Diamond Glass Cutting.

In a recent patent trial concerning the revolving wheel glass cutter, Judge Shipman described the form and action of the diamond in cutting glass as follows:

While almost any diamond will scratch or tear the surface of glass, it is a fact that the value and efficiency of a diamond to be used for the cutting or severing of glass depends not merely on the hardness, but upon the form, of the cutting surface. Other gems than the diamond will successfully cut glass, provided they can be shaped into forms similar to those of the diamonds used for this purpose. Dr. Wollaston, in the "Philosophical Transactions" for 1816, thus explains the peculiarities required for the glazier's diamond: "In the natural diamond there is this peculiarity, in those modifications of the crystals that are chosen for this purpose, that the surfaces are, in general, all curved, and, consequently, the meeting of any two of them presents a curvilinear edge. If the diamond is so placed that the line of the intended cut is a tangent to this edge, near to its extremity, and if the two surfaces of the diamond laterally adjacent be equally inclined to the surface of the glass, then the conditions necessary for effecting a cut are complied with. The curvature is not considerable, and, consequently, the limits of inclination are very confined. If the handle be too much or too little elevated, the one extremity of the curve will be made to bear irregularly upon the glass, and will plow a ragged groove, by pressure of point. But, on the contrary, when the contact is duly formed, a simple fissure is effected, as if by lateral pressure of the adjacent surfaces of the diamond, diverted equally to each side. The effects of inequality in the lateral inclination of the faces of the diamond to the surface of the glass are different according to the degree of inequality.. If the difference be very small, the cut may still be clean, but, as the fissure is then not at right angles to the surface, the subsequent fracture is found inclined accordingly. When an attempt is made to cut with an inclination that deviates still more from the perpendicular, the glass is found superficially flawed out on that side to which the greater pressure was diverted, and the cut completely fails."

The Electrical Condition of Air in the Arctic Regions.

M. Vikjander, during one of the recent Swedish expeditions to the arctic regions, made extended investigations into the electrical condition of the air there existing. All of his observations agree in showing that the atmosphere conducts electricity at temperatures relatively high, a circumstance to which may be attributed the absence of thunder and the presence of the aurora borealis. It has been suggested that this is due to the great humidity of the air in such regions; but it is evident that the phenomenon must be ascribed to other causes, since the same temperature and the same degree of humidity do not produce a like effect in lower latitudes. At less temperatures, —4° and —13° Fah., and below, the air isolates better.

Generally the arctic atmosphere appears to be positively electrified, and the earth negatively. In several instances, the air was effectively electric of itself, and this not due to terrestrial induction. During certain periods of the spring, at a time when the air isolated relatively well, both ground and air were charged with negative electricity. This change of electrical state of the atmosphere was not a constant consequence of greater cold; but when the temperature had been lowered for some time, the air had an evident tendency toward a negative condition.

There seems to be a natural connection between these facts and the aurora. During the months of January and February, the latter phenomenon appeared daily, and was especially noticeable on the 19th and 26th days of the latter month. It then disappeared, to reappear, however, on the 2d of March.

At the same time, changes in the electricity of the air were observed, suggesting the theory that the negative electricity, deprived of the possibility of discharging itself into the aurora, was obliged to accumulate in the lower atmospheric strata, which isolated relatively well. From the 2d to the 11th of March, the aurora returned; and during this period the air was in a good conducting condition, or else, when effecting isolation, was positively charged. Subsequent to the latter date, the auroras ceased entirely, and an interval supervened, of low temperature with negatively electrified air, which lasted until the increasing light of the season of the year precluded further auroral observations.

The Royal Albert Bridge.

The Provincial Parliament some time since passed an act for the construction of a bridge over the St. Lawrence river at Montreal. Up to the present time the surveys have been completed, and the future plan is in process of elaboration. The length of the bridge proper over the river will be 7,300 feet, and of the viaducts in the city 5,000 feet, making the total length of the structure 12,300 feet. The main span, of 600 feet in length and 160 feet above water, will extend over the navigable channel. On each side of this principal span there will be one of about 350 feet, and the remaining spans will average some 300 feet, or such other dimensions as may be established when the cost of stone piers with iron superstructure is fully considered. The piers will be very heavy, and those in the water will be built after the manner of the similar portions of the Victoria Bridge.

The style of iron superstructure will be open lattice work. The rail level will be on the lower chords. Twenty feet above, a floor will support the ordinary carriage traffic; a second floor, twelve feet above the first, will give facilities for city car traffic, several lines of rails being placed and the train drawn by dummy engines; the top of the bridge (to be floored over, and with strong ornamental iron railings for safety) will furnish all the required facilities for pedestrians. For the convenience of the latter, hydraulic or steam elevators are to be arranged at different streets where the bridge extends over the city, so as to enable passengers readily to reach the footway.

Generally speaking, it is thought the bridge will cost very considerably less than the Victoria, and be built in one half the time, the surveys having revealed much more favorable engineering conditions of line than had been anticipated.

Wood Ashes as a Fertilizer.

How can I best utilize that big heap of ashes out by the wood pile? This is a question which we have no doubt that hundreds of the some odd thousands of farmers who read this paper have suggested to themselves, now that the milder weather renders drafts on the wood pile less frequent. In nine cases out of ten, we wager that the speaker's excellent spouse immediately remarks that she is about to sell them to the soap maker; and the money? well, that is her perquisite, and it would be very ungallant on our part to venture a suspicion as to its outlay. Still, we dislike to see these ashes go to the soap boiler, and perhaps a word as to their value to our farmer friend may cause him to think as we do; so with a word of apology to both madame and the soap man for our unwarrantable interference with their little traffic, we venture to suggest that those ashes are very much more valuable as fertilizer than for lye.

