

of subtractions. It takes very little practice to render any one expert in this method, which combines the advantages of quickness and accuracy. By preparing cards from time to time, as occasion requires, one will find that he has, ere long, a pretty good stock of numbers, which, if carefully indexed, will prove very serviceable. The values of a few useful factors are appended:

- Reduction of pounds to kilogrammes: Pounds $\times 0.454$.
 Reduction of kilogrammes to pounds: Kilogrammes $\times 2.205$.
 Reduction of inches to meters: Inches $\times 0.0254$.
 Reduction of meters to inches: Meters $\times 39.37$.
 Reduction of square feet to square meters: Square feet $\times 0.0929$.
 Reduction of square meters to square feet: Square meters $\times 10.76$.
 Reduction of cubic feet to cubic meters: Cubic feet $\times 0.028$.
 Reduction of cubic meters to cubic feet: Cubic meters $\times 35.32$.
 Reduction of U. S. gallons to cubic feet: U. S. gallons $\times 0.134$.
 Reduction of cubic feet to U. S. gallons: Cubic feet $\times 7.48$.
 Reduction of imperial gallons to cubic feet: Imperial gallons $\times 0.1604$.
 Reduction of cubic feet to imperial gallons: Cubic feet $\times 6.25$.
 Reduction of U. S. gallons to imperial gallons: U. S. gallons $\times 0.834$.
 Reduction of imperial gallons to U. S. gallons: Imperial gallons $\times 1.2$.

ABOUT two thirds of the New State Capitol at Albany, N. Y., is now completed. The building thus far has cost \$5,000,000, and it is estimated that about \$7,000,000 more will be required to finish it entirely. If the State Legislature appropriate funds promptly, there is a prospect of the roof being in place by May, 1876.

Recent American and Foreign Patents.

Improved Safety Lock for Elevators.

Henry Carlile, Steubenville, Ohio.—This invention consists in providing an elevator with a pair of clamping jaws, which are actuated by the weight of the cage to seize the guides and arrest the downward movement of the carriage whenever the lift rope slacks or breaks. By the novel means employed in effecting this purpose, all chance of accident is removed, while the carriage may be held automatically at different elevations and stories. It seems admirably calculated for use in connection with the elevators employed by hotels, warehouses, and stores.

Improved Feed Water Heater and Filter.

George F. Jasper, Freeburgh, Ill.—The supply pipe passes downward through and beneath the filtering material, and the water discharged therefrom passes upward through the said material, and flows over into a series of sediment troughs or pans, and thence into the heating tank proper, from which it is conveyed to the boiler. The arrangement of the filter below the tank increases the surface available for application of heat in the furnace, when desired or necessary, as well as gives easy access to it for removal of the sediment when the furnace is fired up.

Improved Seed Planter.

Jacob R. Sample, Liberty, Miss.—This invention relates to the simultaneous distribution of comminuted manures and cotton or other seed, and consists in a peculiar shape of the opening and covering plows, together with the standards by which they are attached to the frame. This insures great uniformity and accuracy in the application both of seed and manure to the soil.

Improved Rotary Harrow and Roller.

Louis Belly, St. Anne, Ill.—This is an improvement in cultivating machines wherein rotary harrows are employed. The novel feature consists in an arrangement of parts whereby the harrows are supported entirely by the rollers and front wheels of the frame, and the revolution of the harrows arrested when raised from the ground.

Improved Stereoscope.

Absalom H. McClintock and Henry J. W. Barker, Fort Scott, Kan.—This is an improved stereoscopic apparatus designed especially for use in object teaching in classes, so constructed that a copy of the picture may be before each pupil. All the pictures may thus be exhibited, replaced by others, and moved to bring them into focus at the same time and by the same operation. Several pairs of lenses are arranged in a box, and the pictures are raised and held before the former by suitable devices. The supporting frame moves transversely to bring each picture into focus.

Improved Bale Tie.

Sewall J. Leach, Tuscaloosa, Ala.—A plate with a right-angled flange at each end is attached to one end of the hoop, and is a little narrower than the breadth of the latter. The flange is notched transversely on the inner faces to lock the free end of the hoop, which is correspondingly notched on its edges to fit the notches of the flanges. The latter are inclined in the direction to cause the hoop to draw to the bottom of the space between the flanges, and thus insure the holding of it so as not to work loose. There is also a loop on one end of the tie for the free end of the hoop to pass through, to be kept in position at the time of fastening until secured by the notches.

Locomotive Attachment for Towing Canal Boats.

Charles Howard, New York city.—The driving wheels of the locomotive are constructed with a V-shaped groove in the periphery, so as to bring the bearing diagonally on the sides of rails without touching the tops. This adds to the traction in proportion to the angle or sharpness of the groove. The towing bars are applied on the bottom of the frame, are pivoted equidistant from the wheels near the center of the frame, and are of curved shape, extending beyond the wheels. They are bent at their ends into upward and slightly forward turned hooks, and swing toward the canal, allowing thereby a free adjustment to the different positions of the towing line. Suitable guide pieces applied to the bottom of the frame control the swing of the tow bars, and a spring forces the latter sideways, when there is no strain on them, preventing the obstruction of the track by the slackened tow line.

