

in SCIENTIFIC AMERICAN SUPPLEMENT, No. 464, crucible, open hearth, and Bessemer in 505, open hearth illustrated in 615, Clapp-Griffith in 490, description of the steel plants in United States in 535, all of which we recommend for your perusal. To soften your brushes, put the shellac brush in 95 per cent alcohol, put the paint brush in turpentine to soak, or in strong solution of soda in water.

(9) N. N. W.—It is said silver prints will not curl at the edges if they are finally washed in the following solution:

- Water 1 part.
Alcohol 4 "
Glycerine 3 "

To ventilate a small dark-room, connect the dark room light by a good sized pipe to the outer air, or to a chimney having a free draught. Then provide openings in the partition at the bottom near the floor, protected by A-shaped wings, which will keep out the light, but let in air. The larger the openings in extent are, at the bottom, the better will be the circulation. The general principle to be borne in mind, is to let plenty of air in at the bottom, with an abundant free exit for the heated, bad air at the top, protected from light.

(10) G. S. A. asks: 1. How can I make a stain for walking sticks, different shades? A. See the formulas given for stains of all colors in "Moore's Universal Assistant and Complete Mechanic," which we can send you post paid for \$2.00. 2. A method for polishing alligator teeth. A. Rub them first with fine glass paper and then with a piece of wet linen cloth dipped in powdered pumice stone. This will give a fine surface, and the final polish may be produced by washed chalk or fine whiting, applied by a piece of cloth wetted in soapsuds. 3. A method for bleaching them perfectly white after they have turned yellow. A. Use peroxide of hydrogen. See article on its application, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 339.

(11) J. H. F. asks how to make a toning bath for rich dark tones. A. If freshly sensitized paper is used, fume it for 25 minutes over ammonia. After printing, and prior to toning, wash the prints in three changes of warm water, letting the last water contain a minute portion of carbonate of soda. Pour into the toning tray the amount of gold you intend using, and neutralize it drop by drop with a saturated solution of carbonate of soda until it turns red litmus paper blue. Then add the amount of warm water necessary to complete the bath, and dissolve in the tray 100 grains of common salt. Let the bath stand for ten minutes. The longer you tone, the more purple will be the prints. They turn red at first, and then change to the desired color. If the bath is kept warm, the toning will proceed rapidly. Use an abundance of the gold solution.

(12) J. M. C. writes: While watching a pair of rough iron bevel wheels running, I saw sparks flying from the teeth. Supposing that they were caused by friction through not being properly lubricated, I examined them, found no sign of cutting or undue friction, and concluded that the sparks were from electricity, and not from heat. At the same time, in another place, one of our engines was so charged that it ran an electric bell with a single wire. A. We differ with you in regard to the cause of the sparks. The gears are metallic and are conductors of electricity. The conditions of metallic contact as with gearing do not admit of an atmospheric escape of electric sparks; they go the other way. The sparks, no doubt, are derived from the heat of friction developed in the minute particles of iron dust abraded from the surface of the teeth. The teeth of the gears would not show much increase in temperature, but any minute particles driven off by friction would take fire in the same manner as in the cold sawing of iron. The slipping of the driving wheels of locomotives strikes fire in the dust of abrasion. Your engine was charged with electricity from the belt, which is a very common phenomenon. By placing an insulated row of metallic points near the inside of the belt, a few feet from the large pulley, you may make a very interesting electric display by insulating a person on a rubber mat, or a platform set on glass bottles, and in that way, by taking hold of the end of the metallic receiver under the belt, make the person a Leyden jar, capable of giving quite a shock by touching another person or a number of persons holding each other's hands.

(13) D. E. W. asks: 1. Can iron which has been made into stove funnels, but which is nearly new, be used for the field magnet of the motor? A. It is better to use new, clean iron, but without doubt your iron will answer if well scraped and cleaned. 2. In a bichromate of potash battery, would the battery work as well if the zincs were amalgamated? A. The zincs must be amalgamated. 3. Is there any limit as to the numbers of messages which can be sent on the same line at the same instant? A. The practical limit is four.

(14) O. M. M.—There are tools sold by the dealers in emery wheels that break up the surface or true it, when glossy or out of true. Hydrochloric or nitric acid will clean a metalized wheel. Swab the surface with the acid, let it lie 15 to 20 seconds, and quickly wash the surface clean with water, and dry.

(15) F. M.—We have no knowledge of the welding compound you mention, nor have we any reliable receipts for welding cast iron to cast iron. Such work is impracticable. Steel, it is said (probably machinery steel), has been welded to cast iron by the use of borax and sal ammoniac. Cast iron that has been treated to make malleable iron can be welded to steel with borax. It is also said that two pieces of cast iron may be sweated together with borax. This process is liable to melt one or both pieces.

(16) F. B. M. asks what to use to prevent brass from tarnishing after it has been polished, as in the brass standards and lecterns of a church; the manufacturers of them put something on that kept them from becoming dull for a long while. A. Use a solution of clear shellac in 95 per cent alcohol. A half ounce shellac to one pint alcohol, cork tight in a clear bottle. Shake and set it in a warm place for a few days. Decant the clear solution at the top for your lacquer. Use a camel's hair flat brush. Heat the brass work to nearly

the temperature of boiling water, in an oven or otherwise, and varnish quickly, going only once over the work; put the work back in the oven for a few minutes to melt and make the lacquer clear.