We suppose that every agriculturist now-a-days has some general idea of the principle of restitution; that is to say, the elements necessary to the growth of vegetables must be replaced; and if they are not, the crop either fails utterly, or at best is deficient in health and growth. The amount of these elements, phosphorus, lime, potash, and several others, to be replaced varies according to the vegetables cultivated. Thus a potato crop from seven and a half acres of land takes away the seed constituents of four wheat crops, besides about 600 pounds of potash. The average turnip produce of the same area removes the seed constituents of four wheat crops and about 1,000 pounds of potash. Similarly also grapes, clover, peas, beans, lucerne, and nearly all leguminous vegetables remove potash in immense quantities. It is evident that in such cases potash is the material which the land most requires to produce a new crop. To buy potash and add it to the soil would be expensive; true, it may be procured in combination with other substances in various fertilizers, but there is a much simpler source for it, and that source is the ash heap, which otherwise the soap man purchases.

Professor Storer, whose recent paper on the fertilizing properties of wood ashes we find in the *Bulletin* of the Bussey Institution, gives the latest information on the value of this most useful material. He says that the analysis of thirteen samples of house ashes shows a range of from 6 to 10·8 per cent of potash, and from 0·4 to 4·6 per cent of phosphoric acid. The lowest percentages of potash, 6 to 6·5, were from ashes of a mixture of maple, oak, and white pine wood, collected by a soap boiler in a country village. The highest percentages, 10 to 10·8, were in ashes of mixed beech, birch, and maple in one case, and in those of pitch pine in the other. Eight of the samples ranged, as to potash, from 7·4 to 9·5, the average of them, as well as that of all the thirteen samples, being about 8½ per cent. This, it must be borne in mind, is the proportion of the chemist's potash or oxide of potassium, and corresponds to about 10½ per cent of the potash of commerce, which is an impure carbonate and hydrate of potassium. The average of phosphoric acid in dry commercial wood ashes, whether unleached or leached, is about two per cent, a much less quantity than would be inferred from the composition of the "pure ash" of many woods.

This phosphoric acid is also a valuable fertilizing material in the majority of soils. The balance of the elements contained in the ash, namely, silica, alumina, iron and manganese oxide, lime, soda, etc., are of no or little account, so that, on what the potash, first, and the phosphoric acid, second, contained, mainly depends the value of wood ashes as a fertilizer. The material is besides a useful dressing for the ground about orchard trees, as it not only improves the soil, but prevents in considerable degree the inroads of insects in the roots and bark.

It only remains for us to show that there is not merely a loss to the land effected, but that a direct expenditure of money is the result of using ashes in a manner otherwise than we have pointed out. In order to thrive, the farmer must keep his land in producing condition, and, as we have already remarked, to soils which require potash, potash must be returned. Potash is worth about six cents a pound, and phosphoric acid is sold in the New York markets for about 12½ cents for the same quantity. A barrel of wood ashes is bought by the soap maker for say twenty-two cents, and it weighs 125 pounds. These ashes contain on an average, as we have already shown, 8 per cent, or 10 pounds, of potash, and besides include two per cent, or two and a half pounds, of phosphoric acid. According to the above prices, the total value of these substances is 91 cents, and therefore a barrel of ashes is intrinsically worth as a fertilizer nearly five times the amount for which it can be sold to the soap manufacturer.

"Ashes," says the *Rural New Yorker*, "contain essential components of all crops. They should not be mixed with compost (there is no gain in so mixing them) but applied broadcast directly to the soil, whether it is grass or arable land. We never knew a farmer who could get more ashes than it was profitable to apply to his land. One hundred bushels per acre is not too much to apply to old cultivated lands. Especially are ashes excellent for orchards. They should not be heaped right about the bodies of the trees, but spread over the roots, which extend as far from the bodies of the trees as the branches do. Ashes are especially valuable as top dressing on old grass lands, or on lands cropped with grain. For root crops they are equally important; indeed, as we say above, there is no crop grown and no land cultivated that is not benefited in a greater or less degree by the application of leached or unleached ashes, the latter being the more valuable."

Most farmers still sell wood in the cities and villages; and rather than go home empty, they should carry back ashes and other fertilizers to replace the potash, lime, and phosphoric acid that have been carried off in the crops and animals sold. Ashes show immediate effect from their application, and at the same time last long in the soil.

DECISIONS OF THE COURTS.

United States Circuit Court.--District of Massachusetts.

PATENT BRUSH—THOMAS E. MURPHY *et al. vs.* LAURENT KISSLING *et al.*

[*In Equity.—Before* SHEPLEY, J.—*October*, 1874.]

This was a suit under letters patent for an improved brush, granted to Francis McLaughlin, January 11, 1870, being the same patent that was involved in the suit of *Murphy et al. vs. Eastham et al.* The object of the McLaughlin invention was to obviate the danger of breaking glass and injuring the surface of wood or other substances to be washed or dusted by contact with the brush head. To this end the patentee proposed to form a groove in the brush head or stock near the bristles, and in this groove to insert a rubber band, one edge or angle of which should project outward and prevent injurious contact between the brush head and the surface to be cleaned. The novelty of the invention and the scope of the patent were fully discussed in the case above referred to.*

Decree for injunction and account as prayed for in the bill.

[*J. L. Newton*, for complainants.
J. T. Wilson, for defendants.

NEW BOOKS AND PUBLICATIONS.

WOODEN AND BRICK BUILDINGS, WITH DETAILS, containing One Hundred and Sixty Plates of Plans, Elevations, etc., with Descriptive Letter Press. Two Volumes, Large Quarto. Price $18. New York city: A. J. Bicknell & Co.

