen over cotton as a material for dressing wounds, or as a fabric for clothing the body. Lint is the unwoven fiber of linen. By wear, and much washing, which it necessarily undergoes, linen becomes softer than when new; it undergoes a partial decay, and the much prized linen eventually becomes "rag." In this state it is fit only to be converted into paper or lint. Lint is, in fact, the woolly fiber of old linen, "thrown" or slightly "felted" together (as manufacturers term it) into the material form so named. The flax plant yields not only linen by means of its fiber, but it also, by expression, gives a valuable oil from its seeds, known in commerce as linseed oil. The residue, after the oil is expressed, is called linseed cake, and excellent food for cattle. Each product of the flax plant, both in peace and in war, has its value either as linen, linseed, or lint.

AN extensive sugar planter, of Louisiana, who has over fifty Chinamen employed, informs us that while this class of laborers are physically incapacitated to perform as much work as the negroes, (man for man), still they are, upon the whole, quite as serviceable and more reliable than any other available class of laborers now in the South, white or black; and inasmuch as there is a great deficiency of farm labor in the cotton and sugar producing States, he informs us that the capitalists of the South are taking steps to insure a large importation of Chinamen in the coming fall and winter, for the purposes alluded to.

JOHN CHINAMAN AS A PLANTATION HAND. —Says the *Illustrated Agriculturist*, (St. Louis); a planter at Irish Bend, Parish of St. Mary, has had twenty-six Chinamen at work for him the past eight months, on his sugar plantation; and he infinitely, and for every reason, prefers them to negroes. They take good care of their teams, never beating or abusing them. They get $13 for twenty-six days work, and ordinary rations. This would indicate John as the coming laborer in the Southwest.

IT is intended to hold a grand exhibition of architectural models, plans, appliances, work and materials, at Berlin, in the course of next year. The funds have been subscribed, and the Emperor of Germany will appoint a commission, to carry out the scheme, immediately on his return to the capital.

THE POLAR EXPEDITIONS.—A letter has been received from a gentleman on board the *Polaris*, reporting the safe arrival of the ship at Upernavick, and her departure thence on September 5, steering due north. All well. From Gotha, Germany, we hear of the German expedition, and its reported success in reaching the open Polar sea. The sea is reported to be "free from ice, and swarming with whales."

EDUCATION enters the mind through the gates of the senses. It is commenced very early, many children requiring to be taught even to nurse. Remembering that James Watt commenced the study of Greek at the age of seventy, it would be difficult to fix a period at which it terminates. As a general rule more lessons are learned outside than inside of our school houses.

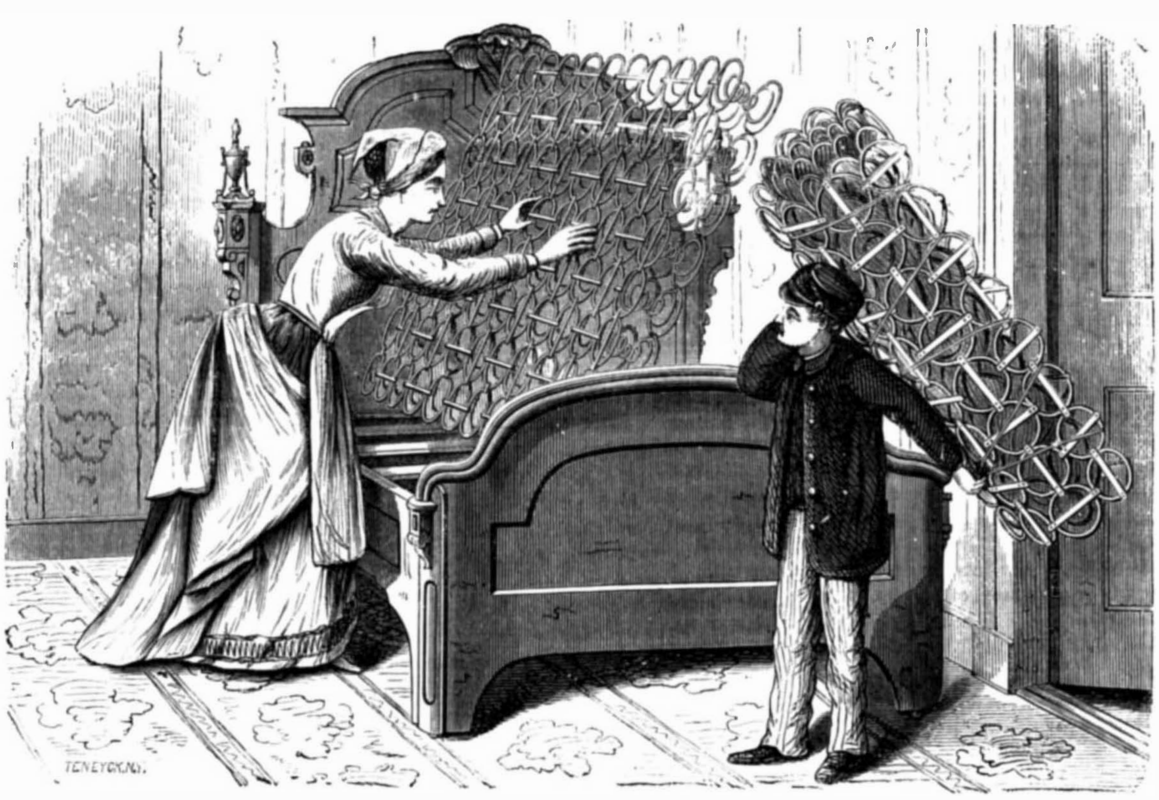
THE CHAMPION SPRING BED.

The sum total of human experience on the subject shows that the bed question is one of great importance to everybody, and that upon the wisdom of one's choice of bedding material depends much of comfort, health, and even the prolongation of life. A badly composed bed is too often but the breeding place of contagion and disease.

Good feathers and curled hair, in abundant quantities, make good beds, but their organic substance renders them unhealthy, and the best medical authorities discourage their use. A capital substitute for them has been found in the elastic properties of metal, and the subject of our illustration is the very latest improvement in this line—the Champion Spring Bed—which rivals in its softness the old-fashioned down and hair, embodying, likewise, all the other good qualities that experience has shown to be desirable.

This bed is composed of eighty-eight beautiful steel springs, comprising over eight hundred coils, drawn and tempered with accuracy, yielding and pliable like watch springs, the helices united by leathern bands, and the whole so arranged that pressure, applied upon any one portion of the surface of the bed, is equally distributed and sustained by all of the springs. This imparts to the bed an even elasticity and general softness, which is a peculiar characteristic, preventing that sinking down of the bed in one spot, and that down-hill feeling of the surface, or sloping towards the place where the greatest weight rests—defects that are common to most of the ordinary spring beds.

Another striking advantage of this bed is its remarkable flexibility. As shown in our engraving, it may be rolled up like a blanket, forming a convenient package for transportation; and it may be lifted, turned, and carried about the household with the utmost facility.



THE CHAMPION SPRING BED.

Its extreme lightness is a distinctive and important quality, the total weight of a first class double bed being only 25 lbs. A child may carry it; any woman may lift it with one hand. Housekeepers will appreciate this quality, for they can remove and place the bed, wherever they require, as easily as if it were a bolster.

Another excellent feature is its perfect security against corrosion, the springs being inlaid with a firm waterproof fire enamel, which renders the bed serviceable in every climate, hot or cold, dry or damp.

Both sides of this bed are alike, it can be used either side up, has no attached frame of wood or slats, but is soft, yielding, and flexible in every part. In summer time it forms a cool and luxurious couch; no under bed being required, a blanket thrown over its surface is sufficient. In cold weather, a mattress of only half the usual thickness is needed.

This bed is noiseless and durable. It is also economical in price, the full sized double beds of this pattern being retailed at $12—the smaller sizes for less. Rolled up for transport, as shown in our engraving, it forms a light, compact bundle of steel springs, which may be sent to any part of the world without risk of damage. Such are some of the merits of this invention, as claimed by the makers, and they appear to be well founded.

Patented Sept. 19, 1871, by Wm. B. Judson. Manufactured by F. C. Beach & Co., 260 Broadway, New York, from whom further information can be obtained.

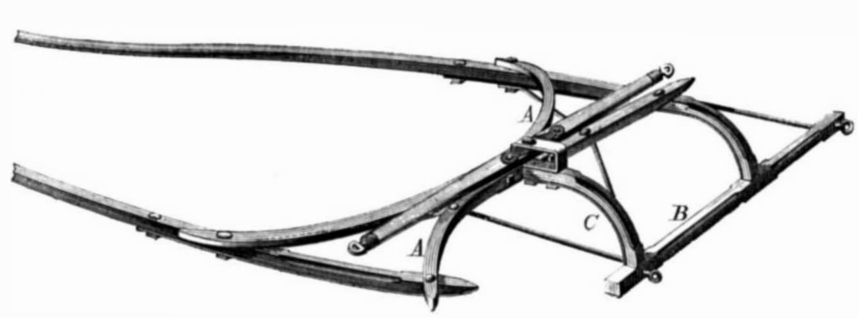
Silk Reeling in California.

At the recent fair in San Francisco, a small space in one of the galleries of the pavilion was devoted to silk, and this was occupied by a reel, the office of which was to unwind the fibers from the cocoons. This was of much interest, and while at work was the center of an admiring group of spectators. The operation was conducted by a California lass, who took real pride in her occupation and showed great skill. The cocoons, which look like large peanuts, are put into a vessel of boiling water which stands in a small furnace, the furnace itself being set below or rather in front of a small table, on a level with the operator as she sat in a low chair. The action of the hot water in a few minutes loosened the gum, that, in the natural condition, cements the fibers to the cocoon. This done, the girl, taking a brush in one hand, stirred the cocoons about with it until the requisite number of fibers were detached at their ends, and clinging to the brush. From this they were quickly brought together to form a thread, passed through a fixed guide or staple at the opposite edge of the table, from this through a staple on a reciprocating bar, and thence to the reel, which was revolved by the hand of a small boy. A second thread was formed in like manner, and in the same way connected with the reel.

As the reel revolved, the fibers were drawn or unwound from the cocoons, which danced about in the boiling water, united in the two threads, and conducted to the reel upon which they were distributed by the vibratory movement of the bar previously mentioned. The two threads, in passing to the reel, were made to cross each other at an angle of about thirty degrees. This was the distinguishing characteristic of the new invention, and the advantage claimed for it is that the two threads, in rubbing each other as they pass to the reel, cause the gum to stick more closely together and consequently secure a smoother and firmer thread. After certain lengths of the two threads were wound upon the reel, its motion was stopped, the threads were severed from it, and the two skeins of raw silk, bright yellow or lighter colored, according to the original tinge of the cocoons, were slipped from its ends. The peculiar skill required from the attendant is shown in keeping the threads of silk continuous as the fibers wind off and leave the cocoons, it being necessary to add the fiber from a new cocoon at the instant the fiber from the previous one is exhausted. The fibers are of course too fine to be seen at the distance of more than a very few inches, and while the operator was attending to her work, it seemed as if her fingers were flying in the weaving of an invisible web.

BOCK'S IMPROVED ONE HORSE SLEIGH SHAFT.

In the old way of constructing the shafts of a one horse sleigh, the left runner extended out beyond the left shaft, so that in passing other sleighs, or in crowded positions, it was liable to get caught and broken



ONE HORSE SLEIGH SHAFT.

In the invention, herewith represented by our engraving, a method of construction has been adopted that not only obviates any such difficulty as that described, but gives a peculiarly graceful style and appearance to the shafts.

Our artist has so well delineated this improvement that any one conversant with sleighs will understand it.

The invention consists in the combination of the shafts with the double crossbar, A, the draft bar, B, and the short curved bar, C, made in such a way as to carry the left thill out laterally beyond the corresponding runner, as above described.

This improvement, though simple, is practical, and we think, will meet general approval.

Patented through the Scientific American Patent Agency, Sept. 5, 1871, by C. & D. Bock. For further information address the patentees, Drum P. O., Luzerne Co., Pa., or Bent, Goodnow & Co., 490 Washington street, Boston, Mass.

To Preserve Flowers.