(17) J. M. W. asks what kind of paint is the best, most durable, and smoothest to use on the bottom of small sail boats, yachts, on fresh water lakes. Used black paint composed of lamp black and linseed oil, last year, and bottom became very rough and coated with a vegetable growth. A. Use a little plumbago (pulverized) in the black paint, when dry, rub down smooth with dry plumbago on a woolen rag. Repeat the rubbing at times during the season, and if the paint gets worn off or thin, rub with plumbago and linseed oil. A little coach varnish mixed with any painter's color makes a good finish for upper work.

(18) H. N. L. asks: Will a balance wheel which is out of balance shake or tremble, if run on an upright shaft? And if so, why? A. Yes; it will shake, and if run fast enough it will shake the building. The centrifugal force of the heavy side will exert its full value upon its confining center or shaft, which will spring, and if in unison with the surrounding framework holding the journals, may set a whole building to vibrating.

(19) S. E. M. asks: What are the wages paid to good draughtsmen, and what is the best way to learn draughting? A. There is no regulated scale of wages of a draughtsman. A boy can drive a rule and pen, but it takes brains to make a good draughtsman. This commodity may be worth from \$500 to \$5,000 per annum. If you have ideas and have the energy, you will succeed accordingly. To start, get the series of SCIENTIFIC AMERICAN SUPPLEMENT, on mechanical drawing (\$2.50), with the instruments there listed, and get to work. After you have assured yourself that you can handle the pencil and pen, offer your services as assistant in some engineering establishment.

(20) T. H. asks a formula for the strength of threaded couplings on iron pipe, in supporting weight hung, as on a rope, safe load, also breaking or stripping weight. A. The ordinary make of couplings on iron pipe cannot be trusted for more than one-half the value of the area of pipe section, on the basis of 30,000 pounds per square inch, divided by 4 for safe load, or divide the area of section in square inches by 2, and multiply by 30,000 for breaking load. Divide the breaking load by 4 for safe load for short usage. If for a pump rod, divide by 6.

(21) W. B. asks: What will remove shellac and varnish from Spanish cedar without cracking or marring it? A. If it is a varnish in which turpentine was the solvent, use a mixture of alcohol and turpentine. If it is shellac varnish, it can be removed by a simple application of alcohol.

(22) P. H. asks: 1. How is royal copper, or sometimes called cypress copper, made, such as seen on lamp bodies, imported from France? A. For the red color on copper. Boil the articles in tartaric acid and water 15 minutes, rinse in cold water and dry. 2. Which is the best way to purify mercury for surgical purposes and for barometers? A. Mercury is purified by distillation, or by prolonged treatment with dilute nitric or sulphuric acids, followed by washing and heating over 212° F. Distillation is the best method.

(23) W. W. D. asks: 1. Can the small electric motor described in SCIENTIFIC AMERICAN, of March 17, 1888, be driven by a current generated by an earth battery? A. We think it would be impracticable, as it would require a large number of plates of large size. 2. What number of plates will be required, what the size of each plate and how should they be arranged in the ground so as to attain the greatest electro-motive force? A. We have no data which will enable us to estimate the number of plates required, but it would probably run up into the hundreds.

(24) E. M. writes: I have secondary coil of an induction coil 6 3/4 inches long, 2 1/4 inches in diameter, hole through center 1 1/4 inches in diameter, wound with 24 layers of No. 36 silk covered copper wire. What size of wire and how large core of primary coil for the above should be used to secure best results? A. The hole through the center of your coil is rather large—an inch, or 1 1/8 inches would have been ample. Make the core of your coil of a bundle of No. 20 soft iron wire. The primary coil should consist of 2 layers of No. 16 magnet wire.

(25) S. D. B. writes: 1. I wish to make motor one-half size of one you describe. Please inform me the size wire I must use, both iron for armature ring and insulated. A. Use No 20 wire. 2. Will it be advisable to use it for watch makers' lathes, and is there power enough for Moseley's No. 2? A. It will readily run a watchmaker's lathe.

(26) J. P. M. asks how to cover a wooden wheel with emery so that it will stick. A. Use the best and strongest brown glue, well heated and quite thick. Warm the wood, and apply the glue hot with a brush, following behind the brush with a sprinkling pan of emery, or roll the wheel in the emery as fast as the glue is applied. When dry, the excess will readily come off by scraping.