We know of no recent publication which will prove of so much utility to architects and builders as that the title of which is above written. The first volume, just issued and now before us, contains fifty-four designs, carefully drawn and evidently reproduced in *facsimile* from the handiwork of some of the foremost architects in the country. These are accompanied with forms of specifications, descriptions of details, and other explanatory matter calculated to be of direct practical use to the profession. To architects residing in country and suburban towns, we can especially commend the work, as it abounds in designs for rural dwellings, all of which are handsome, and some artistically elegant. Mr. A. J. Bicknell, publisher of the *American Builder*, under whose supervision the book has been compiled, deserves great praise for the admirable and painstaking care exhibited in its pages. Both to him and to the publishing house of which he is the head, the public has long been indebted for the production of architectural works, the effect of which must be gradually to substitute, for the normally uncouth edifices of American towns, structures which combine the principles of scientific building with exteriors denoting taste and artistic skill.

THE PRIVATE LIFE OF A KING. Compiled by John Banvard, Artist. 670 pages. Price $2.25. New York city: The Literary and Art Publishing Company, 806 Broadway.

This book is alleged to contain a truthful memoir of the Prince of Wales afterwards George IV., of England.

NEW YORK STATE RAILROAD REPORT.

We are indebted to Hiram Calkins, Esq., Clerk of Assembly, for a copy of the State Engineer's Report for 1873. We also acknowledge the receipt, from same source, of a copy of the "Clerk's Manual" for 1875.

Recent American and Foreign Patents.

Improved Trellis.

Timothy L. Buell, Marietta, Ohio.—This is a trellis made of wire bands or rings and stakes and posts, the rings being attached to the stakes and posts, so that the trellis may be folded up when not in use.

Improved Water Closet Valve.

Edwin O. Brinckerhoff, New York city.—The weight of the person using this water closet forces down rods and valves, compressing springs and bringing the openings of the valves opposite the open ends of the pipe, so that the water may flow freely, and may continue to flow as long as the weight of the person rests upon the seat. As the weight of the person is removed, the elasticity of the springs raises the rod and the valve, stopping the flow of the water.

Improved Saw-Burring Tool.

Franklin J. Martin, Williamsport, Pa.—Two angle plates, about the length of four or five saw teeth, are bolted together adjustably, so that a channel is obtained between the plates for the reception of the edge of the saw between them. The channel being widened or narrowed, according to the gage of the saw to be burred, by shifting one of the plates on the other, this tool is placed on the edge of the saw, with the bottom wall of the channel against the points of the teeth, after the saw has been filed. The operator then gently taps it with a hammer, and thereby burrs the points of the teeth a little, flattening them slightly on the points, and making them of uniform width and length. By this burring of the teeth the saw is prevented from dodging out of its course, and it makes the lumber much smoother than the teeth are capable of as ordinarily dressed.

Improved Safe.

George Damen, Brooklyn, N. Y.—This invention consists of safe having a series of pigeon holes or recesses arranged equidistant from a center spindle, which carries a revolving face plate with apertures fitting the pigeon holes, so as to open one of them at the time while closing the others, and locking them all by means of suitable spring bolts entering rear holes of the face disk in moving the disk forward.

Improved Car Axle Box.

Benjamin K. Verbryck and Thomas Newberry, Chicago, Ill.—The object of this invention is to improve the axle boxes of railway cars in such a manner that the covers or lids are locked or fastened in an absolutely secure manner without the use of set screws, springs, or other devices. The lid is hinged to one side of the axle box, and provided at the other side with a groove and cam, into which a pivoted latch piece with eccentric cam is swung, thus locking rigidly the cover.

Improved Attachment for Injector.

David Lees, of Birmingham, assignor to himself and S. C. Stewart, of Tyrone Forges, Pa.—Between the valve and nozzle of the injector is a lateral tube, in which is placed a valve, held inwardly and away from its seat by a spring, until the pressure of steam is sufficient to close it. Until this occurs, the water of condensation is afforded an outlet, and thereby the starting of the injector greatly facilitated.

Improved Washing Machine.

Simon W. Shanks, Benton Harbor, Mich.—An endless chain of slats passes around two wheels attached to a shaft, the journals of which work in bearing in standards. By this construction, a longer rubbing surface is formed for the clothes, and the spaces between said slats allow the water squeezed from the clothes to flow off freely. Four coiled springs hold an upper rubber down upon the clothes, and at the same time allow said rubber to yield to adapt itself to the varying thickness of the clothes being operated upon. In using the machine, the clothes are inserted between the lower and upper rubbers, and are carried back and forth between said rubbers by turning the crank, first in one and then in the other direction.

Improved Paper Bag Machine.

Charles H. Kellogg. East Leverett, Mass.—The paper passes over guide rolls and between feed rolls, which draw it from the paper roll and present it to the folding table over longitudinal body folders, the margin being at the same time drawn under a pasting roll. The paper rests on a carrier, which reciprocates between the feed rolls and the head, and conveys the paper forward to the cutters, its complete reciprocations corresponding in number with the strokes of the cutters. The carrier turns the feed rolls by the belts, and a coiled spring is applied to pull the carrier back after carrying the paper forward. The belts go back without turning the feed rolls back, and engage the rolls by ratchets and pawls, to turn them forward when the belts are pulled forward by the carrier. A cross head carries a forming plate, over which the tubular portion of the bag is to be folded, which is moved down upon the sheet of paper at the same time that the cutter goes down, and it is held while the folders are performing their work. After this forming plate comes down on the paper, the longitudinal folders are thrown over, folding the paper and sticking the edges together by the pasted margin. After these folders are turned over, they are held while the bottom is folded and till the bag is ready to be discharged. They are then thrown back by springs. Before the folders go back, the bottom of the bag is folded and pasted, the first operation being by the horizontal spreaders, which fold in the side parts against the ends of the folders and the table. As soon as the sides of the ends of the tubes are folded in by the action of the spreaders, the paster rises and pastes the upper and lower corners of the folded bottom, above and below the spreader. The object of this pasting operation is to unite one of the said corners to the middle of the bottom or end portion of the bag, and the other corner to the first corner, which will result when the corners have been folded. The lower vertical folder has a pressure roll connected with it, to press the ends together after they are folded, and stick the paste. There is also a little projecting stud on the upper corner of each folder, to throw it off a little when it comes in contact with the paper, so as not to tear or cut it. A little coiled spring regulates the pressure of the folder on the paper. The discharger, being under the lower part of the bag and pushing against the folded bottom below the center to draw it off from the folder, thrusts the lower edge of the bottom forward and presents it to rolls, so that, in drawing it between them, they fold the bottom down on the upper side, ready for folding up for packing in bales or boxes.