Improved Corn Coverer and Cultivator.

James Copeland, Bloomingdale, Ohio.—The vertical arm of a standard is slotted to receive a wheel that supports the forward part of the machine when adjusted as a coverer or double shovel plow. When the machine is to be used as a cultivator, the standard may be removed and replaced by a similar standard, the lower arm of which is without a slot, is curved slightly forward, and has a hole formed through it to receive a bolt for holding a cultivator plow.

Improvement in Manufacturing Shoes.

Charles F. Hill, Baltimore, Md.—This invention consists in a shoe in which an insole, receiving the lasting nails, is covered by another insole, and the whole united by a line of stitching passing through the outer sole, upper, and the two soles.

Improved Office Door Plate.

Thomas S. Kennard, Exeter, N. H.—This invention consists in the application of time-indicating wheels and an inscribed slide to a slotted recessed plate, in such a manner that, when said slide is in a certain position, the device will indicate that the occupant of the office is out, and also the time of his return; and when in another position, that he is in, the name of the day of the week being indicated and the wheels locked in position in each case.

Improved Hydraulic Safety Valve.

John F. Taylor, Charleston, S. C.—This invention relates to certain improvements in hydraulic safety valves, whereby the valve is weighted with great convenience and facility by the fluid employed. It consists in a valve chamber provided with openings in its seat connecting with the escape pipe, in combination with a valve having different areas of pressure upon its opposite sides, the chambers upon the opposite sides of the valve being connected by a channel through the valve, so that the unit of pressure upon the valve is the difference between the opposite areas of pressure.

Improved Combined Hoe and Chopper.

Charles H. Gaylord, Osceola, Ark.—This invention consists in a tool by which the workman may cut up the soil on each side of a row of plants as he passes along, and then, giving it a half revolution, cut the weeds or surplus plants in the front and rear; the first operation being effected by a chop toward himself, while the second is produced by a chop from himself. The construction of the tool is such that the two effects are secured without changing the position of the workman, consequently with much less labor and fatigue, as well as with a great saving of time.

Improved Extension Table Slide.

James Plenkharp, Columbus, Ohio.—The grooved slides are connected by castings of angular form, with a dovetailed base. The lower half of each casting is provided with a projection or shoulder at its angle, the same being notched to receive a fastening screw or nail. Thus the castings are secured to the slides without being weakened and hence rendered liable to break at their angle, under the strain put upon them by the weight or pressure supported by the table top.

Improved Car Coupling.

Henry C. Chapman, Port Jervis, N. Y.—The outer end of the coupling link is raised or lowered by a looped rod, in which the link rests, and by which the said link may be elevated or depressed to suit the various heights of drawheads on different cars. By having a recess made in the face of the drawhead, into which the looped rod which supports the link may recede when the cars bump together, the said rod is prevented from being injured in the collision. The loop rod is suspended from a U crank of a long rod which extends across the end of the car, and which is readily turned from the side of the latter.

Improved Clamping Attachment for Tinners' Machines.

William H. Burnett, Stanfordsville, N. Y.—A standard is cast with a ribbed socket-shaped part and clamp screw for supporting firmly the operating machine parts, and with an enlarged base. For the purpose of dispensing with the permanent attachment of the standards, and for making them detachable, a strong clamping device, with circular top part fitting closely around the base of the standard, is applied by a clamping screw. The standard may be secured to any part of the bench, and also turned readily into any direction over and beyond the latter.

Improved Blind Bridle.

Francis Schwalm, Clarksville, Cal.—This invention consists in forming the cheek pieces of the bridle so that they operate as cranks on the blinds, which blinds are attached to their upper ends. By means of this improvement, the blinds may, at the will of the driver, be drawn tightly over, and so as to close the horse's eye, and held in that position until the danger is passed.

Improved Exhaust Regulator.

Charles C. Gregory, Fredericton, Can.—As the steam enters a receiver it forces up a spring piston. It then expands until the pressure is equal to that at the nozzle, when the spring will begin to react on the steam, and, while steam remains in the receiver to be forced out, will maintain a continuous uniform blast at the nozzle. A valve in the nozzle is provided for opening and closing it, to regulate the escape by opening the passage wider when the greatest pressure exists in the receiver, and closing it when the pressure decreases. This valve is operated by the piston. In case the steam should, at any time, enter the receiver in excess of the means of escape by this apparatus, the excess will be automatically allowed to escape through a pipe by the opening of a valve lifted by the piston, when the last arrives at a certain predetermined height.

Improved Gas Heater and Condenser.

Sylvanus Warren, New York city.—This is an improved apparatus, to be placed between the exhauster and the purifier of a gas-making mechanism, for heating or scrubbing the gas, and condensing from it the tar and ammonia. By suitable construction, while the gas is passing through the central compartment of a drum, cold, tepid, or warm water or air may be forced through the end compartments and small connecting pipes, to regulate the temperature of the gas as it passes to the purifier.

Improved Shingle Bolting Machine.