A new mode of preserving flowers fruit, and botanical specimens generally, has been suggested by Dr Piesse, which we think will be appreciated by those who wish to preserve specimens gathered by departed friends, or to retain the form of flowers for botanical teaching. The process consists in simply dipping the flowers into melted paraffin, and withdrawing them quickly, when a thin coat of the paraffin instantly sets, and incloses hermetically the plant so treated. In order to be successful, the flowers should be freshly gathered, perfectly dry, and free from dew or moisture of rain, The paraffin should not be hotter than just sufficient to liquefy it; and the flowers should be dipped into it separately, holding them by the stalks, and moving them about in order to get rid of bubbles of air, which are likely to become imprisoned within the corollæ of the flowers. Those parts of plants or flowers which are not required to be preserved should be removed with scissors prior to steeping them in the paraffin.

COOGAN'S MACHINE FOR BOARDING, PEBBLING, AND GLOSSING LEATHER.

The process of boarding leather is at present carried on by vibrating, by hand or machinery, a convex plate, on the doubled leather, which is placed on a flat table. This vibrating plate operates slowly, and the process is consequently expensive. Mr. Owen Coogan, of Pittsfield, Mass., in an invention just patented, proposes to use, instead of the convex plate and table, two cylinders or rollers, hung parallel to each other in a frame, and geared in such manner that they will revolve in the same direction. One of the rollers hangs in vertically adjustable bearings, so that its own weight, or machinery connected with it, may be used to press it against the other roller. The leather to be boarded is doubled, placed between the two rollers, and rotary motion then imparted to the latter. The two layers of leather are thereby drawn in opposite directions. The leather is thus constantly folded and refolded, and consequently softened, and, on the inner side at the same time grained or boarded in the desired manner. The rollers are smooth or roughened and made of any suitable material.

For applying a design to the ace of the leather—"pebbling" it, as it is termed—he applies to the machine a pebbling roller, which is placed between the first mentioned rollers, so that the leather passes around it. The surface of this roller is roughened by indentations, or provided with a suitable design, so that such design will be impressed in the face of the leather while the latter is pressed against the pebbling roller. In order to permit the easy application of various designs, he makes the pebbling roller of a central pin or shaft, and fits short tubes upon it, the tubes carrying the design on their circumference and constituting thus the outside of the pebbling roller.

For glossing the surface of blackened leather, a smooth or glossing roller is used in place of the pebbling roller. The pebbling and glossing rollers are removable from the machine, so that the latter may be used for boarding only. The axis of one of the boarding rollers has at its end a worm, which meshes into the teeth of a worm wheel. This worm wheel has a projecting pin, which, after a certain amount of rotation, strikes against a lever connected with a clutch lever, whereby the driving belt is carried so as to automatically reverse the motion of the rollers. Thus the leather, after having been doubled and moved one way, is subjected to the same process under reversed motion. The pin, set into the worm wheel so as to permit full action on the entire length of leather, is adjusted in position according to the length of the leather to be boarded. For this purpose the wheel has several apertures or sockets for the reception of the pin.

We regard this as an important addition to leather dressing machinery, and see no reason why it should not prove itself valuable in practice.

Labor.

"Labor," says the Rev. Newman Hall, "as a mighty magician, walks forth into a region uninhabited and waste; he looks earnestly on the scene, so quiet in its desolation; then waving his wonder-working wand, those dreary valleys smile with golden harvests—those barren mountain slopes are clothed with foliage—the furnace blazes—the anvil rings—the busy wheels whirl round—the town appears—the mart of commerce, the hall of science, the temple of religion, rear high their lofty fronts—a forest of masts, gay with varied pennons, rises from the harbor—the quays are crowded with commercial spoils, the peaceful spoils which enrich both him who receives and him who yields—representatives of far off regions make it their resort—science enlists the elements of earth and heaven in its service—art, awaking, clothes its strength with beauty—literature, new born, redoubles and perpetuates its praise—civilization smiles—liberty is glad—humanity rejoices—piety exults, for the voice of industry and gladness is heard on every hand; and who contemplating such results, will deny that there is dignity in labor?"

GOOD MANNERS are not learned from arbitrary teaching so much as acquired from habit. They grow upon us by use. A coarse, rough nature at home begets a habit of roughness which cannot be laid aside among strangers.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE DEPENDENCE OF FUTURE MECHANICAL PROGESS UPON THE DISCOVERY OF NEW MATERIALS.

We would not, in the above heading, imply that without the discovery of new materials the triumphant march of improvement will be stayed, but we hazard nothing in asserting that such discoveries at this period would greatly accelerate mechanical progress.

We have within a few years witnessed a new impulse to the arts imparted by the discovery of nickel plating, which places in the hands of inventors a comparatively cheap material, suitable for many useful purposes.

By new materials, we mean not only those substances hitherto totally unused, but such modifications of known substances as render them practically new and capable of hitherto unknown applications.

For both the discovery of new substances and modifications of the old ones, the world must principally look to chemistry and metallurgy. The former almost daily acquaints the world with some new combination; but, for the most part, these discoveries are made in organic chemistry, and prove of little practical value to the arts. Once in a while, however, there appears an announcement of some investigation, the results of which completely revolutionize an entire industry; or, if not of so radical importance as this, still produce immense changes in various arts. As one out of many illustrations of this, we may adduce the discovery of the coloring matters contained in coal tar, which has so greatly added to the resources of the dyer's art.

The aim of metallurgists at the present time seems more directed to cheapening the methods of extracting metals from their ores, and rendering them more complete and effective than they have yet been; and there seems to be a pause in the study of the alloys. Yet, in these remarkable compounds of metals with each other, there seems to us an almost illimitable field, containing the highest promise to the patient worker. The man who could discover a new alloy as widely useful as brass, and who could secure the fruits of the discovery to himself, would have found a source of wealth richer than any gold or silver mine in this country.

What is needed is the systematic study of alloys, the putting of metals together in a great many possible proportions, with a constant record of results, and specimens of each preserved in cabinets, with minute observations of their physical and chemical properties. As this would take much time and involve great expense, it could hardly come within the means of a single individual; but if a suitable laboratory could be endowed, and provided with suitable apparatus, and properly qualified men could be induced to give up their lives to such an investigation, we feel assured the knowledge which might be gained would as fully repay its cost as that obtained in any other field of research.

It is also probable that the vegetable and animal kingdoms still hold rich stores of material, capable of extended use in the arts. It is not many years since it was known that useful paper could be made of wood and straw.

The milky juice of the "silk weed" or "milk weed," as it is called in common language, but known to botanists as the *asclepias cornuti*, is capable of abundant supply, if it can be shown to be of industrial value. It dries into a very viscid substance, as every boy who has soiled his hands with it knows. How nearly is it allied in property to the juice of the india rubber tree? Is it not capable of combining with sulphur, like rubber, to form a species of vulcanite? Who has answered these questions, and scores of others that might be propounded in regard to other plants?

If some of our inventors would now turn their attention to the utilization of new materials in the vegetable world, we think many valuable things might be discovered.

But we have said enough for our purpose, which has been to direct attention to the vast supplies of hitherto unworked materials lying idle in the great storehouse of Nature. Can any one believe that, among all these, remains nothing that can be brought successfully into the service of mankind? We have only to look back a few years to find a negative answer in the general introduction of petroleum products that were unknown to the last generation, to the development of the vulcanized rubber industry, to the employment of anæsthetics in surgery, to the adoption of new articles of food and drink, and to many other contributions to the comfort and luxury of mankind, that were, at the time of their discovery, no more within the limits of possibility than others not yet made are at this moment.

FIREPROOF BUILDING.

It may be safely said that there exists no solid material, available for building, sufficiently refractory to withstand heat, as intense as may be produced by artificial means, or generated in large fires like that which has recently visited Chicago. It is true that there are many substances which resist heat for a long time. Fire clay, plumbago, asbestos, platinum, etc., are capable of enduring very high temperatures, without perceptible damage or change, for considerable periods. Safes, made of these and other materials we could name, would scarcely burn up, though exposed even in the fiercest fires for hours or even days. It is, therefore, not difficult to make a safe that the heat of burning buildings will not destroy; but to make one that will not transmit heat to its contents, after long exposure, is quite another matter. Even the worst conductors do conduct heat somewhat, and though this conduction may be slow, it will, if long continued, be ultimately sure to char the destructible things in any safe that relies solely upon non-conductors—so called—as a protection for its contents. This has been proved in all the great fires that are on record, since the general introduction of safes.

The same remarks apply to fireproof buildings. No doubt a building could be made of a material, or of materials, that will not burn under any combination of circumstances; but walls will heat, and combustible organic substances will become converted into charcoal in dry ovens, for such every really fireproof building is when its exterior walls are the sole protection of its stored wares.

Could we make walls of a substance that will only attain a moderate temperature, no matter to what degree of heat it might be exposed, and which would not melt down or volatilize, we should have found the precise thing of which to make the walls of fireproof safes and buildings. A building made of ice would preserve its contents from fire till the walls were melted. But we cannot use ice for building.

What ranks next to ice as a protector, and is available in large quantity, is water. If a building could be made in such a way that each pillar, block, lintel, and sill—each separate part of the structure—could be instantly, on an emergency, converted into a steam boiler, evaporating water at atmospheric pressure, such a structure would withstand any heat that could be brought against it, and preserve most of its contents so long as the supply of water for evaporation was maintained. More than this, the exact amount of water necessary to preserve it for a given time, under a heat that would keep the water boiling, could be accurately computed. The temperature of no part of the structure could rise much above 212°, at which few materials in common use, and stored in dwellings and warehouses, would be much injured.

As a matter of interesting computation, let us estimate the amount of water necessary to protect a building one hundred feet long, thirty feet wide, and seventy feet high, having the ordinary flat roof. The superfices of such a building exposed to fire, would be equal to the effective heating surface of a 1,927 horse power boiler, or one that will evaporate 1,927 cubic feet per hour; so that, admitting all sides to be equally exposed, that amount of water would keep building and contents down to a temperature of 212° Fah.

Practically, however, only the ends and tops of a building in the center of a block would need such protection, unless the buildings next it should take fire, so that, in most cases, only about 665 cubic feet of water per hour would be necessary, supposing the heat on the ends and top to be intense enough to keep all the water boiling.

It would be clearly impossible to burn a city made up of such buildings; and no fire could have a long duration, unless some inextinguishable substance like coal oil, alcohol, etc., should ignite; in which case, unless such a building as we have described should explode, its interior would become a boiler furnace instead of an oven, and its walls would stand, to a great extent unimpaired, after its contents were consumed.

We do not pretend to assert that precisely such a system as we have indicated, is practicable, but do not doubt that the use of the vapor of water to prevent the possibility of fire would prove far more economical than the present use of that fluid as an extinguisher. We believe the direct application of steam as a conveyer of heat rather than as a motor for engines, which are only employed to throw, in a wasteful deluge, a volume of water upon buildings for the same purpose, would be shown the more scientific and effective method.

If the hint is worth anything, we leave it for inventors to put it into practical form. The problem is to make a structure that fire cannot destroy; and to the use of water as the cheapest, most available material, in combination with those which have proved themselves, when used alone, unreliable we must look for its solution.

THE LEISURE TIME OF BOYS.

Every father of a family knows that there is a time in the life of his sons that gives him much trouble and some anxiety. We allude to the period of boyhood, when exuberance of spirits and thoughtlessness are at their hight, and when the studies imposed by school discipline are entirely insufficient to find adequate employment for their too active minds and bodies. And it is not possible, or even desirable, to increase the already considerable application of all well bred boys to the study of books and the acquirement of learning. It is not to be wished that a youth of twelve should grow up to be a conceited would-be pedant of twenty, and a bookworm of thirty, years of age. Thus the task of finding fitting occupation for the leisure hours of a boy is no inconsiderable one, as few pursuits into which a boy would plunge with eagerness are suited for putting in the way of so much impulsiveness and want of consideration as most boys possess. The question, then, of how to amuse our boys, is one of paramount importance and difficulty.

We would suggest, to the many parents who have been perplexed with this difficulty, to give their lads every possible opportunity of acquiring a mechanical trade. The industry and ingenuity of a boy of average ability may easily be made to furnish him with a never failing source of amusement of the best order. The boy who can produce or make something already begins to feel that he is somebody in the world, that achievement of a result is not a reward reserved for grown people only. And the education of mind, eye, and hand, which the use of tools and mechanical appliances furnishes, is of a great and real value, beyond the good resulting from the occupation of leisure time. Having nothing to do is as great a snare to the young as it is to the full grown; and no greater benefit can be conferred on youths than to teach them to convert time now wasted, and often worse than wasted, into a pleasant means of recreation and mental improvement.