Improved Tea Kettle.

Harriet Gray, Marquette, Mich. The subject of this patent is an improved tea kettle, by which the spilling and boiling over of the water is prevented, and also the heat issuing at the top part is utilized for the purpose of keeping articles warm or cooking therewith. The kettle is provided with a funnel-shaped top rim and outer cover, and also with an interior perforated cover, having an adjustable slide plate, for opening or closing the steam-issuing perforations.

Improved Dash Board.

Christian C. Schwaner, Winterset, Iowa.—The frame for this dash for buggies and other vehicles is so formed that it may be contracted or expanded should the leather cover be made too tight or too loose, and also so that all the stitching may be done before the said cover is applied to the said frame.

Improved Window Shade Fixture.

Charles De Quillfeldt, New York city.—The main objection to the shade fixtures with spring rollers has been the sudden escape of the shade from the hands of the person trying to adjust the same by the action of the spring, so that the shade is wound up with great rapidity around the roller, and exposed to injury. This invention is designed to produce the absolute and positive stopping of the shade at any desired point, by means of a notched hub of the spring roller, having sliding disks, in connection with a covering roller cap, provided with a break piece for stopping the roller and disks when turned in one direction by the spring, but admitting the passage of the disks in opposite direction for the unwinding of the shade.

Improved Saw Gummer.

George Washington Griswold, Pottersville, N. Y.—The clamps for holding the saw are on the ends of screws, one of which passes through the end of the handle, and the other through the end of a bow. The other end of the bow is contined on the outside of the handle. The bow rises up from the screws to give room for the saw. A cutting cylinder is made with a shank, which passes through the sleeve, and has one or more slots through its surface. Cutters, passed through the slots, are inserted from the ond, and are beveled at the inner ends, so that they correspond with the surface of the cylinder. The cutters cross each other, and their edges project sufficiently to take a thin chip from the saw as the cylinder revolves.

Improved Ticket Printing Machine.

James Anderson, New York city.—The paper is drawn between a pair of printing rolls from a spool, printed and caused to issue from the case and passing between cutters which cut off a ticket at each half revolution of the printing rolls, one cutter being forced down by a spring, which is restrained by a cam while the paper is moving, and released by it at the proper time for the cutter to strike. As it may not in some cases be desirable to use a cam independent of the printing rolls, and geared to them in this manner, the cutter may be lifted by a push pin and lever, to be worked by hand before turning the rolls, one of which may have cams to hold the cutter up as soon as the roll is turned far enough, so that the push pin may be released by the thumb to leave the cutter free to be thrown back by the spring. There is a little frame to prevent the printing roll from turning backward or forward while the cutter is down. It is tripped to release the roll when the cutter rises by arms. This instrument is designed essentially for making tickets to be given by the conductors to passengers when they pay their fares, so that they can be detected in case they do not give them; but it is equally adapted for other purposes.

Improved Binder for Roll Couplings.

James Gillespie, Cleveland, Ohio, assignor to himself and William Garrett, of same place.—The object of this invention is to provide, in place of the leather belts used for binding together the spindle and stretchers in rolling mills, an improved spring binder, that may be quickly applied and taken off, so as to secure the stretchers tightly during the motion of the rolls, and to prevent completely the slipping off of spindle and roll-connecting boxes. It consists of a wire binder, with spiral spring part and hook and eye at the ends, for being tightly fastened around the roll-connecting spindle and stretchers.

Improved Cooking Stove.

Edwin O. Brinckerhoff, New York city.—This cooking stove is provided with an arrangement of flues and spaces, so that when the stove is used for baking purposes it may be heated quickly, thoroughly, and uniformly, and with a comparatively small amount of fuel, and that when used for boiling purposes the entire stove need not be heated.

Improved Horse Power Attachment.

John George Merchen, Lowden, Iowa.—In the upright bars of a drum are formed holes to receive the ends of cords which pass through guide eyes formed in pulleys pivoted to the upper ends of short studs attached to sweeps near the edge of the platform. From the studs the cords pass around guide pulleys pivoted to the upper ends of other studs, which are made higher than the studs first mentioned, and the lower ends of which are attached to the outer ends of the sweeps. To the outer ends of the cords are attached loops to which the horse reins are designed to be attached. The studs support the cords and the reins at such a hight as to be out of the way of the doubletrees and whiffletrees, and so as to prevent the horses from getting their feet over said cord or reins. The driver, by turning the central drum, draws all the reins taut at the same time, and is thus able to readily control all the horses.

Improved Hitch Hook for Street Cars.

David Demarest, New York city.—This consist in a bill or head formed upon the point of the hitch hook of street cars, and of such a size that the coupling link of the pole shoe can be readily raised over it when the horses are in line with the car, but which, when the horses are in any other position, will force the side of the link of the pole shoe beneath the shoulder of the said bill, and thus prevent the detachment of the horses. This invention will prevent the running away of frightened horses that have become accidentally detached fr m their car.

Improved Sole and Heel Shave for Boots and Shoes.

Fanny M. Foster, Leicester, Mass., executrix of George P. Foster, deceased.—The body of the knife is slightly curved, and its side edges are dovetailed into the stock. A screw passes through the stock, with its end bearing on the long end of the lever, and exerts a lever purchase to force the short end against the beveled or dovetailed side of the knife. By means of this lever the knife is forced down into the dovetail, kept firm, and prevented from chattering when in use. The lever also prevents the knife from getting loose or starting out. By lowering the screw, the knife may be slipped from the dovetails and taken out for sharpening and other purposes.