William A. Fletcher, Beaumont, Texas.—The pivoted rest for the bolt is provided with two clamps, operated by a single shaft, having right and left screw threads. Said clamps are worked by a single crank for opening and closing them.

Improved Steak Tenderer.

Daniel J. Shults, Mount Union, Pa.—This is a device by which steaks may be easily and rapidly made tender. It consists of two toothed plates, which are hinged at one end, to be adjustable to greater or less thickness of steak, and closed by means of a lever with sectional pinion pivoted to the inner plate, and gearing with a toothed stationary arm of the lower plate. Both plates are carried toward each other by swinging the lever to the front, and act with considerable power on the steak placed between them.

Improved Target and Toy Pistol.

Warren Lyon, Mamaroneck, N. Y.—The first invention is a toy, for use with pea shooters and the like, for the amusement of children. It consists of two or more self-adjusting targets of equal weight, arranged on the ends of radial arms of equal length secured to a rotary shaft. The target is self-righting, and may include several grotesque figures. The same inventor has also devised a toy pistol which may be used in connection with the toy target just described. A piston is arranged in the barrel, and its rod connected at the rear end with a lever. The rod has a coiled spring on it to throw the piston forward. The lever is arranged in a vertical slot in the breech, above which it projects. The lower end has a notch below the pivot, in which a spring catch drops to hold the piston spring, and to be used for tripping it by the trigger. A stop is combined with the spring catch and trigger, to prevent damage to the catch by pulling the trigger too hard.

Improved Grain Separator.

John Gordon, St. Catherine's, Can.—The novel feature in this invention is a hinged valve which may be arranged to connect at will the carrier board leading to the discharge with the carrier board leading to the suction channel. This is useful in case the separation of the wheat into lighter and heavier grades is not desired.

Improved Pump.

J. C. Chambers and S. Chambers, Dallas, Texas.—This invention consists in combining, with three bottom-valved cylinders, three valved connecting pipes, and a single discharge pipe, three differential pistons, of which one is always forcing water into the discharge pipe. This produces a continuous and uniform flow of water, and not only greatly lessens the time usually required, but also very considerably diminishes the labor.

Improved Sack Scale.

Pascal P. Parker, Parkersburgh, Iowa, assignor to himself and Milton I. Powers, same place.—To the inner edge of the scale pan are attached two standards, to which is secured an oval band having an inwardly projecting flange formed upon its lower edge, and which is provided with an open spring ring for supporting a bag, and holding the mouth open while being filled.

Improved Land Roller.

Benjamin S. Healy, Cohocton, N. Y.—The new feature in this invention is an arrangement of the double tree and draft bars whereby the draft will always be applied to the front part of the frame in whatever position the tongue may assume.

DECISIONS OF THE COURTS.

United States Circuit Court.—District of Massachusetts.

PAPER BOX PATENT.—UNION PAPER BAG MACHINE COMPANY v. LUTHER C. CRANE et al.

[Before Clifford and Lowell, J. J.—May Term, A. D. 1874—to wit: October 6, 1874.]

Lowell, J. :
 The bill is brought under section 58 of the consolidated Patent Act of 1870, 16 Stat., 207, alleging that the plaintiffs own a patent granted by them December 24, 1872, as assignees of Lorenzo D. Benner, for an improvement in paper bags, of which said Benner was the original and first inventor; that the defendants hold a patent dated February 20, 1872, for an improvement alleged to have been invented by Luther C. Crowell; that the patents interfere, and the plaintiffs pray that the patent of the defendants may be declared void. The answer denies that Benner was the original and first inventor of the improvement patented to the plaintiffs; insists that Crowell was the inventor of that held by the defendants; does not explicitly confess or deny the interference between the two, and concludes with a prayer that the plaintiffs' patent may be adjudged void.

It appears to us, on a comparison of the specifications, that they describe and claim the same invention, and the evidence proves that the plaintiffs intended that their patent should cover the same ground as the defendants'. The Patent Office decided in favor of the plaintiffs, after an interference had been regularly declared with Crowell's patent, which had already issued: upon the hearing, Crowell produced no evidence excepting his own statement, and Benner examined several witnesses, and both parties were heard in argument.

Two points of law are taken by the plaintiffs: first, that the decision of the Patent Office is final between these parties; second, that the defendants are estopped by the statute to set aside the decision of the Patent Office respecting the date of his invention to introduce evidence in this case carrying his invention back to an earlier time than that which he specified in that statement.

The decision of the Patent Office is never final upon the question of the novelty or priority of an invention. The rule may have been adopted at first from a consideration of the ex-parte character of the proceedings at Washington, but it has never been confined by the courts to the cases in which no contest was had; and it is obvious that it cannot be so limited, because, if one party to an interference is concluded as against the other party, the result may be that the patent is valid as against him, which is void against all the rest of the world. If, for instance, Crowell's invention was, in fact, earlier than that patented to the plaintiffs, the latter patent is concluded to be void as against the plaintiffs, who had no hearing before the Patent Office, while the defendants' patent would be void as against the plaintiffs, and all persons claiming under them; so that the only person who could not practice the invention would be he who had made it, and his assignees.