We say, therefore, to all parents, provide your boys with mechanical apparatus and tools. There is no greater pleasure to most boys than the handling of a tool; and many great men and ingenious inventors look back with gratitude and delight to the day when they were first allowed to use the lathe, the saw, and the plane.

The expense of a visit or two to a theatre will furnish a family of boys with an occupation into which they will all enter with alacrity, and which will instruct them in two most important branches of education, namely, quickness of eye and docility of hand. And, further, it will develope any latent genius they may have for the mechanical and constructive arts, which are, now more than ever, the most important means to the progress of mankind. The boy, whose time and mind are now occupied with marbles and kites, may be a Watt, a Morse, or a Bessemer in *embryo;* and it is certainly an easy matter to turn his thoughts and musings into a channel which shall give full scope to his faculties; for, to any lad, the use of mechanical tools is the most fascinating of all occupations. And for boys whose spare hours are spent in more objectionable ways than the innocent games of childhood, it is of tenfold importance that all fathers should recognize the existence of a simple and attractive substitute.

And if the boy has not in him the germ of a great benefactor to his race, and if his tastes and morals are unexceptionable, the training of the intellect in some handicraft will have great and salutary influence on his character. As logic and mathematics have a value beyond accuracy in argument and the correct solution of problems, in that they teach men the habit of using their reflecting powers systematically, so carpentry, turning, and other arts are of high importance, even if the boxes and silk spools produced are of little value. These occupations teach boys to think, to proceed from initial causes to results, and not only to understand the nature and duty of the mechanical powers, but to observe their effects; and to acquire knowledge by actual experiment, which is the best way of learning anything. All the theories culled out of books leave an impress on the mind and memory, which is slight compared to that of the practical experience of the true mechanic.

Our advice is, to all who have the great responsibility of the charge of boys, give them a lathe, or a set of carpenter's, or even blacksmith's tools. Give their minds a turn towards the solid and useful side of life. You will soon see the result in increased activity of their thinking capabilities, and the direction of their ideas towards practical results; and, still more obviously, in the avoidance of idle mischief and nonsense (to omit all reference to absolute wickedness and moral degradation), which are, to too great an extent, the pastime of the generation which is to succeed us. The future of the world is already sown, and is springing up in our children; is it not worth while to bestow a little thought on the cultivation of a growth so important to society, and so easily influenced for good or for evil?

VALIDITY OF PATENTS ISSUED UNDER THE NEW LAW

Some anxiety has been caused to patentees by a statement, now circulating among the papers, to the effect that all patents issued between July 8, 1870 (the date of the new patent law), and July 4, 1871, are invalid by reason of a discrepancy existing, during that period, between the working of the patents issued and the wording of the new law. The difference referred to is this: Under the old law, a patent was granted to the applicant, "his executors, administrators, or assigns," but in the present law the reading is "his heirs or assigns," It seems that, during the interval above named, the old blank forms were used while the new ones were being prepared and engraved, the above difference in wording not being considered of any essential importance, and certainly in ro manner exposing the validity of the grant. It would have been a simple matter to have changed the wording of the old forms with pen and ink, if it had been legally required, or even desirable. We understand that the chief reason for adopting a new blank form was to reduce the size. Why a change was made in the wording of this paragraph in the law itself is not apparent. Persons, therefore, who may have seen the sensational item alluded to, and have had their fears much excited thereby, can safely compose themselves on the subject. Even in case the Office had committed an error, as stated, affecting in any measure the soundness of any patent, Congress would not fail to protect the rights of the party interested.

SOMETHING ABOUT FACES.

It is a trite remark that, among all the multitude of people who inhabit this globe, no two can be found that exactly resemble each other. Even in cases of twins, where a strong similarity exists, there is always to be found some point of difference by which those most intimately acquainted with them are enabled to distinguish one from the other. And it may be further observed, that those most alike in early youth lose their resemblance, to a greater or less degree, as age advances. No face leaves this world at mature years without having undergone changes that astonish even the most intimate when comparisons are rendered possible. In this age of photographs, almost any one is able to make such comparisons, and to note how the various circumstances and trials of life carve their impress upon the features. Very few have, however, fully estimated the infinite variety and number of indirect, direct, near and remote influences that have operated through ages to work out the form and feature of every face upon earth.

A skillful physiognomist may often determine character approximately by the countenances of men; but, as a sheet of paper, printed and reprinted, must at last become a confused jumble of indistinguishable characters, so are most people's faces too much interlined and crosslined, by the confused imprint of circumstances and events, to be intelligible even to the most practiced reader of faces.

There are, indeed, some traits of character, and some passions that ordinarily stamp themselves upon faces more conspicuously than others. Of these may be mentioned cruelty, settled melancholy, and jolly good nature. As a rule, these traits are easily distinguished by a look at faces; but it is not infrequent that good faces conceal bad hearts, and sanctimonious appearances cover secret vices.

A man who was tried for and convicted of murder, and who confessed his crime before his execution, was admitted, while on trial, to be as fine looking and prepossessing in appearance as any man on the bench, in the bar, or in the jury box, yet that court room contained some men whose lives and record have been in the highest degree honorable, and whose personal appearance could scarcely be excelled by any equal number of men anywhere.

It is notorious that circumstances of easy living, the absence of business cares and worries, will do much toward smoothing away the marks of crime; while the faces of criminals that have lived in circumstances of physical hardship gather a rough brutality from which we instinctively shrink.

As the circumstances which give character to the human face at birth have been infinitely various, and have acted through long periods of time, it is not a matter of surprise that the results are so varied, but rather that they should be even as uniform as they are. Were it not that throughout nature there prevails the great law of compensation, and also the great law of reversion (admirably set forth by Darwin), there could be no two living things even approximately alike. There would be neither *genera* nor species, even if the wide difference in structure and habits thus arising should not lead to the mutual destruction of all.

As circumstances shape our birth, so they shape our lives and mold our characters. Yet, with all the thought and effort toward social improvement that marks the age, the effort of society seems to be directed to making character adapt itself to circumstances rather than to form character by controlling the circumstances through which character is developed. Thus we have failed to recognize the fact that physiological law is stronger than social law. We do not yet admit the fact that, if our habits and customs are such as to develop the animal in us at the expense of the mental and spiritual, we shall have animals to control by civil law; or if we do see this, we do not see that civil law must prove utterly inadequate to control animals, that obey only their depraved instincts.

Society, in assuming to govern not only the depraved, but the healthy, instincts of our animal nature, assumes too much when it attempts to force violations of physiological law. As well might it legislate that weights shall fall upward; they will fall downward in spite of enactments; and so will the catastrophes and crimes that have lately shocked our community continue to happen so long as the circumstances that lead to them are permitted to exist. If we feed our children upon heating diet, and place them where they are forced, like plants under glass, into premature bodily development, let us blame ourselves only, that their immature minds and wills are too weak to contend with the strength of their passions which we have taken such pains to cultivate; and if, in the temptations that beset them, they overstep the bounds of social propriety, let us not be surprised that, in their efforts to escape the disgrace society attaches to such lapses, they, some of them, resort to dangerous practices, and find a final escape in death.

DEATH OF SIR RODERICK IMPEY MURCHISON.

The death of this distinguished man is announced by telegraph to have taken place on October 22, in England, at the advanced age of seventy-nine years. It has rarely fallen to the lot of any man to contribute so largely to the advancement of science as this deceased scholar. His career was a peculiar one. In early life he was an officer in the British army, and, as such, served under Wellington in Spain. He left the army, in order to marry and settle down to quiet literary pursuits; and, in accordance with the advice of his friend, Sir Humphrey Davy, as well as the influence of his accomplished wife, and following a natural predilection, he took to scientific studies, more particularly to geology and physical geography.

One of the earliest fruits of this study was the publication, in 1834, of a work "On the Geology of the Neighborhood of Cheltenham," which was afterwards augmented by Buckman and Strickland, and republished in 1845. "The Geology of the Counties of Salop, Hereford, Radnor, etc.," appeared in 1835; and, in 1839, was published "The Silurian System, founded on geological researches in the County of Salop." By this time Murchison had become a thorough scholar, and an indefatigable investigator; and, like many previous scientists, had taken up a hobby, which he pushed with admirable zeal, and in elegant language. The ancient name of Wales was Siluria, and this served to give character to the new system of the oldest rocks. The Silurian system has become one of the recognized names in geological science, and for this we are indebted to Sir Roderick.

From the date of his first publication, in 1834, down to the time of his death, Sir Roderick Murchison was a constant contributor to the proceedings and transactions of learned societies, and the author of several popular books. The genial character of the man and his high social position at once pointed him out for the position of presiding officer over the learned societies of London, and he was for many years President of the Royal Geographical and Geological Societies; and in this double capacity he was able to aid in the organization of some of the most important exploring expeditions that have ever been fitted out in England. To his persuasion and energy, the world is indebted for much that we have learned of obscure portions of the earth.

The death of such a man will create a profound impression in the whole scientific world, for there is no part of the globe where his name has not been carried by the indefatigable explorers fitted out and sent through his influence. A thorough gentleman, a conscientious scholar, an active publisher, an elegant writer, and an eloquent speaker, he will be greatly missed from English circles, and will be mourned by lovers of scientific truth everywhere.

Death of Mr. Charles Babbage.

We have received from England the news of the death of Mr. Charles Babbage. This gentlemen gained considerable celebrity by inventing a calculating machine, which excited great public curiosity for a time, but was found to be valueless for general use. It was subsequently improved, and is now in use in England for indicating logarithms in one of the statistical departments of the Government service. The deceased was for many years the holder of the mathematical professorship at Cambridge University, a position long held by Sir Isaac Newton. Mr. Babbage's writings on the economy of manufactures and cognate subjects are numerous and valuable. He was, in the year 1832, a candidate for Parliament, but was defeated at the election. He died in his seventy-ninth year.

FAIR OF THE AMERICAN INSTITUTE.---ADDITIONAL OBJECTS OF INTEREST.

Many objects of interest have been added to this exhibition since our last visit, some of which we will notice in the present article, and which, together with what we have already noticed, render this year's fair one of the best ever held by the American Institute.

GLASS AND STONE CUTTING BY SAND BLAST.

The new process of cutting hard substances by the sand blast has, on account of its novelty and unique character and the great rapidity and exactness with which the work is performed, attracted crowds of admiring observers, so much so that it was quite difficult to get near enough to see the operation of the apparatus. When, however, we succeeded in approaching it, we were lucky enough to be in time to witness a test experiment, being the drilling of a ¾ inch hole through a solid emery wheel; this was done at the rate of a quarter of an inch per minute. Specimens of glass cutting in beautiful lace patterns, and of lettering in marble in either *intaglio* or relief, elicited unanimous commendation. Few that saw the operation of the machine failed to see that the process is destined to a high place in the useful arts. As we purpose giving an engraving of this machine, we reserve further particulars for a future article.

NAIL CUTTING.

Mr. Henry Scheurle, 64 Avenue B, New York city, has added to the attractions of the fair a nail cutting machine that cuts, from cold bar iron, 400 nails per minute. The machine is small and very compact, and its gluttonous way of satisfying its appetite for iron amuses all who see it.

GEOMETRICAL LATHE.

Mr. A. Schaefer, of 82 Forsyth street, New York city, exhibits a geometrical lathe. This wonder of mechanical art, seen for the first time by the majority of visitors to the fair, is a center of attraction to which many are drawn, and the delicacy and richness of the tracery wrought by it are marvelous to the uninitiated.

Mr. G. L. Kelty, 722 and 724 Broadway, New York, has laid the public under obligations by exhibiting the various processes in the manufacture of upholstery trimmings. The beautiful wares, growing under the practiced and skillful fingers of the trained female operatives, are very curious, and make a very instructive and interesting exhibit. The machines employed have a somewhat primitive appearance, and there is more than one operation now performed by hand that appears susceptible of being done wholly by automatic machines.

BRICK MAKING.