Improved Sand-Papering Machine.

Valentine Hepp, Chicago, Ill.—The frame which carries the heads around has a hollow shaft, with a shaft running down through it, and carrying a large spur wheel, which gears with the pad carrier, so as to divide the motion between the carrying frame and the driving shaft, in such a manner as to obtain the requisite rapid motion of the pad carriers without having to run either the frame or the driving shaft at a high speed.

Improved Child's Carriage.

J. Manvill Lewis, North Springfield, Vt.—The two axles are connected by a reach of two malleable iron rods, with a spring near about the middle for supporting the front portion of the body. Ordinary C springs on the rear axle support the rear end of the box, by which it is designed to simplify and cheapen the construction considerably, while at the same time the carriage is equally as strong and more elastic than those in which the body sills curve down and connect with the front axle to form the reach.

Improved Washing Machine.

Francis M. Myers, Windsor, Mo.—This invention is a roller to which clothes are attached, and a semi-cylindrical oscillating rubber, provided with a slot through which the clothes pass, and resting upon a roller bed, or equivalent surface. When one side of the part of the clothes being operated upon has been sufficiently rubbed, the rubber is turned ouce around in such a direction as to reverse the position of the clothes between the rubber and the roller, and the rubber is again oscillated. When this part of the clothes has been sufficiently rubbed, the roller is turned to roll the washed part of the clothes upon it, and another part is operated upon. When the article has been wholly washed, it is detached and another is applied.

Improved Magazine Fire Arm.

Edwin A. Prescott, Hatfield, Mass., assignor to Prescott Pistol Company, of same place.—The invention consists of certain peculiar devices and arrangements thereof for throwing out the case of the exploded cartridge, feeding the cartridge to be fired into the barrel, and retaining the cartridges in the supplementary barrel or magazine while the discharging barrel is being loaded. Two springs in the magazine are used for holding the cartridges from falling out when the barrel is turned down, instead of one spring and a notch in the barrel, as heretofore. A spring catch is combined with the stock and the groove into which the head of the cartridge is received from the magazine, to catch the flange and hold it against being thrown or knocked out before the flange rises up. The slide is connected with the arm by a connecting rod, for working it by said arm, instead of a toothed segment on the arm and a toothed bar on the slide, which is a simpler and cheaper arrangement, and works more accurately. A little cam on the end of the rod connected to the slide is thrown up above the top of the slide to raise the cartridge above the top of the slide while being moved up to its position behind the barrel. This avoids the loose joint, which is objectionable for its rattling noise and uncertain action. The spring catch for fastening the barrel and the breech together swings vertically on a horizontal pivot, and is provided with a thumb bit directly in advance over the top of the barrel, so that the thumb of the hand in which the arm is held may be used for unlocking the barrel to swing it dowu for loading, by merely pushing down on the thumb bit, and also so that the pressure exerted for unlocking them also tends to force the barrel down.

Improved Feathering Paddle Wheel.

Bernhard Vater, New York city.—This is an improved construction of paddle wheels for steamboats, by which the paddles pass vertically into and through the water, so as to utilize the full amount of power with less agitation of the water and vibration of the vessel. The invention consists of a paddle wheel with vertically arranged paddles, that retain their position during their passage through the water by the rotation of the supporting frame in connection with the action of intermediate gearing, and a central stationary cog wheel on the gear wheels of the paddles.

Improved Spring Equalizer.

Thomas L. Guest, Pottstown, Pa.—The forward and backward throw of the body of a carriage, as the wheels descend and rise from a level in passing through a hollow and over an obstruction, are limited to the amount of play given to a stay rod, and the movement of the said body within said limits is made easy by the play of pivoted cross bars in their bearings.

Improved Holder for Ornaments, etc.

Walter J. Garvey, St. Louis, Mo.—The object of this invention is to provide means for holding up the ornaments which are placed upon ceilings until they can be fastened thereto; and it consists in a spring holder made adjustable as to length, capped with rubber or other soft material, and with a spring at the other end, to hold it in place.

Improved Drag.

Wilson Gardner, Wheelersburg, O., assignor to himself and L. Salladay, of same place.—The pulverizers and furrowers are connected with the same carriers, so that ground may be laid off in rows for planting as fast as it is brought into fine tilth, and by the same operation.

Improved Blind Stop.

Charles E. Steller, Milwaukee, Wis.—A series of slats pivoted in a frame is connected with an opening and closing bar. A slight pressure of a cam against the side of the bar serves to hold it and the blinds in any desired position, while a tighter pressure makes the blind slats stand so firm that no wind or storm can cause them to rattle.

Improved Chair.

William T. Doremus, New York city.—In this device, when the cover is put under pressure a roller will be turned in such a direction as to tend to coil up springs, so as to give elasticity to the back of the chair.

Improved Printing Press.

William E. Gump, New York city, assignor to Mrs. Maria L. Gump, Garden City, N. Y.—By operating a lever, the platens will be brought up against the form. Upon the rear of the upper parts of the end frames are formed cams, which take up all the play of the joints of the rods, arms, and levers, and bring the platens against the form fully and squarely, and thus insure a full, clear, and clean impression.

Improved Washing Machine.

Thomas Stumm, Ada, O.—This invention has for its object to improve the construction of the washing machine for which letters patent were granted to same inventor May 5, 1874. By moving the free end of a lever in one or the other direction, the uprights and a rod or shaft and its attachments may be raised and lowered to raise the clothes out of or lower them into the water. To the uprights are attached the ends of a dasher board, against which the clothes are pressed, and which has numerous holes formed through it to allow the suds to readily escape.

Improved Velocipede.

Edwiu Crother and Michel Bergeron, Hackensack, N. J.—In this velocipede the rider can use either his hands or his feet, or both together, to control the direction and uncouple one of the wheels for turning curves in the road. When the strain upon the spring ceases, the reaction throws the coupling into gear with the wheel, and both wheels become propelling wheels.