The statute is not ambiguous. It gives a court of equity power to decide between interfering patents without any exception or limitation. This is substantially a re-enactment of section 16 of the act of 1836, under which Mr. Justice Nelson is said to have decided the very point. *Atkinson vs. Boardman*, Law's Dig., title, Construction of Statutes 13. See, also, section 50 of the act of 1870.

By the act of 1836, interfering applications were to be passed upon by three arbitrators, and upon this act Mr. Justice Story said:
 "The award or decision of the arbitrators would have been final between the parties so far as respects the granting of the patent."
 The sole object of such an award is to ascertain who is *prima facie* entitled to the patent. But, when once obtained, it is liable to be repealed or destroyed by precisely the same process as if it was issued without opposition. *Stearns vs. Barrett*, 1 Mason, 173, 4.

Upon reasoning and authority, then, the new patent granted after a hearing merely makes out a *prima facie* case for the plaintiffs, shifting the presumption that would otherwise exist from the earlier date of the defendants' deed.

2. There is no ground for holding the statement of Crowell an estoppel. It was not made to the plaintiffs, nor intended to influence their action, and the evidence is clear that they did not act upon it.

We have examined, with great care, the evidence concerning priority of invention, and are of opinion that Crowell was the true and first inventor. He submitted his case before the Patent Office, and the examiners were led to believe that he might have obtained hints or suggestions from the drawings of Benner for a patent that was issued to him a short time before that of Crowell. It is true, those drawings were left with Mr. Coffin, one of the persons interested in Crowell's invention, and in the shop where Crowell was at work on his machines; but the evidence in this case does not prove that any use was made of them, but tends to prove the contrary. But a wholly decisive consideration, as to which the course of proceedings before the Patent Office led the examiners into error, is that those drawings do not contain the invention, and, if they had been seen and studied by Crowell, would be no answer to his claim of priority. This is now admitted by the plaintiffs, and was well known to them while the interference was going on, as appears by a letter from their counsel to the president of the company, which they have printed on page 41 of the record. As their argument before the Patent Office is not given, we do not know whether the admission was made at that time; but the fact that the decision was very largely influenced by this mistake is shown by the record, and must detract much from the weight of the adjudication.

Upon the principal point of fact we are well satisfied, not only that Crowell's invention was actually made by him, but that it was completed in 1871. The plaintiffs, not denying that Crowell made the invention, insist that he was not the first inventor, and that they have introduced evidence which they rely upon to prove that Benner made it in 1868, and that Crowell was not earlier than 1871. The defendants, on the other hand, insist that they have thrown doubt upon the claim of Benner to have made the invention at all, though he may have approached it. As we are satisfied that Crowell really made the invention before Benner or any of his witnesses say that Benner made it, we have not examined the question whether Benner ever made it at all.

Decree for defendants.

United States Circuit Court.—District of New Jersey.

FLUTING MACHINE PATENT.—SUSAN R. KNOX et al. vs. ARTHUR H. LOWEBEE et al.

[In equity.]

NIXON, J. :
 The bill filed in this case charges the defendants with infringing four different patents belonging to the complainants—to wit:

1. Patent issued to Susan R. Knox and W. D. Corlister, April 3, 1865, and reassigned to Susan R. Knox, assignee, April 1, 1870, No. 3,681.
2. Patent issued to Susan R. Knox, November 20, 1866, and reassigned to her April 25, 1870, No. 3,938.
3. Patent issued to Samuel G. Cabell, July 17, 1866, and reassigned to Flora B. Cabell, assignee, March 1, 1870, No. 3,856.
4. Patent issued to Flora B. Cabell, assignee, November 10, 1868, No. 83,924, and reassigned to Flora B. Cabell and Susan R. Knox, assignees, November 28, 1871, No. 4,653.

The defendants, in their answer, deny the validity of these patents on various grounds. They allege that the complainants were not the original and first inventors of the said inventions or of any material or essential parts thereof; that there was a prior knowledge, use, and public sale, in many parts of the United States, of machines embodying all the principles and combinations claimed as new by the complainants; that the invention had been mentioned and described in certain printed publications; that there had been an abandonment by the inventors to the public; and that there had been no written consent by the defendants of the rights and privileges alleged in the bill to be secured to the complainants by their several letters patent.

Held by the Court:
 A patentee held to have made his invention when he had a machine embodying it completed and in operation and actual use, though the use was private.

Delay in filing an application is no ground for charging the inventor with abandonment if he was residing in the jurisdictional States during the war.

Making the lower roll in a fluting machine adjustable is an infringement of a patent for making the upper roll adjustable by similar means and for the same purposes.

Making the roll adjustable by means of a crank and pinion instead of a screw is also an infringement.

Decree for the complainants against the defendants for the infringement of the first and third claims of the reassigned patent No. 3,856, and of the first and second claims of the reassigned No. 4,653; but without costs.

[J. J. Coombs and F. W. Leonard, for complainants. N. Perry, Jr., for defendants.]

Rochester, N. Y., 8th Dec. 1874.

Mr. G. W. HARROLD.