Mr. J. Nottingham Smith, 225 South Third street, Jersey City, N. J., claims with much reason that it is useless to press bricks when molding them, for, consisting of intimately mixed clay and water, they, at that stage of the process, form a practically unyielding mass. When, however, they have partially dried, they are susceptible of being further compacted, and he has therefore invented, and exhibits at the fair, a machine designed for this purpose, which is worthy the attention of brickmakers. The theory seems plausible, and the machine is evidently the production of a thoughtful mechanic. It is guaranteed to press one thousand bricks per hour.

AIR COMPRESSING ENGINE.

This is the exhibit of J. B. Waring, consulting engineer of the Norwalk Iron Works, 133 Center street, New York city. It is a very handsomely finished and effective machine, evidencing in its design a full comprehension of the niceties of engineering required in a first class air compressor. The air cylinder is kept cool by a water jacket. The trouble experienced in some compressers, from congelation of moisture on the chilled pipes, seems, by certain peculiarities of mechanism, to have been obviated in this machine. It supplies power to two rock drilling machines in another part of the building, of one of which we have now an engraving in process of preparation, and in describing which we find it necessary to again allude to this air compresser.

THE CAMPBELL COMBINATION PRINTING PRESS.

We have already noticed briefly this beautiful machine, and we now return to it, because its liberal exhibitor, having announced that it will be sold at the close of the fair, and the proceeds donated to the Chicago Relief Fund, we are anxious to aid in its sale for a good price by some further exposition of its merits. Said a bystander at our last visit: "That machine feels and thinks," and surely the extreme delicacy of its operation is such as to make it easy to imagine a brain and nervous system concealed in its beautiful proportions. If it has not these, it has the nearest approach to them human art has ever been able to achieve, a galvanic battery, which so acts upon the adjustment of the machinery that it is impossible to print out of register. Said its inventor to us: "When I first began to construct presses, it was impossible to print in register. I first rendered it possible, and now I have made it impossible to print out of register." As a proof of the truth of this last assertion we have now on our table a sheet, one side of which received two impressions, the form being inked the second time and the sheet fed in precisely as at first. No one in comparing it to a similar sheet printed only once could tell it had been printed twice, except that, having received double the usual quantity of ink, it is somewhat darker in general tone. There is no indistinctness of outline, and yet this sheet has upon it engravings of a character that would show the slightest discrepancy in the registering.

Unless the sheet is properly presented to the grippers, the press refuses to print it. If it is a quarter of an inch from the guide, it is thrown out perfectly blank and uninjured; if it is farther away from the guide than this, it may be rumpled, but will not be soiled. If the sheet is not printed, the press places it on the regular pile, with its edge sufficiently projecting to be easily seen and drawn out, so that it shall not be sent to the bindery. In printing the second side, unless the registering points are entirely through the paper, the sheet cannot be printed, as, these points then failing to make the battery circuit complete, a stop motion, to all the parts not necessary to throw out the sheet unprinted, acts to effect this result. Ink is only taken by the forms when the press prints; when a sheet is printed, the press runs on but takes no more ink till the next sheet is printed; and although the roller may have run many times over the form, there is to the ordinary observer no perceptible difference between the sheets printed. This results from the fact that in inking there are two distinct and complete operations, at each end of the form, that distribute the ink in, so to speak, two superimposed wedges, the thin end of one lying on the thick end of the other, and thus making the layer of ink uniform throughout. No part of the form can be over inked. This, with the new and peculiar mode of adjusting the form rollers, makes four rollers equal in efficiency to twenty of the old style, as is shown daily in the actual working of this press. All this automatic accuracy in working is accomplished through the agency of the sheet itself. It must cover, when laid, three small holes in the sheet guides, which, when so covered, establish a perfect communication between a small gravity air pump and two diaphragm bolts. These moving pieces accomplish all the varied results, and they are so simple and easy to comprehend when seen that they surprise even the best mechanics who have, after long search for something complicated, found in them the secret of the delicate working of the press. If any one wishes to see a mechanical poem, and to converse with a man who has reduced printing almost to a fine art, let him look at this press, and get it explained by its courteous exhibitor, Mr. A. Campbell, who is generally present. Mr. Thomas H. Senior, *Sun* Building, New York city, is the general agent.

GRINDING MACHINES.

Mr. W. S. Jarboe, 93 Liberty street, New York city, agent of the Union Stone Company, Boston, exhibits an Universal Grinding machine, which is a very useful appliance in doing many kinds of work. The work is placed on a bench or truck, and the emery wheel is swung at will to conform to the straight or uneven surface. It is especially adapted for heavy work that cannot be easily handled. He also exhibits a hand machine for universal grinding of castings, etc. which have uneven surfaces, which is an ingenious and effective tool.

Another interesting exhibit is a machine for grinding paper or other long knives requiring to have a truly straight edge, the knives traversing by the emery wheel, and the grinding being performed in the most accurate manner. In all these machines, emery wheels made by the Sorel process are used.

STEEL CASTING TO PATTERN.

A case of various articles of steel, cast to pattern, is shown by the Union Steel and Iron Works, of Rhinebeck, N. Y. It is claimed that the process by which they are made is entirely novel in its character, and that by it all articles now forged from steel may be successfully made. The articles thus cast may be hardened or tempered to suit the work they are designed to perform; and the steel, being malleable when taken from the molds, may be, it is claimed, worked and tempered the same as tool steel. The specimens shown seem to indicate that these claims are not exaggerated. Should they become established in practice, this little case will be entitled to rank among the most important expositions of the present fair.

POTTERY.

The Jersey City Pottery Works show the process of manufacturing pottery. This evolution of forms of beauty from crude clay, by the agency of the time honored and primitive potter's wheel, has attractions second only to those of glass blowing, which forms a center of delight in another part of the building. The managers of the fair are wise in encouraging displays of this kind, which do far more to educate the people than the mere exhibition of products.

ANOTHER NOVELTY IN SEWING MACHINES.

The Lathrop Combination Sewing Machine Company, of New York, exhibit a decided novelty in sewing machines, which is almost as radical in its character as is the celebrated Lyall positive motion loom in weaving. This machine sews directly from two spools, making either the lock stitch, the simple chain stitch, or a beautiful French embroidery stitch compounded of the two. The looper is so constructed that one of the spools, sustained in a carrier which takes the place of the shuttle on ordinary shuttle machines, passes through the loop to make the lock stitch. The machine is most ingenious, and appears to work admirably. We hope soon to present engravings illustrating it, together with a minute description.

The Bickford Family Knitting Machine, several of which have been running at the fair since its commencement, deserves commendatory notice. It has no competitors at the fair, but notwithstanding the absence of opposition to add zest to its struggle for public favor, it attracts much favorable comment. It has, like Saxe's fisherman, a "very taking way," that seems to captivate the fair sex at sight, and it is really wonderful to witness the variety and beauty of the work it performs, as well as the speed with which the operation proceeds. It has made a decidedly good impression, and is one of the first class attractions of the fair. It is exhibited by Mr. Dana Bickford, vice-president and general agent, 689 Broadway, New York. The reader will find a detailed description of it, with illustrations, on page 367, Vol. XXIV. of the SCIENTIFIC AMERICAN.

EXTENSION DESIRED.

We echo a generally expressed desire that the date for closing the fair shall be postponed. The attendance still remains large, and, as it must be remunerative, we trust the wish for an extension will be regarded by the managers.

[Special Correspondence of the Scientific American.]

LARGE NUMBER OF PATENTS EXTENDED.

Washington, D. C.

Among the extensions recently granted are the following:

To Stanley A. Jewett, for improvement in melodeons, reissued in 1864. The invention consists in graduating the sizes of the air chambers, above and below each reed, upon a geometric scale, by which an uniformity of volume of sound is produced; also, in producing a perfect *mute*, and in producing a swell and *diminuendo* by operating the swell valve by the bellows, without the intervention of a pedal, yet under the control of the performer.

To J. D. West, for an improved pump.

To G. J. Mix, for an improved iron spoon. The bowl and handle are made in separate pieces, cut and fashioned by a die, and then riveted. The invention consists in forming the rivet and handle out of one piece of metal, by which the manufacture is much facilitated and a better article produced.

To Samuel Darling, for a metallic square. The blade is tempered at the edges to prevent wear, and soft in the middle to prevent springing, and so united to the beam by soldering that there is no danger of its changing its position; a valuable invention by which a very durable and accurate instrument is produced. Formerly the tongue of the square was warped by being tempered throughout its whole extent, and had to be straightened before being fit for use, and the blade, being secured to the beam by rivets, was constantly liable to be untrue or to be displaced through the wear of the rivets.

To Lauriston Towne, for machine for making ornamental chains. The links are cut from a strip of sheet metal, and then transferred to the bending and clinching mechanism, which locks them together, and thus builds up the chain. Prior to this invention, chains of this character were all made by hand, at an average price of fifty cents per foot, but on this machine they are manufactured for three cents per foot. The exclusive use of this machine in this country is controlled by Sackett, Davis & Co., of Providence, R. I., and since the patent was granted, they have made nearly 2,000,000 feet of chain, causing a saving to the public, on the above ratio of three to fifty, of about $839,000. Four machines are leased to parties in Hanau, Germany. So valuable a machine is necessarily exposed to infringements, and, in this case, no less than ten different parties have pirated the invention and worked it secretly, until discovered and compelled by the Courts to cease the manufacture.

To A. B. Lotta, for a steam generator. This is the third extension granted to the applicant for devices connected with tubular coil boilers, which are specially useful in steam fire engines, where steam is required on short notice. The patent just extended was for a combination of a force pump receiving water from the jacket, and returning it to the coil, and a strainer box through which the surplus water, discharged from the coil, passes on its way to the jacket. In ordinary boilers, the salts, formed by heat and evaporation, settle at the bottom, and are blown off; but in case of rapid circulation, as in the tubular boilers, this becomes impracticable, hence the need and advantage of Lotta's strainer box. Mr. E. G. Maguire, who was chief engineer of the fire department of Cincinnati for many years, estimates that each of Lotta's patents is worth not less than $20,000 to that city city alone. The application in the above case is made by Finley Lotta, administrator of A. B. Lotta, deceased.

John Butler, for a gas generator. The gas is for lighting purposes, and is produced from resin. The invention consists in covering the bottom of the retort with a fusible metal, such as lead, which, becoming fluid, prevents a crust from forming on the bottom of the retort, and effecting a saving of fifty per cent. An ingenious and valuable invention. The rebellion having cut off the supply of resin, applicant has failed to reap a reasonable reward during the term of his patent.

William Plumer, for a rock drilling and cutting machine. It consists of an arrangement of devices, for cutting out pillars and blocks of stone, circular pillars of any diameter, and blocks either square, rectangular, or irregular shaped, the cutter working on all sides of the piece. A valuable invention, and some of its features have been incorporated in nearly all of the later stone cutting machines, but, by reason of sickness and service in the late war, applicant has failed to cover even the expenses of his invention.

To E. B. Bigelow, for wire weaving looms. Owing to the inflexibility of wire, the ordinary fly shuttle is too uncertain and weak in its action for this class of weaving, and is not adapted to straighten the wire as it comes from the reel or bobbin; and, prior to this invention, wire cloth was made by hand. Mr. Bigelow's shuttle is moved positively throughout its whole passage, and is provided with a wire straightener. The drag required to straighten the wire would draw in the selvedge wires, and contract the cloth, but this is guarded against by an ingenious mechanism. Pointed upright bars are moved horizontally towards and from the selvedge, also vertically up and down, by which they are alternately thrust between the filling wire and the selvedge, so that the filling wire passes around them, and draws on them instead of on the selvedge. The loom is also provided with a peculiar stop motion and also a double beat up of the lay. The Clinton Wire Cloth Company was organized to develop this invention, and has produced 11,444,059 square feet of cloth at an average cost of from three and a half to four cents per square foot less than hand made goods, making a saving to the public of $400,652·05 A portion, however, of this saving should be credited to other inventions used in the manufacture.