Improved Car Coupling.

Benjamin J. Sirmans, Blackshear, Ga.—When two cars are run together, the link of one car will enter the hole of the bumper head on the other, strike against a plate, and push the inner end of a lever to the rearward, which movement of the said lever withdraws a catch arm from another lever, and allows the pin to drop thr ugh the bumper head and link, coupling the cars.

Improved Bob Sled.

John Wampach, Shakopee, Minn.—Pivots and holes in the tongue roller are contrived to allow the pins to play up and down freely as the roller is raised or lowered at one end above or below the other by the rising or falling of one of the runners independently. The hounds extend forward of the hind beam each side of the reach, and cross bars connect them at the front, above and below the reach, to hold the hind beam so as not to rock with the runners.

Improved Corn Planter.

Abram Staley, Martin, Mich., assignor to himself and Joseph L Staley, of same place.—The slides are so arranged relatively to each other that the opening through one registers with the passage through the pocket when the other does not, thus enabling one to close and the other to open by one and the same movement of the two slides. The construction of these jaws and slides is such that the jaws open and make a good opening in the ground before the seed drops, which allows the seed to scatter as when planted by hand, and they open so that the seed can be seen after dropping, and before the jaws are lifted out of the ground, so as to be certain of the perfect action in every case. The machine also opens the ground, so as to insure the covering of the soil perfectly.

Improved Organ Reed Board.

John R. Lomas, New Haven, Conn., assignor to Bernard Shoninger, of same place.—A partial set of reeds is inserted below the sounding board, which come within the length of the bass reed valve. By this means there are added to the treble as many reeds as can be supplied with air by this valve, thereby making no difference in the required touch of the keys.

Improved Composition for Filling Teeth.

Erwin Erlenmeyer, Houston, Tex.—This is a composition for filling hollow and decayed teeth, which is pulverized when used, and which is compounded of phosphoric acid, lime, magnesia, fluoride of calcium, potash, silica, and oxide of zinc.

Improved Harvester.

Charles K. Myers, Pekin, Ill.—The driver, while standing upon the platform attached to the rear part of the tongue, by operating a lever can easily guide the machine in any desired direction, and by means of another lever can raise and lower the cutter bar to cut the grain farther from or closer to the ground.

Improved Machine for Making Metal Shoe Shanks.

John Hyslop, Jr., Abington, Mass., assignor to Hiram H. Jenkins and George O. Jenkins, of same place.—The shanks are cut off from a sheet fed on a stationary block, and fall down the stationary incline in front of the stationary former, where they are held by suitable means until the movable former comes forward and presses them to produce the requisite shape. A couple of pushers move forward aft r each one falls, and push it, together with the previously fallen ones, forward along the table side by side, so that they may be taken off in batches in such order.

Improved Carriage Curtain Fastener.

Carl Kurz, New York city.—This invention consists of a metal button with a T head, which is fastened to the inside of the apron or curtain, and a little slotted plate fastened on the bow, with its slot at right angles to the head of the T, so contrived that the slotted plate, which only swells out a little around the slot, does not project like the studs now in use, nor does it show on the outside, as the studs do. The button-hole plate to be used for the top of the curtain has the upper portion of the slot widened, so that the buttons can drop into it when the button plate is held up horizontally; and a portion of the button-hole plate above the slot is so contrived that, after the button has been dropped down with the curtain as it hangs, it locks the button, so that it cannot be detached while so hanging.

Combined Land Roller and Seeding Machine.

James H. Holland, Aurora, Mo.—The roller is made in two parts, and to its outer ends are detachably bolted two wheels, one or both of which are rigidly connected with the shaft, so as to carry said shaft with them in their revolution.

Improved Lamp Extinguisher.

Augustus Umholtz, Tremont, Pa.—The invention consists in attaching an extinguisher to the stem or rod by which the wick is raised and lowered, so that both may be operated together, and in constructing the extinguisher plate with slots in the flanged top portion, contiguous to the top of the wick tube, for admitting the passage of air upward to the flame of light downward.

Chief Engineer's Office, U. S. Navy Yard,
WASHINGTON, November 18, 1874,

Commodore Thos. H. Patterson, U.S N., Commandant:

SIR:—In obedience to your order of October 5th, 1874, to carefully test the EMPIRE PORTABLE FORGE, manufactured at Troy, N. Y., I have the honor to submit the following report:

* * * * * * This is a very excellent and convenient forge. It works easy and with but little noise, and the power being applied with a lever, it can be worked without interfering with the manipulation of the fire.

I can recommend it as a very useful tool for work on ship board or shop use.

Very respectfully, your obedient servant,
[Signed] EDWIN FITHIAN,
Chief Engineer, U.S.N.

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Notes & Queries

J. S. & Co. will find directions for utilizing mica scraps on p. 42, vol. 25.—J. D. F. will find directions for manufacturing ice on p. 54, vol. 31.—L. F. L. will find instructions for preventing the percolation of water through a brick wall on p. 75, vol. 32.—R. H. D. will find a recipe for Worcestershire sauce on. p. 281, vol. 26.—A. C. A. will find some particulars as to the manufacture of aluminum on p. 91, vol. 31.—J. H. will find directions for preparing buffalo hides on p. 266, vol. 26.—J. M. C will find a formula for ascertaining the contents of a cylinder on p. 281, vol. 25, and for the proportions of a safety valve on p. 107, vol. 31.—E. S. T. will find a recipe for indelible ink on p. 112, vol. 27.—H. R. W. will find a recipe for wood filling on p. 347, vol. 31.—L. F. S. will find directions for making rubber hand stamps on p. 156, vol. 31.—B. A. S. will find directions for making and using a pantagraph on pp. 99, 179, vol. 28.—F. G. T. should consult, as to his diet, a physician who is acquainted with his case.—C. S. R. will find a recipe for a dip for brass goods on p. 282, vol. 29.—W. F. R. and others can solve the problem of the length of the hypothenuse by the method illustrated on p. 187, vol. 32.—W. B. will find directions for calculating the proportions of gear wheels on p. 187, vol. 29.—F. B. will find directions for removing clinkers from stoves on p. 187, vol. 32.—A. B. will find the dimensions of the Great Eastern on p. 346, vol. 31.—J. R., Liège, Belgium, and others will find a description of a wood-splitting machine on p. 79, vol. 28.