DEAR SIR:—THE PROUTY STEAM TRAP that you put in for us works to our entire satisfaction; you may now remove the other trap, as it is no longer of any use to us. We consider your Trap in every respect superior; it saves a great amount of constant labor in drawing off water, which we had to do almost constantly when heating on different floors with the other Trap. Yours respectfully,
SIBLEY, LINDSAY & CURRIE.

Business and Personal.

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

Agricultural Implements, Farm Machinery, Seeds, Fertilizers. R. H. Allen & Co., 189 & 191 Water St., N. Y.

Artesian Well Driller—Best of references, when required. Z. Hopkins, Fort Wayne, Ind.

500 pairs Sewing Machine Legs, Treadles, Wheels, &c., suitable for Scroll Saws, Amateur Lathes, Flower Pot and other Stands and Tables. Nicely japanned. Will be sold cheap. Hull & Belden Co., Danbury, Conn.

30.—The Combination Foot-Power Scroll Sawing Machine will pay for itself in one week, if run for profit. Send for circular, to A. W. Morton, 20 Platt Street, New York.

For Sale—Flint Quarry, Bone Steamer, Engine, and Phosphate Machinery. B. I. V. Miller, Coatesville, Chester Co., Pa.

Glue Factory for Sale—Steam and Water Power; all necessary Tools. Capacity, 15 barrels a day. Miller & Van Valkenburgh, Equitable Buildings, 120 Broadway, N. Y.

Partners Wanted—More working capital needed. Grounds, Shops, Tools, and Machinery, all in good working order. A rare chance for parties desirous of engaging in the manufacturing business. Correspondence solicited. Address D. Whiting, Ashland, Ohio.

Sheet Metal Drawing Presses—For the best and cheapest, address The Baltimore Sheet Metal Machine Company, Baltimore, Md.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass. Send for sample and price list.

Dickinson's Patent Shaped Diamond Carbon Points and adjustable holder for working Stone, dressing Emery Wheels, Grindstones, &c., 64 Nassau St., N. Y.

Electric Bells for Dwellings, Hotels, &c.—Most reliable and cheapest Hotel Annunciator. Cheap telegraph outfits for learners. Instruments for Private Lines, Gas Lighting Apparatus, etc. J. H. Heslin, Sec., Cleveland, O.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement. Andrews' Patent, inside page.

Faught's Patent Round Braided Belting—The Best thing out—Manufactured only by C. W. Arny, 301 & 303 Cherry St., Philadelphia, Pa. Send for Circular.

For Sale—One "Cottrell & Babcock" Water Wheel Regulator. Also, one "Harrison's" 12 in. Portable Corn Mill—all in good order—by D. Arthur Brown & Co., Fishersville, N. H.

"Fairy" Electric Engines, with battery complete, \$6; without battery, \$4. Electro-Magnetic Manufacturing Co., 36 Broad St.—P. O. Box 1904, New York.

Price only \$3.50.—The Tom Thumb Electric Telegraph. A compact working Telegraph Apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key, and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 363 Broadway, New York.

Cast Iron Sinks, Wash Stands, Drain Pipe, and Sewer traps. Send for Price List. Bailey, Farrell & Co., Pittsburgh, Pa.

Pratt's Liquid Paint Dryer and White Japan surpasses the English Patent Dryers and Brown Japan in color, quality, and price. Send for descriptive circular to A. W. Pratt & Co., 53 Fulton Street, New York.

For Solid Wrought-Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, &c.

Many New England Manufactories have Gas Works, which light them at one fourth the cost of coal gas. For particulars, address Providence Steam and Gas Pipe Co., Providence, R. I.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Mechanical Expert in Patent Cases. T. D. Stetson, 23 Murray St., New York.

For the best Portable Engine in the world, address Baxter Steam Engine Co., 13 Park Place, New York.

All Fruit-can Tools, Ferracite, Bridgeton, N. J.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Brown's Coal-yard Quarry and Contractor's Apparatus for hoisting and conveying materials by iron cable. W. D. Andrews & Bro., 414 Water St., New York.

For Surface Planers, small size, and for Box Corner Grooving Machines, send to A. Davis, Lowell, Mass.

The "Scientific American" Office, New York, is fitted with the Miniature Electric Telegraph. By touching little buttons on the desks of the managers, signals are sent to persons in the various departments of the establishment. Cheap and effective. Splendid for shops, offices, dwellings. Works for any distance. Price \$6, with good Battery. F. C. Beach & Co., 363 Broadway, New York, Makers. Send for free Illustrated Catalogue.

Temples and Oilcans. Draper, Hopedale, Mass.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

Peck's Patent Drop Press. For circulars, address Milo, Peck & Co., New Haven, Conn.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Notes & Queries

M. J. will find the recipe for diambone cement on p. 90, vol. 30 (cementing whalebone to wood).—W. H. H. and T. E. C. will find directions for bronzing iron on p. 233, vol. 31, and for tinning iron on p. 362, vol. 31.—W. L. D. can make a magnet by following the directions on p. 218, vol. 31.—J. G. M. & Co. will find a recipe for paste for use on tin on p. 253, vol. 30.—J. E. H. can nickel plate steel by following the instructions on p. 174, vol. 30.—L. T. can repair his rubber boots by following the directions on p. 203, vol. 30.—C. McE. can make a carmine red ink by the recipe given on p. 200, vol. 30.—F. M. H. and many others will find directions for nickel plating on pp. 43, 90, 346, vol. 31.