The application of George W. Hildreth, of Lockport, N. Y., for an extension of his patent for a gang plow, has been refused. This patent was reissued last December. The leading features of the invention are these: crank supports, for adjusting the hight of the frame from the ground; supporting wheels, so adjusted as to run upon different planes, one to run in the furrow and the others upon the sod; the axle made adjustable laterally; in brief, the axle has a triple motion, upward, downward, and lateral, and it also vibrates on the center bolt. This plow is well known on the Pacific coast, and has been manufactured by Baker & Hamilton, of San Francisco. It is claimed that it will plow from two to four acres a day more than a common plow. The applicant appears to have been unfortunate in reaping no profits from his invention. He says: "I am getting towards three score years and ten, and have had a hard up-hill business for years; and this gang plow business has contributed largely to my misfortunes." The extension was strongly opposed, and remonstrants claim that applicant has not used due diligence in introducing his alleged invention into general use, and that in his reissue he claims more than is his invention. A suit for infringement of this patent has lately been brought against Treadwell & Co., the damages being fixed at $50,000.

It will be noticed that the Patent Office is disposed to be liberal towards all applicants for extension, and that in most cases of real merit, extensions are allowed without any close scrutiny of the profits that may have already accrued. Even the present limit of a patent to seventeen years is considered by many as too short, and it is not impossible that Congress will either extend this period, or allow the Office to grant extensions to patents issued since March 2, 1861. In a late issue of your paper, I see that ex-Commissioner Charles Mason expresses the opinion that Congress, by special act, will extend many of the seventeen year patents, and that twenty-one years is not too long a period for their general continuance.

Among the recent visitors at the Patent Office (and no bureau or department is more inviting to strangers) we find the names of Mr. William and Mr. Alfred Carpmael, the sons of the distinguished patent lawyer of England, Hon. William Carpmael, the author of a standard collection of law reports of English patent cases. These gentlemen have made a thorough examination of our patent system, and of much of the office routine, and they have expressed themselves highly pleased. In England, at present, the subject of patents is undergoing considerable discussion in view of proposed changes, some favoring an entire abolition of this form of government protection, while others favor the adoption of the American law and our general official management.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN CHEMIST—Edited by Professors C. F. & W. H. Chandler of Columbia College, 49th street, corner 4th avenue, New York—to whom subscriptions should be sent—now rivals in interest and value the London *Chemical News*. Each number contains a large amount of information that no progressive chemist can afford to be without. The Professors Chandler are editing this journal with singular ability and judgment, and it has taken its place in the front rank of contemporaneous scientific publications.

THE ATLANTIC MONTHLY FOR NOVEMBER comes to hand richly freighted. The number is one of the best issued by its publishers, James R. Osgood & Co., Boston, during the present year. The article "Bedlams of Stamboul" is alone worth the price of the number. The leading article, "Tennyson and Theocritus," in which the styles of the ancient poet and the English Poet Laureate are compared, will be of great interest to students of *belles lettres*. The usual lighter literature and reviews are provided.

THE COMMERCIAL LAWS OF THE UNITED STATES. A Summary of the Laws relating to Arrest—Assignments—Attachments—Collections—Commercial Paper—Corporations—Depositions—Dower—Deeds—Damages on Bills—Execution—Exemption—Factors and Consignees—False Pretences—Homesteads—Imprisonment for Debt—Interest—Usury—Liens—Statutes of Limitation—Receivers—Redemption—Stay Laws—Partnership—The Rights of Married Women, etc. New York: Published at the Office of the "Banker's Magazine and Statistical Register," 23 Murray street. Sold by Baker, Voorhis & Co. Price, Three Dollars.

The exhaustive summary of contents of this book, embraced in the above title, relieves us from the necessity of characterizing its contents, except by way of commendation, of which it is highly worthy. It would be worth many times its price, annually, in the counting room of almost any business house in the country.

EXPERIMENTAL MECHANICS. A Course of Lectures, delivered at the Royal College of Science for Ireland, by Robert Stawell Bell, A.M., Professor of Applied Mathematics and Mechanism in the Royal College of Science for Ireland (Science and Art Department). With Illustrations. London, and 38 Bleecker Street, New York: Macmillan & Co.

This is a magnificently printed, illustrated, and bound octavo volume comprising twenty lectures (some of them revised and rewritten), delivered at the above named institution of learning, to artisans and others unable to attend the ordinary classes. As specimen lectures in which science is popularized, they are models. While, of course, they do not take the place of a full treatise on mechanical science, they form an outline easily comprehended by ordinary readers, and really embracing the fundamental principles of the subject. If a mechanic has once mastered these, there is little danger of his being led astray into absurdities in his practice. The style of these lectures is such as to at once attract and sustain the attention of the reader, and no father could make a more valuable investment for the price (six dollars) than to place the volume in his family library.

A TREATISE ON THE RESISTANCE OF MATERIALS, AND AN APPENDIX ON THE PRESERVATION OF TIMBER. By De Volson Wood, Professor of Civil Engineering in the University of Michigan. New York: John Wiley & Son, 15 Astor Place.

This is a thorough investigation of the resistance and strength of materials in the various forms and under the different circumstances in which they are applied in civil and mechanical engineering. It has been prepared by an author of distinguished ability in his field of labor, and is rich in tables and formulæ for reference. In this place it would be impossible to give any thing like a suitable review of the work. and we shall therefore supplement this notice by some extracts which will give our readers a taste of its quality. The volume is a handsome octavo of over 200 pages, with an appendix, but, we regret to say, while giving a full table of contents, is devoid of an index. This, while it matters little in a work used solely as a text book, limits the usefulness of the treatise as a work of reference.

ANCESTRAL TABLETS. A Collection of Diagrams for Pedigrees, so arranged that Eight Generations of the Ancestors of any person may be recorded in a connected and simple form. By William H. Whitmore, A.M., Member of the New England Historic-Genealogical Society. Second Edition. Boston: William Parsons Lunt, 102 Washington Street.

This is, undoubtedly, the most complete, direct, and easily understood system of genealogical diagrams ever divised. Those who are interested in tracing back their ancestry, or in the recording of pedigrees, will find it very useful. We cannot spare space to describe the ingenious method adopted but recommend our readers to examine the system for themselves.

CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS. Published by Henry Carey Baird, Industrial Publisher, 406 Walnut St., Philadelphia. Sent free on application.

This enterprising publisher is constantly extending his catalogue, which now embraces works on almost every known industrial subject. The mechanic.engineer, chemist, farmer, and teacher, may each find, in its enumeration, works which constitute the most valuable aids to each avocation. Full descriptive tables of contents of the works are given, so that there is no difficulty in selecting the precise work needed. It is worth the trouble to send for this catalogue, if only to see what an amount of talent has been enlisted by Mr. Baird to supply industrial information to the workers of the United States.

SCRIBNER'S MONTHLY FOR NOVEMBER is a beautiful number, finely illustrated, and containing much useful as well as entertaining reading. This deservedly popular monthly is achieving, we are glad to learn, a brilliant success, and it has undoubtedly a brilliant future in American literature. The Hell Gate improvements form the subject of a very instructive and interesting article, profusely illustrated, which appears, to our mechanical mind the gem of the number.

Business and Personal.

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

Examples for the Ladies.

Mr. James Stewart, of Yonkers, N.Y., reports that a Wheeler & Wilson Machine, No. 38, under his charge, has been hat-binding by steam for nearly 17 years, and will now do as much work as any machine, new or old, of any make. From September, 1868, to 1869, it bound 137,088 hats, and the operator earned $654.17. The previous year she earned $507.48.

Answers to Correspondents.

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

ALL reference to back numbers must be by volume and page.

PROPORTIONS OF TELESCOPE.—Let E. T. N. query No. 15, Sept. 30,) procure for the object lens, one of about ½ an inch focal distance, another for the amplifying lens, 2¼ inches focal length and 1¼ inch diameter, and a third glass, 1 inch focal distance, to be placed next the eye. The distances at which these glasses should be placed from each other are as follows: The object glass should be placed at the end of a small tube, next the object, and the aperture or hole that lets in the light should not exceed one tenth of an inch in diameter. At a distance of about 7 inches from this glass, the amplifying should be placed; and the glass next the eye should be placed about 1¼ inch from the amplifying lens; such a microscope, reckoning the combined eye glasses to magnify 6 times, and the object glass 14 times, will produce a magnifying power of 84 times in linear dimensions, and in surface 7,056 times. The stage and its supports may be made of wood, and the tubes of paper or very thin pasteboard.—J. R. B., of Md.

PASTING GLAZED PAPER.—In answer to query No. 5, Oct. 21, if F. S. will mix a little honey in the paste, his object will be accomplished. W. R. J., of Pa.

CLEANSING THE HAIR.—Query No. 14, Oct. 21.—Barbers use carbonate of potash, known as salts of tartar, in water, to shampoo with. It is better to use a tablespoonful or two of common spirits of hartshorn, in a basin of water; then thoroughly wash the scalp and hair until they are clean; then wash with clean water, wipe dry, and apply a little oil or pomade.—W. R. J., of Pa.

FRENCH POLISH.—Let W. B. W. take one ounce of shellac, a quarter of an ounce of gum arabic, and a quarter of an ounce of gum copal; bruise them well, and sift through a piece of muslin; then put them, along with a pint of spirits of wine, into a closely corked vessel; place it in a very warm situation, and shake frequently every day till the gums are dissolved. Then strain through muslin, and keep well corked for use.—D.D., of Ohio.

DIMENSIONS OF CYLINDER.—W. G. N., query 20, Oct. 21, should multiply 231 (the number of cubic inches in a gallon) by the number of gallons, and divide the product by the hight in inches. This gives the area of the cylinder. To find the diameter, divide the area by ·7854, and extract the square root of the quotient. In reply to his second query: Find the area of cylinder by squaring the diameter, and multiplying by ·7854, by which divide the number of cubic inches in the number of gallons, and the quotient will be the hight in inches. To his third question: Divide the area by ·7854, and extract the square root of the quotient. If the answer is in feet and decimal parts of a foot, multiply by twelve for the inches. If the answer is in inches, divide by 12 for feet.—A.B.P., of N.J.

CLEANING POLISHED BRASS.—If G. W. K. will get some tripoli, such as comes in lumps: powder it up fine, and use with oil and a cloth or chamois skin, and then use some more of the powder dry, with another piece of chamois skin, he will be able to make his brasses shine. If the brass be very badly tarnished, he had better use a solution of oxalic acid first, and immediately wash clean with water; then use the tripoli, with water or oil, whichever is the most convenient. The oxalic acid will immediately remove all stain and discoloration, and the tripoli will polish the brass. Most of the lacquers have shellac for a base, consequently heat would ruin them, although there is a kind that will stand heat, that does not contain shellac, but I have forgotten how it is made.—J. F., of Ga.

STEAM HEATING PIPES.—To R. G.—I have been using a heater for three years, and never met with the trouble you speak of. I carry low pressure (two pounds); if you have greater pressure, I would advise you to place a stop cock in your return pipe; then when you shut off the steam with one cock, you can shut off the return with the other cock.—J. A., of Md.

CLEANING POLISHED BRASS.—In answer to G. N. K., query 17, Oct. 14, I will say that I have found lime juice the best thing for cleaning polished brass. Rub the brass with cotton waste, dipped in lime juice, and polish or finish with whiting. This cleans the blackest brass or copper, with scarcely any labor. G. N. R. can try this, and is welcome to the recipe.—I. G. B., of S. A.

CLEANING BRASS.—If G. N. K. will take equal quantities of good vinegar and fine salt, he can clean his brass work easily; but this mixture will not polish it.—S. R. G., of N. J.

Queries.

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

1.—ALUMINUM FROM CLAY.—I wish to know how aluminum is obtained from clay. Will some one let me know the process of manufacturing it, and how much can be obtained from a tun of clay?—J. L. R.

2.—FIREPROOF PAPER.—Can newspapers, intended to be used in walls to protect against cold, be cheaply rendered fireproof?—C. G. A.

3.—FIREPROOF CLOTH.—Can common cotton cloth be made fireproof by any substance that will withstand rain? A double tent of common sheeting, like two tents, one outside the other, is an excellent shelter for a party traveling in cold weather, even when snow is on the ground and ice in the rivers. It is very light, yet keeps out cold, wind, and rain better than duck, besides being cheaper. The sole disadvantage is its liability to catch fire from sparks from the camp fire. Such a misfortune has recently befallen me, and to have one's house thus burned over his head on a frosty night is no joke.—C. G. A.