(1) H. M. asks: Please explain the antiseptic action of common salt, and also of sugar. A. In the case of salt, the albumenoid and other putrifiable matter goes into solution in the brine; sugar or sirup acts by preventing the access of atmospheric oxygen to the substances immersed in it.

(2) H. D. D. and others.—One process for utilizing tin scrap consists in first cutting it in a suitable machine into comparatively fine chips, and then placing it in a revolving cylinder so arranged as to constantly shower the chips with mercury, with which the tin unites; and the two may afterward be separated by distillation, or by the oxidation of the tin.

(3) W. C. asks: Can heat enough be obtained in a small furnace to melt brass without the aid of a pair of bellows? A. Yes.

What will dissolve chemical paint out of a brush? A. This depends wholly upon the composition of the paint. Most of the common pigments find solvents in either water, turpentine, alcohol, ether, or oil.

(4) J. H. asks: In pressing quicksilver through buckskin to extract the impurities or gold, is it injurious to have the hands in contact with it? A. We do not know of any trouble originating in this way: but as mercury is slightly volatile at common temperatures, extreme care should be taken not to inhale the vapors, as it is liable, otherwise, to produce salivation.

(5) J. McM. asks: Why is an inverted image seen when one looks upon the concave side of a burnished spoon, and an erect image when the convex side is turned towards the face? A. In the case of a concave mirror, the reflected rays of light approach and cross each other before reaching the eye, thus producing an inverted image. In the case of convex mirrors, the convex surface simply causes the rays to diverge.

(6) D. H. S. Jr. asks: 1 Has ozone ever been used as a bleaching agent? Yes. 2. Can it be produced by the discharges (into atmospheric air or pure oxygen) of the electricity generated by the glass plate or cylinder electrical machine? A. It can, but in exceedingly minute quantities in comparison with the bulk of the gas operated upon. 3. Is there any work extant which treats minutely upon the production, properties, and uses of ozone? A. Read the work by Cornelius B. Fox, entitled "Ozone and Antozone," published by J. A. Churchill, London, England.

(7) L. N. P. says: 1. I am thinking of putting electric bells into a house. Is there any likelihood of the batteries or any connections ever setting fire to easily inflammable things? A. No. 2. Is there any chance of batteries in a closet forming gas liable to catch fire? A. No.

(8) F. G. N. ask: 1. Suppose that I take a permanent magnet, and surround its armature with a helix, would not a feeble current be generated every time the magnet and armature were united and separated? A. Yes. 2. If the ends of the helix are connected with a Rhumkorff coil, would not the feeble current of electricity generated induce a stronger one in the other wire of the coil, so that, by connecting several wires successively, we might finally obtain a current indefinitely stronger than the one we started with? And if we connected the last coil with a helix surrounding a soft iron horseshoe, would not the current of induced electricity transfer it into a much stronger temporary magnet than the permanent one we began with? A. If properly constructed, it would. 3. Would the induced current differ from the generating current otherwise than in being stronger? A. That would depend upon the construction of the machine. 4. If this is true, does it not overthrow the idea that one force cannot produce a greater one without a corresponding loss in time or distance? A. Not at all. If the results you suggest were to follow your premises, they would not tend to overthrow the idea mentioned. In this case it would be simply a transfer of mechanical force (the moving of the armature) into electrical energy, and the amount of the energy would be proportioned, other things being the same, to the rapidity of the movement of the armature.

(9) D. H. L. H. says: In your answer to W. E. D., you give directions for making a Callaud battery; can I nickel plate steel with such a battery? A. Yes.

(10) P. R. H. asks: Is there any battery that will produce electricity continuously, without being touched or renewed after once being completed and put to work? A. No.

(11) I. H. asks: How can I plate with nickel without a battery? A. Use a magneto-electric machine.

(12) M. P. asks: What is the best method of removing gold that has been deposited on brass by galvanic battery, so as not to destroy the brass in the operation? A. Place the articles in strong nitric acid, and add some common salt in crystals. After coming out of the acid, the articles must be polished.

(13) E. M. asks: Will you please suggest the simplest way that I can produce rotary motion by electricity? I have a small battery and electro-magnetic telegraph. But I want to show to my pupils how a wheel may be turned. Being poor, I cannot buy an electric engine. Any cheap and simple way by which I can make rotary motion by the battery, at home, that is what I want. A. Suppose you attach four soft iron keepers to the circumference of a wooden wheel, so that in turn they approach the poles of an electro-magnet. Let the circuit of the electro-magnet be closed as each keeper approaches the poles and opened as soon as it comes opposite. The method of making a circuit closer will occur to any ingenious mind.

(14) W. D. H. asks: 1. How can I electroplate in bronze? In what solution shall I immerse the articles to be bronzed? A. Make a solution composed of 50 parts carbonate of potash, 2 parts chloride of copper, 4 parts sulphate of zinc, 25 parts nitrate of ammonia, and use a bronze plate as the positive electrode. 2. Which is the best battery for the purpose, Smee's or Leclanché's? A. The Smee.