(1) E. C. asks: 1. In the present Atlantic telegraph cable is, there a floating battery, or has there been one at any time since it was laid, in mid-ocean? A. No. 2. What is the size of the batteries used at the shore ends of the cable? A. Quart cells. 3. How small a battery is it possible to use and send a communication over the cable? How small a battery has been tried, which showed indications at the other end? A. A battery composed of a single percussion cap, in each case. 4. Would it be possible in taking up the cable, beginning in mid-ocean, to communicate with the shore, unless they first separated the cable or outer coating? A. It would not.

(2) N. N. asks: What is the best battery for running a revolving armature? A. A large size Daniell, battery or the modification of it known as the gravity or Callaud battery.

(3) S. E. T. says: 1. I wish to convey water from a stream to a tank 1,000 feet distant and 30 feet higher than the stream. Will I get as good a supply of water with the same power if I lay a 3 inch pipe over the first 300 feet, a 2 inch pipe over the next 200 feet, and a 1 1/2 inch pipe over the remainder, as with a 2 inch pipe over the whole distance? A. The data are not complete, but it would be better to have the pipe the same size throughout. 2. Will chestnut sticks, with a 2 1/2 inch hole bored through them lengthwise, united with iron couplings, answer the purpose for pipe? A. Yes. 3. How many horse power will it require to give a supply of 10 gallons per minute? A. From 2 to 2 1/2 times the power required to lift the water, neglecting friction.

(4) N. N.—A very pretty magnified view of an aquarium or other object is obtained through a telescope when the objective and eyepiece are very far apart, in a tube of extra length.

(5) I. F. J. asks: How can I repair an opera glass of which the plating is discolored and the ivory broken? A. Nickel plate the metal surface, and cover with morocco leather attached with marine or other glue.

(6) S. D. E. says: 1. Eight months of labor and patience have rewarded me with a splendid reflector. I used Draper's method of silvering on glass, as described in your answers to correspondents. Any one who follows the formula must succeed. My reflector is 12 inches in the clear, with 10 feet focus. I want to set the reflector at an angle, so that I can view direct instead of using an angle mirror; and I wish to leave the tube 2 feet longer than the focus, so that my head will not be in the way of the light. Will this answer? A. If your mirror gives sharp definitions, mount it as a Newtonian; if not, mount it as an aerial, as figured by Dick. 2. Please tell me what the focal distances and diameters of the two eyepieces should be (the focus spot by the sun covers about half an inch). A. To construct a battery of eyepieces, take the highest power, say 600, and divide it by 15=40, the next power; 400+15=268+15=177, +15=59; or begin with the lowest, say 60, and make each power 1/2 greater than the one below it. 3. How far should the first glass (next to reflector) be beyond the focus? Should it be plano-convex or double convex? A. Focus is within the Huyghenian eyepiece. See No. 48, October 17, 1874. A Ramsden or positive eyepiece, for micrometer or reticule, is constructed thus: The focus of the field lens=twice the focus of objective divided by the power required. Focus of eye lens is 0.555 or 1/2 that of field lens. Distance apart is 1/3 or 0.444 of focus of field lens. Equivalent single lens is 1/2 focus of field lens. Apertures are 1/2 of focal length. Image is 1/10 of focus of field lens in front of it. Both lenses are plano-convex, the convex sides facing each other.

(7) Z. T. R. says: I wish to convey the water of a spring to my dwelling, which is at a distance of 600 yards; the pipe will have to cross a creek and swamp, making the lowest point of the pipe 40 or 50 feet below the fountain head. The spring affords water enough to fill a 2 inch auger hole through a weir with a 6 inch head. What size of pipe will be required for the work, the discharge being 15 or 20 feet below the receiving point, and consequently at a head of 15 or 20 feet at the house all the time? A. A one inch iron pipe will serve your purpose, and, notwithstanding the friction of so long a line, give water enough for a family's use. The salts in the water will very likely coat it so as to prevent the rusting of the iron. The usual thickness of a one inch wrought iron pipe will be strong enough for the pressure at the lowest point. The exterior may be covered with a wash of coal tar. 2. Who makes the best pipes, to keep water free from all poisons and rust? A. Tin-lined lead pipe is supposed to be the best pipe for the purpose. All pipe should be laid below the reach of frost. The power of a water wheel is best ascertained by experiment.

(8) J. G. H. says: I have a sawmill boiler in which the distance from the bottom of the boiler to the top of the arch is 8 inches from the arch. The brickwork is gradually sloped. We fire with sawdust, but have to use some dry slabs to get steam enough. An engineer tells me that if I

make the arch 10 or 12 inches from the boiler, and leave the space from the arch to the brick wall empty instead of filling it up, I will be able to burn more sawdust and refuse and keep up steam, without using slabs. I want to burn all the sawdust and refuse I can, and at the same time have steam enough. Which is the better way? A. We do not think that the change will produce any decided advantage, unless you make a combustion chamber, by admitting air into the space back of the bridge wall.