(27) D. W. C. asks: What is the metal molybdenum used for? A. The principal use of molybdenum is for the manufacture of molybdate of ammonia, used in phosphoric acid determinations, and of similar salts.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low. In accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 1, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Table listing inventions and their patent numbers, including items like Air brake, Aluminum furnace, Annunciator, Arrow for passing cord, Axle for thrashing machines, Axle lubricator, Axleplate for wheeled scrapers, Axle wagon, Axle washer, Bales machine, Baling press, Band cutter, Bar, Basket, Baskets, Bath, Batteries, Battery plates, Bed bottom, Bed pan, Bell, Bellows, Belt tightener, Bird food holder, Bleaching, Block signal, Board, Bolt, Bolt cutter, Bolting reel, Bolting reel frame, Book cover, Boot or shoe nail or rivet, Boot or shoe, ventilated, Bottles, Bottling machine, Box, Box or case, Brake, Bridle bit die, Brooder, Buckle, Buckle and spring hook, Buckle shield, Buckle, suspender, Buffing machine, Bung fastener, Bung making machine, Burial caskets, Burner, Bustle, Button, Buttonhole cutting and embossing machine, Cable grip, Cannon, Cant hook, Canteen, Car brake, Car brake, Car coupling, Car door, Car door, freight, Car, stock, Miller & Seltz, Car, street, Car switch, automatic, Cars, air brake for railway, Cars, electric lighting apparatus for railway, Cars, sand box for street, Carriage boot, Carriage boot, Carriage curtain fixture, Carriage top, Carriage top, folding, Carrier, Case, Casting saw teeth, Ceiling, Cervix clamp, Chain, drawing, Chain, drive, Chair, Chair, Chuck, lathe, Churn, Cigar boxes, Cigar bunching machine, Clamp, Clasp, Clasp, Clipping machine, Clothes drier, Clutch, friction, Coat and hat hook, Coffee making machine, Coffin, Colter, rolling, Combination lock, Conveying apparatus, Cooker, steam, Copies, apparatus for setting writing, Copper, purification and alloying of, Corkscrew, Corn shucking and shelling machine, Corn splitting and cutting machine, Coupling, Crank and lever motion, Crucible, Cultivator, Cultivator, Cultivator, Cultivator, Cut-off for spouts, Cutter, Damper, stovepipe, Dental foil, Derrick, Disks from wood, machine for cutting, Door button, Door check, Drier, Drum, H. G. Lehnert, Drum head strainers, Egg carrier, Electric currents, converting and distributing, Electric machines, armature for dynamo, Electrical distribution, system of, Electrical transmission of power, Electro-magnetic motor, Elevator, Elevator safety device, Elliptic spring, Engine, Envelope, elastic folding display, Exhaust, utilizing, Explosive charge, Explosives for use, preparing, Fabric, Fabric turfing implement, Fan, Fan, Fan, Fan for ventilating purposes, Faucet attachment for barrels, Faucet, wooden, Feeding device, Fence, Fence, H. Mater, Fence, P. Miles, Fence post, File, paper, Fire alarm signal circuit, Firearms, rear sight for, Fire escape, Fire escape ladder, Fire hydrant, Fire kindler, Fires and preventing the escape of steam in railway cars, device for extinguishing, Fires in railway cars, device for extinguishing, Fish plate, Flour bolt, Fork guard, Frame, See Bolting reel frame, Furnace bridge wall, Fuse for projectiles, contact, Gauge, Gas and air, device for mixing, Gas burner, automatic electric, Gas lighter, electric, Gate, Gate, See Hatchway gate. Railway or farm gate, Gate, F. W. Berning, Glass cutting table, Glassware, coloring, Glove package binder, Gloves, etc., fastener for, Grain binding machine, Grain cradle, Grate bar, Grate, dumping, Renland & Fisher, Grate, fire, D. M. Crumley, Grinding mill, Hair curling and crimping device, Hame fastener, Hanger, Harrow, disk, Harrow, leveler, and cultivator, combined, Harvester, S. D. Maddin, Harvester, corn, Hatchway gate for elevators, Hay rake, horse, Hay stacker, Heel protector, Heeling machine, Tyler & Merritt, Holder, See Bird food holder. Penholder. Tire bolt holder, Hook, See Cant hook. Coat and hat hook, Hoop, J. Leach, Horse detacher, Horseshoe, Horseshoe, J. E. & W. Bingham, Horseshoe, Jonas & Hirsch, Horseshoe pliers, S. J. Hurley, Hose nozzle, Ice dog, Igniting apparatus, electric, Indicator, Indicator, Street and station indicator. Water gauge indicator, Inhaler, C. C. Sharp, Insulating joint, Ironing board, Jack, Jar fastening, Joint, See Insulating joint. Sheet metal joint, Keyhole guard, Knitted fabric, Knitting machine, Knitting machine, straight, Ladder, E. A. Sherman, Ladder with jump shelf, Lamp, H. A. Black, Lamp and burner, central draught, Lamp, carbureting gas, Lamp, miner's safety, A. Howat, Lamp, oil spray or vapor, Nelson & Taylor, Lamp sockets, protector for electric, Lamps, adjustable nipple for incandescent electric, Leather gouging machine, Leather scraping machine, Letter box, Lever, quaternary yielding, Lifting jack, Liquid forcing apparatus, Liquids, apparatus for cooling, Lock, See Combination lock. Nut lock. Safe lock, Lubricator, See Axle lubricator, Malt liquors, making, Mandrel, roller, Measuring device, rope, Meat cutting machine, Mechanical movement, Metals by means of electrolysis, apparatus for producing, Meter, See Water meter, Mill, See Grinding mill. Rolling mill. Sawmill.