4.—SPONGY PLATINUM.—How can I make the platinum sponge for Doebereiner's process? And is it possible to restore platinum sponge which has lost its catalytic property?—T. M.

5.—TRANSPARENT CEMENT.—In your last issue I read: "It is a shameful thing to be weary of inquiry, when what we search for is excellent." I have been experimenting lately in making a transparent cement. I have been very successful; only one difficulty is in the way. Will you tell me how I can prevent white sugar from turning into white powder again after it has been melted in water? I want it to dry clear, and prevent it from again becoming granulous, when mixed with gums and other protean bodies.—C. E. E.

6.—SOLUBLE GLASS.—On page 105, Vol. XXV., SCIENTIFIC AMERICAN, I read Professor Bottger's method of preparing cement by mixing different materials with soluble glass. I have tried to obtain soluble glass in San Francisco, but cannot get it. I am told silicate of soda is the same material, and have bought a small quantity to try. It is a hard, dry, jelly-like, colored substance; and, if made irregular on the face, it in course of time fills up and becomes level and smooth on the surface. I have dissolved it in hot water and used the liquid, but it has no more effect than water upon any substance with which it is mixed. When dissolved in water it is just as thin as water. I understand soluble glass should be of the consistency of sirup. It would be an advantage to have it of that thickness, as it would make the material with which it is mixed adhere better. Any information will be thankfully received.—W. J.

W. J., for a reply to his other query, can consult our advertising columns.

7.—ENAMEL FOR IRON.—I am experimenting, trying to make a hard, white enamel for iron, similar to the black plate used for ambrotypes. I shall be glad to have any suggestions as to articles or books from which knowledge on the subject can be obtained. The enamel should not only be hard, but insoluble in ether and alcohol when dry. I have succeeded with a plate made with varnish compounded with zinc white, but it is not sufficiently hard. The black plate is simply or principally asphaltum varnish. It becomes very hard, and still remains pliable. I want a substance soluble in turpentine.—J. S. Y.

8.—PORCELAIN LINED VESSELS.—Can tin vessels be lined with porcelain? What are the processes of fusing porcelain upon tin, and is the art patented?—C. L. S.

9.—DESTRUCTION OF TREES.—Will A. K., of N. Y., page 186, current volume, please tell me how to prepare the concentrated solution of sulphate of iron for killing trees?—J. B. S.

10.—SCALE IN BOILERS.—I wish to know how to prevent the carbonate of lime from forming scale in my boiler.—E. L. F.

11.—INDIA RUBBER BELT UNDER WATER.—Can a gum belt be successfully used in working under water? And, if so, can any and what preparation be applied to preserve the belt?—O. J. H.

Declined.

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

BOILER EXPLOSIONS.—P.
MATHEMATICAL NOTATIONS.—B. J. B.
MOTION.—G. W. H.
PHOSPHORESCENCE OF THE SEA.—A. P.
PROCURING RAIN.—H. J. S.
ANSWERS TO CORRESPONDENTS.—G. K.—J. P.—R. P. S.
QUERIES.—A. P.—C. C. & Co.—C. T. H.—J. B. B.—J. C. W—T. I. M.

Recent American and Foreign Patents.

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

PIANOFORTE.—Azariah H. Hastings, of New York city.—These improvements, in the construction of the plates and tuning mechanism of upright and other pianofortes, consist in a new manner of forming the upper or back edge of the metal plate, and in a new construction of and fastening for the travelers that hold the upper or back ends of the strings. The metal plate of a pianoforte has in its upper edge oblique grooves. Through these grooves are fitted the screws for holding the ends of the piano strings. The screws for the strings of each key are arranged in one groove, so that there are two or three screws in every groove. By the oblique direction of the grooves, the screws, though collected for the several notes, are, nevertheless, alternated transversely, to provide more room for the keys to work in and permit the use of larger screws. Each screw fits with its lower end into a nut or traveler, which is a prismatic rod, with a neck near, and a head at, the lower end. A funnel shaped cavity is formed in the lower end of the traveler, and an oblique slot cut through one side of the rod to meet such cavity. This slot forms a hook-bearing for the string. The upper end of the string is fitted through an aperture of the traveler, then wound around the neck, and finally put through the slot into the aforesaid cavity of the traveler. In this manner it is securely held, and will be in line with the adjusting or tuning screw, so as to be pulled straight and not twisted. The two or more layers of travelers are placed under flat guide straps, which prevent them from turning and hold them steady on the plate. These guide straps are preferably made of wood. The invention is, in every respect, as applicable to horizontal as to upright pianos.

ELEVATOR BRAKE.—Theodore Thorn, of St. Clair, Pa.—This is an improvement in a safety brake for elevators or platforms used for raising coal or other articles from mines or perpendicularly. It consists in a beveled cage or platform frame and in wedge shape brake blocks and jointed brake bars operating in vertical rabbeted timbers, in such a way that, should the hoisting chain or rope break, the loaded cage would instantly wedge, between the brake blocks, bars acting as knuckle joints to force the brake blocks with their ragged faces against the guide timbers. In use there would be more or less play between the timbers and the brake blocks and between the brake blocks and the cage; but, in case of a break, the cage would act instantly upon knuckle joints and be arrested.

PAN SCRAPER.—Gottlieb Scherer, of South Boston, Mass.—This invention has for its object to furnish an improved pan scraper or metallic dishcloth for scraping and cleaning pans, kettles, etc. It is formed of iron rings interlocked with each other to form a network or cloth. At one end of the scraper is formed one or more loops, also made of iron rings, for convenience in hanging up the scraper when not in use. When it is desired to make a heavier scraper, one half of the rings may be made double—that is to say, formed of two coils of wire. The scraper thus constructed is rubbed over the surface of a pan in the same manner as an ordinary dishcloth, and does its work quickly and thoroughly, leaving the surface clean and smooth.

CULTIVATOR.—John S. Nolen, of Paulsborough, N. J.—This invention relates to an improved implement or machine for agricultural purposes, particularly designed for the use of gardeners. It is so constructed in its several parts as to adapt it to be used at a harrow or mere pulverizer of the soil, and also as a cultivator, which shall lift the vines and throw the earth around the roots or stocks of the plants. Oblong and eight sided shovels, adapted to be reversed or changed in position so as to adapt the implement for use as a harrow or cultivator, are employed, both the form of the shovels and the method of constructing the machine being covered by the patent.

FLOUR BOLT.—Thomas G. Morgan, Murfreesborough, Tenn.—The ribs of the reel have cam rims attached midway between the arms. The roller knockers are arranged to fall upon the cams and impart to them a slight downward motion, by springing the ribs so that their recoil will detach the meal from the cloth and the ribs in the most effectual manner. The roller knockers are mounted in the ends of levers pivoted to the frame, and having adjustable weights to vary the force of the blows. By pins provided in the ribs for securing the cloth, tacking is avoided, except on the rib where the two edges of the cloth meet. Nuts on the arms enable the ribs to be adjusted out or in, radially for regulating the tension on the cloth. Clamping strips are placed on the ribs above the cloth to confine it, said ribs being held by nuts screwing down on the arms and having holes for the pins. The ribs are made oval on the inside to facilitate the rolling of the meal down the cloth, which, being kept free by this arrangement of the knockers, will bolt it properly without specking as much as when the meal is carried up by the ribs and let fall, and the cloth will not be worn as much a when so let fall.

DERRICK.—William M. Howland and George L. Howland, of Topsham, Me.—This invention relates to improvements in derricks, and consists in a combination, with a chain wheel which engages the links of the chain so as to draw it without winding around said wheel, of a chain keeper or guide adapted to prevent the chain from twisting at the under side of the chain when returning to the wheel in letting down the chain after being raised up. The invention also consists in novel arrangements of apparatus for connecting the shores or braces of the derrick to flat railroad cars. It also consists in a novel arrangement of reversing gear for letting out the chain after raising a load, and also in a novel arrangement of a pair of shore braces and a connecting bar, whereby they are connected together and to the derrick, and may be disconnected and folded together for transportation.

CASTERS FOR SEWING MACHINES.—Warren D. Hatch, of Antrim, N. H., assignor to himself, Shepard Russell, of Boston, and Henry O. Goodrich, of Worcester, Mass.—This invention has for its object to furnish an improved caster attachment for sewing machine tables, dentists' chairs, etc., which shall be so constructed and arranged that the weight of the table, chair, or other article, may be thrown upon the casters or upon the feet of the article, according as it is desired to move the article or have it stand immovable; and it consists in long and short adjusting levers of the casters by means of a toggle lever hinged to the upper part of the frame.

HORSE HOLDER FOR SLEIGH.—Henry A. Sprague, of Charlotte, Me.—This invention has for its object to furnish a simple and convenient device for attachment to a sleigh runner, which shall be so constructed that, should the horse start, the sleigh will move forward while the holder remains stationary, thus tightening the reins and stopping the horse. In using the device, it is placed upon the upper end or bend of the runner. The reins are then placed upon an arm or hook, and the device is allowed to slide down said bend. When the horse attempts to start, a calk is drawn beneath the runner, and forced into the snow or ice and held stationary while allowing the runner to move forward or backward through it freely, so that when the sleigh is drawn forward it tightens the reins, and slackens them when the sleigh is backed.

CARRIAGE SPRING ATTACHMENT.—Orrin E. Bennett, of Cannonsville, N. Y.—A short bar is secured to the cross springs with clips. To this bar, about midway between its ends and center, are riveted or otherwise securely attached two eyebolts, the eyes of which are interlocked with the eyes of two other eyebolts, which, in the case of the back spring, are passed through and secured to the spring bar. The eyebolts in the case of the front spring are secured to the head block or platform. The device thus forms a hinged connection between the cross springs and the parts of the carriage body with which they are connected, so that the side springs may be straightened out by the pressure of the load without twisting or breaking the springs or their fastenings.

STEAM BOILER.—E. H. Rümmele, of Glenbeulah, Wis.—This invention consists in an improvement on steam boilers, in the use of which, it is claimed, the heat is well utilized, even that of the cinders that fall through the grate being made available for the production of steam. The boiler can be easily cleaned, and is not liable to get out of order, and is not liable to accidents on account of clogged passages.

HORSE POWER.—James W. Knox, of Winona, Miss.—This invention relates to improvements in horse powers; and it consists in a simple and economical arrangement of the sweep or hitching bars for connecting, so as to apply the power directly to the rim of an overhead power wheel. It is well known that something is gained in power, and that the shaft and arms of the wheel are relieved of considerable strain, by attaching the sweep or drawbar directly to the rim of the wheel, which has been heretofore done; but, as a better, more simple, and economical means of so connecting to the rim than any heretofore employed, this inventor proposes to form the sweep of branching descending metallic arms, the hooked end having a brace, connected to one of the arms near the crotch and extending upward and toward the center of the wheel to one of its arms, while the branches are connected to the rim, one in advance, and the other behind the vertical plane of the hook. Each branch of the sweep, thus composed of these arms, is bolted to the wheel by a single bolt tapped into it. This is claimed to be a much stronger and more durable sweep for this kind of connection than any now in use, while the arrangement is such that it can be very economically constructed.

PIANO STOOL.—Charles A. Schindler, of West Hoboken, N. J.—This invention has for its object to improve the construction of piano stools, to make them stronger and more durable, and at the same time improve their appearance. The top of the stool has attached the upper ends of three or more legs; to its center is attached the upper end of the pedestal. The seat of the stool has attached, to the center of the lower side, a screw, which passes through the center of the top and into the pedestal, which is made hollow to receive it. A metallic band is fitted upon the lower end of the pedestal, and is secured in place by a screw or spike, made with an ornamental head, and screwed or driven into the lower end of the pedestal. Upon this band are cast three or more brace arms, as many as there are legs, which are made of such a length as to reach the legs, to which their outer ends are secured by screws. The brace arms are designed to be made with the same style of ornamentation as the other parts of the stool, and strengthen the legs, making the stool more firm and substantial while greatly improving its appearance.