(9) D. N. B. asks: 1. Is it economy of fuel to buy a 10 horse power engine and work it up to 15 horse power rather than work a 15 horse engine at its nominal capacity? How much work could a well made nominal 10 horse engine be made to do without over working or straining? A. We cannot tell you anything about nominal horse power, as it varies with different makers; nor is it possible to give general rules for the most economical manner in which to run all engines, as it depends upon a number of variable quantities. 2. How might the relative value of coke and Illinois bituminous coal be stated for making steam? A. It can readily be determined by experiment. Keep account of the fuel consumed and work done. 3. What power of engine would you advise putting in, to run machines requiring (according to manufacturer's representations) an aggregate of 10 horse? A. An engine of 10 effective horse power.

(10) H. L. says: 1. I wish to construct a two inch achromatic telescope and use it both as a terrestrial and astronomical one. What would be the best object glass, and what length of focus should it have? A. See answer No. 27, October 24, 1874. 2. How should I construct the eyepiece to match? A. Put the smaller plano-convex lens next the eye. 3. What are the names, distances, magnitudes, and masses of about ten of the nearest fixed stars whose distance has been roughly ascertained? A. 61 Cygni has a parallax of 0.45", distance 44 millions of millions of miles; diameter of orbit 17 times that of the earth; light period 7 years. Sirius and α Lyra have each a parallax of 1/4 second; they are about 800,000 times as distant as the sun. 4. Please give the rates at which they appear to travel in their orbits, and towards what star they appear to travel, as well as the rate at which others move away. A. Stars approaching us are: Arcturus, 55 miles per second, Vega 44, α Cygni 39, Pollux 49, α Ursa Majoris 46 to 60. Stars receding are: Sirius 13 to 22 miles per second, Betelgeuse 22, Rigel 15, Castor 23 to 28, Regulus 12 to 17. The two fourth magnitude components of γ Virginis revolve round their center of gravity in 169 years; major axis, 7". Xi Ursa Majoris fourth and fifth magnitudes, 61 years, 5". ζ Herculis third and sixth magnitudes, period 36 years; major axis 2 1/2". 5. What time does it take Sirius's companion to go round him? A. Four hundred years, 10th magnitude; mass of satellite=half mass of Sirius. Sirius is over three million miles in diameter. 6. What are the diameters of Saturn's moons? A. Titan is larger than Mercury. It can be seen with 1 inch aperture, Japetus with a two inch. 7. In what constellations can I find five of the largest nebulae that have been found to be gaseous? A. Great nebula of Orion: Right ascension, 5h. 29m., declination S. 5° 29'. Nebula in Andromeda: 4° long, 2 1/2° broad, R. A. 0h. 36m., D. N. 40° 37'. Dumb bell nebula, R. A. 19h. 54m., D. N. 22° 22'. Annular nebula in Lyra: R. A. 18h. 49m., D. N. 32° 52'. Horseshoe nebula, R. A. 18h. 13m., D. S. 16° 15'. Two copies of SCIENTIFIC AMERICAN for 1 year and two of Science Record will cost \$10.

(11) J. McD. asks: 1. Is there any place in America or Europe where crude petroleum is used for making gas? A. There have been many attempts to employ it, some of which are still in progress. 2. Does such process pay economically, in comparison with coal? A. As yet, the various inventors have not succeeded in perfectly overcoming the practical difficulties.

(12) A. A. N. asks: Is there any way of preparing the sympathetic inks which are visible only when heated, such as solution of Co (NO₂)₂, CoCl₂, etc., so that they can be used for printing or stamping? A. We do not know of any such method.

(13) J. G. S. asks: How can I make a cheap paste for putting up paper exposed out of doors, making it impervious to any kind of weather? I should like it to form some kind of hard surface similar to varnish. A. We know of no material that will answer all these requirements.

(14) C. W. asks: 1. Are the saltpeter deposits in the Big Bone Cave, Tenn., extensive? A. It is probable that saltpeter has been obtained by lixiviation of the earth in the cave. 2. Is it true that large quantities were obtained here for the rebel army? A. The amount, though considerable, would not cause this source of supply to supersede others.

How can I preserve guns with least trouble? A. Cover the iron with a mixture of tallow and white lead.

How must I treat brier root to prevent splitting, and how can I color it for a pipe bowl? A. Boil the wood for an hour or two in water, and dry slowly. To color, hold near the fire so as to gently warm, and by means of a feather coat the surface with dilute aquafortis; oil and polish.

How can I dye hair switches dark brown? A. To a saturated solution of sulphate of copper (blue vitriol) add ammonia until the precipitate which falls is redissolved. For a mordant, to be first applied, use a saturated solution of ferrocyanide of potassium.