(15) L. K. asks: 1. How many feet of air does one grown person require to keep him in good health for six hours? A. The average amount of air inspired and exhaled at each respiration is 30 cubic inches, and the average number of respirations 20 per minute, so that 500 cubic feet of air pass through the lungs in 24 hours. The amount of carbonic acid exhaled is variable, and is interesting as an index of the rate of internal change. The more energetic the circulation, the larger the quantity of carbonic acid; it is less during sleep than while awake, and less during fasting than after a full meal. 2. Is it best to have a constant change of air from the outside into a room in which we are sleeping? A. A sleeping apartment should always have adequate ventilation while in use.

(16) O. D. asks: I have heretofore worked the burglar alarm apparatus in my house by the Leclanché battery, of which I use 6 cells. But this winter they stopped working. I then put in 6 new cells of the same; still they did not work. I then substituted the ordinary sulphate of copper battery, and have had no trouble since. Now can you tell me what probably was the matter with the Leclanché? Did the cold weather produce any mischief? A. No. The Leclanché battery will stand as much cold as the sulphate of copper. Did you test your Leclanché cells separately on short circuit to see if the connections were good?

(17) H. M. asks: What chemicals are used to render paper sensitive so that you can photograph directly on it? A. Chloride of ammonium 40 grains, gelatin 20 grains, water 20 ozs. Dissolve by the aid of heat and filter when cold. Take 10 or 12 sheets of thin clear paper, and, having marked the right side, immerse them bodily in the liquid one by one, taking care to remove air bubbles; then turn the batch over, and remove them singly, beginning with the sheet immersed first. Render the paper sensitive by a solution of ammonio-nitrate of silver, 60 grains to the oz. of distilled water.

Is there any chemical that I can insert in the bark or sapwood of trees, that will kill them? A. Try a strong solution of chloride of zinc.

(18) J. W. L. asks: Can I light gas by electricity? A. Put on a pair of dry slippers, and walk briskly over a carpet. You will thus charge yourself with electricity, and may light the gas with your finger in dry cold weather.

(19) P. J. N. asks: 1. To what pressure per square inch can air be subjected by means of the air pump? A. A maximum of condensation has not been reached. It depends altogether upon the strength of the pump, its valves, and the power and velocity with which it is driven. 2. What work is the best on pneumatics? A. Ganot's "Physics."

(20) E. L. F. asks: Why does a distant light scintillate like a star? A. Because of the interposed changing layers of air of different densities. The diverging rays are caused partly by the irregular figure of the crystalline lens of the eye, and are partly owing to the pull of the six muscles which move it.

(21) W. B. H. asks: 1. How many Grove cells are required to operate a line half a mile in length, using No. 14 common iron wire, with a relay at one end of 100 ohms, and at the other a relay of 120 ohms? A. Two cells. 2. How can I charge a main line Grove battery of 10 cells? A. Cover the zincs with quicksilver. Put 16 parts water to 1 part sulphuric acid for the outer solution, and use pure nitric acid of commerce for the porous cup. 3. How often should it be replenished? A. Replenish the nitric acid every day and the solution once a week. Brush the zincs every day.

(22) C. W. asks: Which is the heavier, a cubic foot of water or of ice, and what is the difference? A. The water is the heavier. If one cubic foot of distilled water at 39° Fah. weigh about 62¾ lbs., one cubic foot of pure ice will weigh about 58¼ lbs.

(23) A. C. asks: What acid is used to mix with urine to detect Bright's disease of the kidneys? A. Nitric acid. Urine when mixed with nitric acid and boiled should coagulate if the person is suffering from Bright's disease.

(24) J. D. W. asks: 1. Is the Leclanché battery inodorous and constant? A. Yes. 2. Do the contents of the porous cups ever have to be removed and renewed? A. Yes. 3. What are the proportions of sal ammoniac and water to a quart cell? A. Two thirds full. 4. What is the reaction? A. Ammonia is set free at the negative pole, while the nascent hydrogen from the ammonium reduces the peroxide of manganese to sesquioxide. The zinc unites with chlorine, forming chloride of zinc.

(25) W. H. B. asks: Is there a solution which, mixed with pure white quicklime, will harden it into stone in 24 hours? A. Soluble glass, or silicate of potash or soda, is used for this. You will find it advertised in our columns.

(26) R. M. C. asks: What is the latest and and best work on electro-metallurgy? A. "Manual of Electro-Metallurgy," by James Napier.

(27) D. X. asks: What are the powers and focal lengths of the two largest equatorial refractors? A. That at Washington is 26 inches clear aperture, weighs 180 lbs., and was nine months correcting. The new McCormick telescope is a trifle over 26 inches aperture, was eight months correcting, and weighs 170 lbs. Both are of about 33 feet focus, and their highest power is 2,000 diameters. The objectives alone are worth $25,000 each. The government equatorial cost $46,000 currency, the McCormick $38,000 gold.

(28) H. H. asks: 1. What battery, and how many cells, would be the best for electroplating and making an electric light? A. For electroplating, 2 cells of Smee's battery. For electric light, 50 cells of Bunsen's. 2. What solutions should I use for gold, silver, nickel, and copper plating? A. Gold solution, 1 grain of gold and 10 grains of cyanide of potassium in 200 grains of water. For silver, 2 grains of cyanide of silver and 2 parts of cyanide of potassium in 300 grains of water. For copper, a saturated solution of sulphate of copper. For nickel, See p. 346, vol. 31.

(29) C. J. W. says: 1. I have made a Morse sounder, key, and battery for telegraphing. I made my horseshoe magnet by winding the covered wire round in the usual way, only I wound both poles to the right and then joined the wires. I made another by screwing two cores into a flat base, and wound one pole to the right and the other to the left. This has a neater appearance. Which is the best in your opinion? A. They must be so wound that the current shall flow in the same direction in both. 2. Does it make any difference to a magnet if the wires from the battery are first applied in one way, and then (by mistake) reversed? A. No. 3. How is the electric bell made? A. The armature lever closes an electric circuit when the spring draws it back, and opens it when the magnetism draws it forward. 4. What is meant by positive and negative poles of a bat