HORSE HAY FORK.—John C. Lampman, of Baltimore, Md.—This invention has for its object to furnish an improved horse hay fork, strong, durable, simple in construction, and effective in operation, and which shall be so constructed that it may be conveniently repaired, should any of its parts be accidentally broken. The rear end of the central tine is bent and extended upward to serve as the shank or standard of the fork. The side tines have their rear ends bent inward, and are welded or otherwise securely attached to the central tine at or near its bend, the connection being further strengthened by the band that forms the eye, to which the hoisting rope is attached. Upon the upper end of the shank is formed a notch or shoulder, to receive a loop or link attached to the hoisting rope. The trip lever is pivoted to the upper end of the standard, and is curved to serve as a cam to push the link out of the notch, to discharge the load from the fork. The trip rope passes over a guide pulley, pivoted to the shank or standard, so that it may always act in the proper direction upon the trip lever, whatever may be the position from which it is operated.

PRESS FOR STAMPING PANS, DISHES, ETC.—John B. Jones, of Williamsburgh, N. Y.—The die is operated by suitable mechanism, and connected with a piston, working within a reciprocating frame, whose lower face constitutes the pressure plate for holding the sheet metal down upon the counter die. The counter die consists of an outer and an inner portion. The outer portion of the counter die is securely affixed to the frame, and is of annular or other form of about half the depth of the pan or dish to be shaped. The inner portion of the counter die is as large in diameter as the opening in the stationary part of the counter die, and is fitted through the same. A piston, fitting a cylindrical chamber, is affixed to the bottom of the counter die, and is sustained by water or other liquid material, or mechanism. Liquid, when used, is let into the chamber by a pipe, from a reservoir. When the central part of the counter die is lowered, its slanting sides meet those of the outer portion to form a continuation of the same. The die, in descending, bends the metal at once over the edge of the stationary part of the counter die and over the edge of the movable part, as at the beginning of each operation the counter die is elevated so that its upper edge is about in line with the top of the outer part of the counter die. The margin of the plate is kept from crimping by a reciprocating pressure plate. The die gradually descends, and at the same time the inner part of the counter die descends with about half the velocity of the upper movable die. The bottom and upper portion of the pan are thus formed at the same time. The metal is first bent over the edge of the inner part of the counter die, and as the latter gradually descends the lower part of the pan is formed. The metal is subsequently bent over the edge or corner of the outer part of the counter die, and this gradually and not suddenly drawn into the required shape. The movable part of the counter die is elevated by means of a lever, which is actuated by suitable connection with the operating mechanism. The lowering of the inner part of the counter die is regulated by the displacement of the water, controlled by suitable mechanism.

BALANCED SLIDE VALVE.—John Rigby and Joseph Holt, Marquette, Mich.—This invention relates to improvements in the method of balancing slide valves for steam engines. It consists in connecting the valve with a slide which is given an uniform and simultaneous sliding motion with the valve, the steam being admitted between them; and it consists also in a device for raising the valve and slide from their seats, when the engine is not in motion, by the fall of a weighted lever, sustained when the engine is in motion by the pressure of steam on the piston in a small cylinder within the steam chest.

ROTARY ENGINE.—John Stott, Burlington, Iowa.—This is a combination of a piston, toothed ring, hub, and pinion, also a steam gate swinging on its center within a steam chest, in combination with a weighted arm, thereby dividing the pressure of steam and lessening the friction on the piston. The invention is of a nature, not easily explained in a mere verbal description, by which an engine may be caused either to rotate or reciprocate. The device is ingenious, and forms an important attempt at advance in this department of engineering.

HELICAL WIRE BRUSH.—Francis F. Field, Stapleton, N. Y.—This is an improved wire brush for cleaning boiler flues and other uses, the contiguous wires being arranged at right angles with each other at their centers. A tube receives the ends of the binding wires at the base of the brush, and has a screw thread cut upon its outer end for the attachment of the rod by which it is operated. Four binding wires are used, the ends of which are secured in the tube. The brush wires are arranged between the four binding wires (at right angles with each other at their centers), so that each brush wire may project to an equal distance upon the opposite sides of the binding wires, a side view of the brush thus showing a spiral row of brush wires between each coil of the binding wires. If desired, the brush wires may be made small or thin, and two of them used together, the pairs being arranged alternately at right angles with each other, as described. When the brush wires have been arranged, the binding wires are coiled, and their ends secured in the ordinary manner.

CHANDELIER CENTER.—Joseph Kintz, West Meriden, Conn., assignor to himself and P. J. Clark, of same place.—This invention consists in having the chandelier arms connected to the center piece by a shank or tenon, going through the rim or wall of said center piece and receiving a nut, key, or other fastening, the shoulders of said arms having projections fitting in sockets in the outer face of the wall or rim, to prevent turning. The inventor is thus enabled to use the most simple mode of connecting the arms, and by it to hold them securely against turning, which has heretofore prevented the use of such connections.

CHANDELIER CENTER.—John Meah, Meriden, Conn., assignor to Meriden Malleable Iron Company, of same place.—This invention consists in having a vertical socket for each arm of a chandelier on the inner side of the cylindrical part of the center piece, from which the arms radiate, and a pintle on the part of the arm extending to the inside of said ring fitting in the socket, in which it is locked by the cap of the center piece. The ring is of cast metal, forming the cylindrical part of the center piece, with deep notches in its upper edge for the arms to extend into the interior. Vertical sockets are formed on the inside of this ring, one under each notch, and each arm is provided with a pintle on the under side to fit into the socket for it, as shown, for holding the arms with greater security than they can be held by any arrangement now in use.

SAP BUCKET COVER.—A cover for sap buckets is formed of a square piece of board or metal, with one edge rounded out, forming the arc of a circle to nearly correspond with the diameter of the tree. On the other three edges of the cover there is a flange projecting down three inches (more or less), so as to completely cover the top of the bucket and exclude leaves, snow, rain, and all foreign substances. On top of the cover, near the circle, are two screw eyes, which engage with the hooks driven into the tree for supporting that edge of the cover. On the opposite edge is another screw eye, to which a cord is attached, which is tied with a hook in the tree to support the cover in an inclined position. Without some kind of protection, sap buckets are liable to receive whatever may be flying in the atmosphere or drop from the trees, and the sap is thereby frequently rendered nearly useless. With this improved cover the bucket is perfectly protected, and the sap caught therein is preserved pure and fit for use, without reference to the state of the weather, or what may be falling or flying in the air.

FLANGED COLLAR FOR BROOM.—Henry A. Lee, New York city.—This invention pertains to an improvement in metal caps for covering the butts of the corn attached to the broom handle by wire in the ordinary manner; and it consists mainly in forming the cap with corrugations, which enable it to compress or bind the corn somewhat, but to perform the more important functions of holding the lower wire in place.

WATER RAM.—Christopher Hodgkins, Marlborough, N. H.—This invention has for its object to increase the efficiency of hydraulic rams by making them continuous in operation; and consists chiefly in the application to one ram of two force or conducting pipes whose force valves are connected so that the closing of one will cause the opening of the other, and *vice versa*. The invention also consists in a new form of force valves, and manner of applying and making them adjustable. This ram will always start itself whenever water is let on, owing to the absolute obedience of the valves to pressure, which requires less accumulated force for closing said valves than the lowering appliances hitherto necessary. Another advantage claimed is that it cannot be stopped by dirt, since one side will close and wash the dirt out from the other side; and that a change of temperature will not affect it, while ordinary valves must have their weight changed in cold and warm weather.

ENDLESS TRAVELING SIDEWALK.—Alfred Speer, Passaic, N. J.—Mr. Alfred Speer, of Passaic, N. J., has invented an endless traveling sidewalk, as described below: A permanent walk is suspended from the buildings bordering the streets in any suitable way, in which it is proposed to run the endless traveling walk of platform cars, connected together and mounted on rails elevated on posts in any suitable way, so that the top of the platform will be level with the walk. These cars are to be propelled at a suitable rate of speed continuously by stationary engines, or any other means. Awnings are employed to shelter the passengers. To facilitate the getting on and off, small cars will be mounted with the wheels of one side on a rail on the permanent way, and those of the other side on a rail on the movable walk, and each set provided with an independent brake, so that a person, on the stationary walk and wishing to get on the movable one, taking the brake handle for the wheels running on the rail on the stationary walk and forcing the brake down on the wheels, can readily stop the car, as the wheels upon the movable track will simply turn on their axles without moving the car forward. He may then step on the foot board of the car, and, releasing the brake he first set in action and setting the other in action with the wheels on the movable platform, will cause the car to move with the platform, after which he may get off the car, release the last mentioned brakes, and leave the car to the next person wishing to get on or off. For the latter operation the car will be caused, by the brake of the wheels on the traveling walk, to move with the platform until the passenger gets on the foot board. Then it will be stopped as at first, and he will step off upon the permanent way. Any suitable number of these transferring cars will be arranged along the whole route, so as to be at all times at the service of passengers. Many persons may get on and off at the same time, according to the capacity of the transfer cars. These cars may have seats above the foot boards, for persons who are aged or infirm to rest on while they are stopping or starting.

BOTTLE OPENER.—Charles B. Trimble, New York city.—This invention consists in a metallic stirrup or casting attached to the counter, or placed in any convenient position, so constructed that by a slight pressure the yoke is forced from the cork of the bottle, when the gas immediately forces the cork from the neck. When the bottle is filled, and the cork is driven into the neck, the yoke is turned up over it, which securely holds it against the pressure of the gas in the bottle. The pressure of the gas is frequently so great that the end of the yoke is embedded in the end of the cork, rendering it extremely difficult to remove it by simply pressing it with the end of the thumb and fingers. By grasping the bottle and pressing the bars formed on the yoke against lugs formed on the stirrup, the yoke is readily forced off the cork. When this is done, the nose of the bottle will pass between the lugs, and the cork will fly under the counter. By this simple device the cork is removed without straining the thumb or fingers. Much time is saved, and no one is annoyed by the flying cork.

LUBRICATOR.—Erick Ehlin, San Francisco, Cal.—From the oil reservoir descends a tube, which passes through the stopper and is placed in a hole in the cap of the journal box. There is a metallic plate or disk on the inner end of the tube, and also on the outside of the stopper, for keeping the latter in position, although they may be dispensed with. The inner end of the tube is a conical valve seat, fitted with a cone or valve, tapered so as to engage with the valve seat, and provided with a stem which extends down into the tube and upon the lower end of which there may be a screw thread. A spiral wire coil, of about the diameter of the interior of the tube, is attached to the stem, and extends below the lower end of the tube so as to rest upon the journal. The elasticity (laterally) of the spiral wire coil will hold it to the stem sufficiently tight in any position, whether the stem is provided with a screw thread or not. The cone or valve is adjusted by slipping the wire coil up or down on the stem, so as to allow a greater or less quantity of oil to descend through the tube and reach the journal. The jarring of the machinery will cause a slight but constant motion in the wire coil and cone or valve, which serves to feed down the oil uniformly on to the journal and prevent any clogging. The tube may be screwed into the box cap, or it may be connected in any other manner, so as to be supported (with the reservoir) in an upright position.

PROPULSION OF CANAL BOATS.—Owen Coogan, Pittsfield, Mass.—This invention relates to a new mechanism for propelling canal boats, river boats and wheeled vehicles; and consists chiefly in the employment of a propelling rope, which is stretched over the water course or road, and can be wound around a drum on the vehicle, so that the latter, when rotary motion is imparted to said drum, will be propelled by friction with the rope. The invention consists, also, in a means for suspending said rope above the vehicles so that the contact with the drum can be uninterruptedly sustained, and in improvements of the mechanism connected with the drum on the vehicle.

VALVE MOVEMENT.—This is an improved device for operating the valves of steam engines. The valves are operated by flexible metallic plates, or diaphragms, placed on the inside and at the ends of the steam chest connected with the valve stem, and operated by steam in a way that cannot be well described in this notice, the admission of steam to the diaphragms being controlled by an oscillating valve actuated by a crank, the crank being oscillated by a connecting rod from the piston rod. The invention has been patented by Frederick Glassen and William Gilfillan, of Paterson, N. J.

BALANCED SLIDE VALVE.—Charles B. Hutchinson, Concord, N. H.—We would be glad to give our readers an idea of the details of this unique invention. It is, however, of a nature that precludes a mere verbal explanation. The balancing devices may or may not reciprocate with the valve, and either cylinder and piston, or a spring, may be used to effect the balancing, the whole being intended to obviate certain defects in the operation of balanced slide valves, and to effect the desired balance in a superior manner.