(15) J. B., of Wells, England, says: On removing a sheet of tin which had been placed immediately behind a looking glass plate (exposed to the sun) I discovered several circular spots, varying from two to four inches in diameter, with a dull silvery appearance and very smooth. If this was a coating of silver, can you explain how it was conducted from the plate to the tin, as the mercury on the plate did not come in contact with the tin, except at the edge of the plate? A. They were prob-

ably spots produced by a small amount of mercury volatilized from the back of the mirror, acting upon the tin.

I have two small pine trees (which I brought from America last winter) and wish to preserve. One especially is looking sickly, although both have grown a little. They were planted in a rich red soil in a low situation. Can you tell me what locality or soil would be most congenial to their growth? A. In this country, pine trees do not grow in rich, moist bottom lands, but upon arid, sandy soils.

(16) S. asks: What is a solvent of oxidized linseed oil? A. Turpentine.

(17) J. H. asks: What is a durable cement, for cementing burlaps to the edges of a frame made of building paper? A. Edmond Davy prepares a cement, which is well spoken of, by melting in an iron vessel equal parts of common pitch and gutta percha. It is kept liquid under water, or solid to be melted when wanted. It is not attacked by water; and it adheres strongly to wood, stone, glass, porcelain, ivory, leather, paper, feathers, wool, hemp, and linen fabrics, and even to varnish.

(18) H. W. asks: What is the best preparation to put upon the wood floor of a public building which is daily much used? A. In cases of this kind, the general practice is to use some cheap durable paint.

(19) J. H. A. asks: 1. Will oil in which steel is repeatedly hardened lose its hardening property? A. No. 2. Which is the best kind of oil for hardening steel? A. Common machine oil may be used; but for fine work, olive or cotton seed oil will be more satisfactory.

(20) J. W. asks: What materials are used to make amber-colored glass, beside manganese? A. Different shades of yellow may be imparted to the glass by the addition of the oxides of silver and antimony, and by finely divided charcoal; also by the presence of peroxide of iron in quantities not exceeding one per cent. The tints may be tempered by the addition of minute quantities of the purple of Cassius.

(21) J. K. asks: If a mixture of steam and air, after passing through red hot pipes, were admitted, by means of the draft, to a coal fire, would it insure a more complete burning of the smoke than if air alone were so used? A. It would be a dangerous experiment, as such a mixture (if a sufficient amount of heated iron were presented to the steam to liberate a part of the hydrogen) might be rendered explosive.

Why do the rays of the sun warm the air more in the valleys than they do on the top of high mountains? A. The air receives its warmth by contact with the earth; as the valley offers to the lower strata of air greater surface, the contact is more frequent and intimate. Something is also due to evaporation.

(22) H. A. G. asks: 1. Are glass tumblers made in molds? A. Yes. Many forms of glass ware are made by blowing into molds. 2. How is window glass made? A. In the manufacture of common window glass, the workman dips an iron tube into the melted mass, a portion of which adheres to it. This is blown into a pear shape, which becomes elongated by swinging like a pendulum. By reheating, blowing, and rolling, it is worked into the form of a cylinder, which is cut off around the top and bottom and split down the side. After again softening in the furnace, it is opened and spread out into a flat plate. 3. There is a recipe for crystal glass which states: White sand 15, red lead 10, refined ashes 4, and niter 1, parts. What are these parts? A. Parts by weight.

(23) D. H. R. asks: How can I relieve canaries from the attacks of a very small red parasite? A. Allow the birds to bathe frequently, and keep the cage very clean, with plenty of sand at the bottom.

(24) H. E. B. asks: 1. In re-sharpening files will any other kind of battery answer the same purpose as the Bunsen? A. Yes. 2. Will a zinc and porous cup battery, excited by nitric and sulphuric acids, be sufficient, and how many cups are needed? A. No doubt any kind of battery will answer the purpose, provided the electromotive force be equal to that of twelve Bunsen cells, the number employed by Mr. Werdemann in his experiments. 3. Are the files placed horizontally or in a perpendicular position? Should the positive pole connect with every file separately in the bath, or do they project above the bath and make a dry connection with the positive pole? A. Perpendicularly. The handle end of the file should project above the liquid, and connection may be made by means of a binding screw with the positive pole (copper or carbon) of the battery. 4. Will a small battery of medium strength be sufficient to sharpen a few files at a time, or even one, with a longer period of immersion? A. Possibly. The experiment is easily made.

(25) J. J. B. asks: I have been making some magneto-electric apparatus, and to insulate the wire I wrapped it with silk thread. Is there not a cheap silk thread made especially for this purpose? A. Yes. The wire is covered with raw silk floss, called untwisted silk for covering telegraph wire.

(26) I. J. S. asks: 1. Is there any way which will effectually destroy magnetism in the steel parts of watches, except passing them through the fire? A. There is no practicable method of destroying it. 2. Why do watchmaker's small tools get magnetized when there is no magnet about the shop? A. It is possible but not probable that the tools may have become magnetized by friction. It is more likely that your tools have accidentally got in contact with a magnet.

(27) M. D. says: Will you give me the simplest process of nickel-plating small objects like surgical instruments? A. Use chloride of nickel for a solution with a nickel positive electrode, and proceed as in silver plating.