STUDS OR BUTTONS.—The invention of William R. Dutemple, of Providence R. I., assignor to himself and J. M. Hopkins, of the same place, provides studs or buttons with a post having wings arranged thereon at right angles, one wing being capable of being turned half way round, when it stands superimposed on the other wing. In this way the wings are easily inserted into the button hole, and then the turned wing, being restored to its original position, engages with a stop that holds it from turning back again, thus holding the stud very securely.

SLEIGH.—Rice Webb, Star Prairie, Wis.—This is a combination of various parts now used in sleigh building into a new, light, tasteful and strong design for cutters or sleighs, one which, we judge, will be much cheaper than the present, while it will be more durable, the raves, runners, knees, and braces being made of wrought bar iron, bent into the required form. Either end of either of the runners is capable, through a peculiarity of construction, of rising to pass any unevenness in the road, while the other runs smoothly, thus making, it is claimed, the sleigh or cutter of much lighter draft than those having rigid runners.

DITCHING MACHINE.—This is the invention of Oscar F. Hale, of Irvington, Iowa. It is a combination of various strong and seemingly effective devices for the purpose specified, which is, to deposit the excavated dirt of open ditches in a ridge at a distance from the edge of the ditch, and place the sod upon the ditch side of the ridge between it and the ditch, to prevent the washing back of the excavated earth.

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120,146.—SCOOP.—N. S. Barnum, Bridgefield, Conn.
120,147.—ROLLER SKATE.—J. L. Boone, San Francisco, Cal.
120,148.—CHAIN LINK.—H. Boyd, East Bridgewater, Mass.
120,149.—BOLT CUTTER.—J. R. Brown, Cambridgeport, Mass.
120,150.—HUB.—J. Y. Burwell, Worthington, Pa.
120,151.—COAL GAS.—D. Davison, New York city.
120,152.—PAPER.—D. D. Foley, J. J. Johnson, Washington, D. C.
120,153.—ROOFING MACHINE.—C. L. Fowler, Baltimore, Md.
120,154.—MATTRESS.—H. Gardner, R. Lowe, J. & J. Wood, J. Pickering, Manchester, Eng.
120,155.—NAIL MACHINE.—L. Goddu, Boston, Mass.
120,156.—HOOK.—A. J. Goodrich, Wolcottville, Conn.
120,157.—SAW FRAME.—W. Hankin, Williamsburgh, N. Y.
120,158.—STEP LADDER.—W. Huey, Galena, Md.
120,159.—WHEELBARROW.—W. McKibbin, San Francisco, Cal.
120,160.—HAY FORK.—P. J. Moose, J. Kuhn, Dansville, N. Y.
120,161.—TURN TABLE, ETC.—W. K. Muir, Hamilton, Can.
120,162.—PUNCH.—R. J. Mullen, Providence, R. I.
120,163.—HAT VENTILATOR.—E. G. Nichols, Beaufort, S. C.
120,164.—BRUSH.—J. Pickering, Philadelphia, Pa.
120,165.—FURNACE.—W. Quann, Philadelphia, Pa.
120,166.—SOLDERING IRON.—J. C. Reynolds, Taunton, Mass.
120,167.—THRASHING MACHINE, ETC.—H. Ries, Norwalk, O.
120,168.—CURTAIN FIXTURE.—A. Roelofs, Philadelphia, Pa.
120,169.—STONE DRESSER.—T. Ross, Rutland, Vt.
120,170.—EDGING BOARDS.—J. K. Sanborn, Sandy Hill, N. Y.
120,171.—BURIAL CASKET.—J. Scott, Philadelphia, Pa.
120,172.—LAMP.—G. W. Thompson, New York city.
120,173.—RUFFLING DEVICE.—E. J. Toof, Fort Madison, Iowa.
120,174.—RENOVATOR.—J. Wellfare, F. Champagne, Aurora, Ill.
120,175.—WASHER. S. Williams, H. McNeill, Philadelphia, Pa.

120,176.—REST.—E. Withall, Rochester, N. Y.
120,177.—LOCK.—S. N. Brooks, Bernardston, Mass.
120,178.—FENCE.—P. C. Yost, Carthage, Ill.
120,179.—ORDNANCE.—H. Arden, Brooklyn, N. Y.
120,180.—LOCOMOTIVE.—W. D. Arnett, Denver City, Col.Ter.
129,181.—MILLSTONE PICK.—S. A. Bell, Newtown, Ohio.
120,182.—ROCK CUTTER.—M. C. Bullock, Rutland, Vt.
120,183.—ROTARY ENGINE.—W. Case, Troy, Ill.
120,184.—HEATER.—E. C. Clay, Malden, Mass.
120,185.—ELECTRIC CLOCK.—W. M. Davis, Cincinnati, Ohio.
120,186.—CLEARING OIL WELL.—J. Dickey, Oil City, Pa.
120,187.—BUCKLE.—E. F. Driggs, Brooklyn, N. Y.
120,188.—GRATE BAR.—A. W. Foster, Jr., Pittsburgh, Pa.
120,189.—HOD ELEVATOR.—E. H. Garrigues, St. Louis, Mo.
120,190.—NAIL MACHINE.—J. C. Gould, Oxford, N. J.
120,191.—LOTION.—J. Greene, Providence, R. I.
120,192.—FASTENING.—J. J. Greenough, Syracuse, N. Y.
120,193.—PAVEMENT.—W. J. Harris. Elizabeth, N. J.
120,194.—ALARM PUMP.—E. Haskell; Dover, N. H.
120,195.—HARROW.—E. W. Herendeen, Geneva, N. Y.
120,196.—PRIMER.—A. C. Hobbs, J. Orcutt, Bridgeport, Conn.
120,197.—TRAP.—T. W. Houchin, Morrisania, N. Y.
120,198.—BRAN DUSTER, ETC.—J. H. Jones, Yellow Springs, O.
120,199.—CAR COUPLING.—J. H. Kenworthey, West Point, Ind.
120,200.—TREADLE.—E. W. Keyes, Charlestown, C. K. Bradford, Boston, Mass.
120,201.—STEAM GAGE.—G. Lightbody, New York city.
120,202.—BRICK KILN.—T. Lindsley, New York city.
120,203.—PUNCHING MACHINE.—R. Livingston, Albany, N.Y.
120,204.—HARROW.—J. Mathison, Fremont, Neb.
120,205.—HARVESTER.—E. R. McCall, Simcoe, Canada.
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120,353.—VESSEL.—W. G. Warden, Philadelphia, Pa.
120,354.—SEEDER, ETC.—J. W. Webb, New Athens, Ohio.
120,355.—DISINFECTING.—H. M. Wells, New York city.
120,356.—HORSE COLLAR.—C. Wheeler, Warsaw, Ohio.
120,357.—ANIMAL POWER.—M. G. Wood, Church Corners, Mich.
120,358.—GRATE.—R. J. Wood, Hancock, Mich.
120,359.—MEAT CHOPPER.—N. T. Worthley Brunswick, Me.
120,360.—STEAM VALVE, ETC.—H. Wright, Warren, Ohio.

REISSUES.

4,604.—TUBE WELL.—S. L. Bignall, Chicago, Ill.—Patent No. 92,569, dated July 13, 1869.
4,605.—HOSE COUPLING.—J. C. Cooke, Bridgeport, Conn.—Patent No. 22,166, dated November 30, 1858; reissue No. 4,344, dated April 18, 1871.
4,606.—ALCOHOL.—J. H. Deacon, Lumberton, N. J.—Patent No. 86,284, dated January 26, 1869; reissue No. 3,837, dated February 15, 1870.
4,607.—VENTILATING, ETC.—T. Krausch, New York city.—Patent No. 108,707, dated October 25, 1870.
4,608.—CRUCIBLE.—A. Pickering, Boston, C. R. Vickery, C. R. Atwood, and the Phœnix Manufacturing Company, Taunton, Mass.—Patent No. 49,141, dated August 1, 1865.
4,609.—FURNACE.—H. Ross, J. H. Clemens, Pittsburgh, Pa.—Patent No. 118,279, dated August 22, 1871.
4.610.—CULTIVATOR.—W. S. Weir, Jr., Monmouth, Ill.—Patent No. 37,251, dated December 23, 1862.
4,611.—CASE, ETC.—S. Whitaker, Macon.—Patent No. 113,827 dated April 18, 1871.

DESIGNS.

5,320.—LAMP SHADE.—C. Binzer, New York city.
5,321.—FENDER.—G. Buchanan, Washington, Pa.
5,322.—BILLIARD TABLE.—W. H. Griffith, New York city.
5,323.—SHAWL FABRIC.—J. Hodgson, Philadelphia, Pa.
5,324.—STEAM ENGINE CYLINDER AND FRAME.—J. R. Maxwell, Cincinnati, Ohio, E. Cope, Covington, Ky.
5,325.—CHAIR.—J. G. Strain, Delaware, Ohio.

TRADE MARKS.

495.—MINERAL WATER.—G. R. Bishop, New York city.
496.—LOOM TEMPLE.—Dutcher Temple Company, Hopedale, Ms.
497.—KNIT GOODS, ETC.—P. M. Hardee, Philmont, N.Y.
498.—SHIRTING.—W. E. Joslin, Nashua, N. H.
499.—COMPOUND.—D. P. Mathews, Winthrop, Mass.
500.—ADVERTISING MEDIUM.—K. Palmer, Richmond, Va.
501.—HEATER.—Richardson, Boynton & Co., New York city.
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503.—GIN.—F. Schuchardt, New York city.
504.—CHAIR.—J. G. Strain, Delaware, Ohio.
505.—SHEET IRON.—A. Wood & Co., Philadelphia, Pa.

EXTENSIONS.

PUMP.—J. D. West, of East Orange, N. J.—Letters Patent No. 18,309, dated September 29, 1857.
METALLIC SQUARE.—S. Darling, of Providence, R. I.—Letters Patent No. 18,327, dated October 6, 1857; reissue No. 2,869, dated February 18, 1868.
ROCK CHANNELING MACHINE.—W. Plumer, of Boston, Mass.—Letters Patent No. 18,352, dated October 6, 1857; reissue No. 3,368, dated April 13, 1869.—Division A.
ROCK CHANNELING MACHINE.—W. Plumer, of Boston, Mass.—Letters Patent No. 18,352, dated October 6, 1857; reissue No. 3,399, dated April 13, 1869.—Division B.
LOOM FOR WIRE CLOTH.—E. B. Bigelow, of Boston, Mass.—Letters Patent No. 18,320, dated October 6, 1857.

APPLICATIONS FOR EXTENSION OF PATENTS.

HARVESTER.—Ezra Emmert, Franklin Grove, Ill., has petitioned for an extension of the above patent. Day of hearing, January 3, 1872.

METALLIC TIE FOR COTTON BALES.—Frederic Cook, Washington, La., has petitioned for an extension of the above patent. Day of hearing, February 14, 1872.

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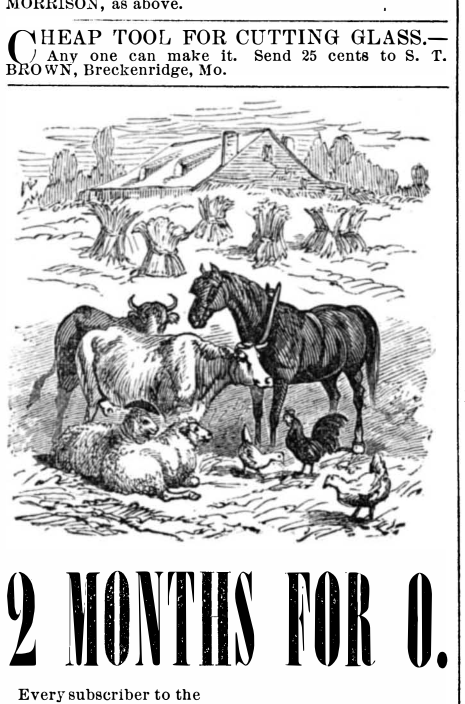

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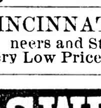

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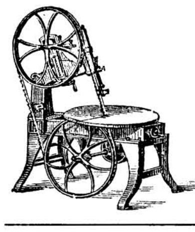

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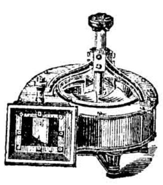

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