

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less 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. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Sugar Machinery. Atlantic St. Engine Wks. Bklyn. N. Y. Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

Assays of Ores, Analyses of Minerals, Waters, Commercial Articles, etc. Technical formulæ and processes. Fuller & Stillman, 40 & 42 Broadway, N. Y.

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Telephones, \$2 a pair. Newest, cheapest, and best. Send for circulars. Wm. R. Brooks, Phelps, N. Y.

Coulter & McKenzie, of the Bridgeport Iron Works, want to trade a 2d hand Chain Feed Lathe, 32 x 11 feet, with boring table, for a small engine lathe. Address as above.

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The new fragrant Vanity Fair Cigarettes. New combinations of rare Old Perique and Virginia.

Telescopes of all sizes manufactured; also, telescopes carefully corrected and repaired at short notice. I have testimonials from Lewis M. Rutherford, 175 2d Ave., N. Y., certifying to the perfection of my telescopes. John Byrne, 314 E. 21st St., New York.

To Manufacturers of Firearms.—The right to manufacture a first-class breech-loading, long range rifle for target or sporting purposes, may be secured by addressing W. M. Clarke, 362 Plane St., Newark, N. J.

Corliss Engines. Watts, Campbell & Co., Newark, N. J. Any of our readers in the smaller cities and towns, who are seeking employment, or who wish to add to their incomes, would do well to correspond with the H. W. Johns Manufacturing Company, No. 87 Maiden Lane, New York. Their Asbestos Roofing, Steam Pipe, and Boiler Coverings, round and flat Steam Packing, Fire-proof Sheathings, Coatings, Cements, etc., are universally needed, and find a ready sale at all seasons of the year. This company are also the most extensive manufacturers in this country of strictly first-class Liquid Paints for dwellings and general structural purposes, and they offer liberal inducements to reliable men as local salesmen.

Manufacturers of Hardware Specialties address G. Webster Peck, Manf's Agent, 110 Chambers St., N. Y.

Bunnell's New Nickel Solution; rapid in action; white and perfect deposit on all metals; works on zinc, iron, solder, etc., without coppering; easily managed; and low price. Guaranteed to infringe no patent. Bunnell, 112 Liberty St., New York.

Catalogues and Circulars of our latest Scientific Publications, mail free. E. & F. N. Spon, 446 Broome St., N. Y.

Case Hardening Preparation. Box 73, Willimantic, Ct.

Nickel Plating.—Wenzel's Patent Perforated Carbon Box Anode for holding Grain Nickel.

H. Prentiss & Company, 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N. J.

Photo-Engraving taught by an expert. O., 10 College Place, New York.

Neophonography.—Saves four fifths the labor of writing; every sound expressed; no stenographic hooks or crotchets. 50 cts. Harroun & Bierstadt, 60 Reade St., N. Y.

Belcher & Bagnall, 25 Murray St., N. Y., have the most economical Steam Engines, Boilers, Pumps, in market; also improved wood and iron working machinery.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N. Y.

Bolt Forging Machine & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

For Sale Cheap.—Second-hand 8 foot Boring and Turning Mill, Lathes, Planers, Drills, Bolt Cutters, etc. Circulars. D. Frisbie & Co., New Haven, Conn.

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

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For Sale.—Brown & Sharp Universal Milling Machine; Bement Profiling Machine; first-class 2d hand Machine Tools. E. P. Bullard, 14 Dey St., N. Y.

Send for circulars of Indestructible Boot and Shoe Soles to H. C. Goodrich, 40 Hoyne Ave., Chicago, Ill.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N. J.

Eagle Anvils, 9 cents per pound. Fully warranted. 1,000 2d hand machines for sale. Send stamp for descriptive price list. Forsaith & Co., Manchester, N. H.

Galland & Co.'s improved Hydraulic Elevators. Office 206 Broadway, N. Y., (Evening Post Building, room 22.)

Brush Electric Light.—20 lights from one machine. Latest & best light. Telegraph Supply Co., Cleveland, O.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are to be sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

J. C. Headley, Consulting Engineer and Mechanical and Scientific Expert, Lawrence, Mass.

Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St., N. Y.

For Town and Village use, comb'd Hand Fire Engine & Hose Carriage, \$350. Forsaith & Co., Manchester, N. H.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 23d & Wood St., Phila., Pa. Vertical & Yacht Engines. N. W. Twiss, New Haven, Ct.

Walrus Leather, Walrus Wheels; all kinds of Polishing Supplies, in quantities to suit. Greene, Tweed & Co., New York.

Dead Pulleys that stop the running of loose pulleys and their belts, controlled from any point. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Partner Wanted.—See advertisement on inside page.

Best results obtained from Success Turbine Water Wheel. References given. S. M. Smith, York, Pa.

The new "Otto" Silent Gas Engine is simple in construction, easy of management, and the cheapest motor known for intermittent work. Schleicher, Schumm & Co., Philadelphia, Pa.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

Self-feeding upright Drilling Machine of superior construction. Drills holes from 1/8 to 1/2 in. diameter. Pratt & Whitney Co., Manufs., Hartford, Conn.

The Lambertville Iron Works, Lambertville, N. J., build superior Engines and Boilers at bottom prices.

Blake's Belt Studs; strongest, cheapest, and best fastening for Leather or Rubber Belts. Greene, Tweed & Co., New York.

The Best Friction Clutch Pulley and Friction Hoisting Machinery in the world, to be seen with power applied, 95 and 97 Liberty St., New York. D. Frisbie & Co., New Haven, Conn.

Inventors' Models. John Ruthven, Cincinnati, O.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Warranted best and cheapest Planers, Jointers, Universal Woodworkers, Band and Scroll Saws, etc. manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.



(1) J. J. B. asks how water colors are mixed and formed into cakes, and what kind of paint is used. A. Mix almost any of the finely ground pigments with a thin mucilage of gum arabic, or dextrine.

(2) W. H. A. asks: 1. How to cast metals, such as zinc, copper, German silver, antimony, and britannia, in plaster of Paris moulds. I want to make very fine work, taken from nature, leaves and flowers, which cannot be cast in sand. A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 17, for full directions for casting soft metals in plaster moulds. 2. How to make a small furnace, to melt about from 10 to 20 lbs. of metal. A. Any of the fusible metals or alloys may be melted in an iron ladle over a common fire. Copper, brass, German silver, and the metals which fuse only at high temperatures, may be melted in a crucible in a draught furnace, which is simply a modification of a common coal stove.

(3) G. H. writes: I have a plano-convex lens two and three quarter inches in diameter and three quarters of an inch thick in the thickest part. Could I use it in a camera obscura? A. The focus of your lens is too short for a camera obscura.

(4) H. W., Jr., asks how to temper steel to the hardest possible degree. A. Heat it to a cherry red and plunge in mercury. As the vapor of mercury is deleterious it should be used with great care.

(5) F. S. C. asks: What boiler should I use for a steam buggy to go on a common country road? Give size and weight of boiler and engine, weight of water and fuel. [Perhaps some of our readers who have experimented with such wagons will be kind enough to furnish some account of their attempts.]

(6) C. F. F. asks: What would be the suitable size pipes for vacuum pan, which is fed by a one and one quarter inch live steam pipe, always open full? Also, should a check be used between the boiler and the pan, same as pump? A. It is generally best to use a check valve, and there is nothing gained by making the drain pipe larger than the supply. It should lead from the vacuum pan on an incline, and should be arranged with a vertical fall to the boiler, if possible. Unless the lowest point of the vacuum pan is above the water level of the boiler, a trap or its equivalent will be required.

(7) J. L. K. asks: 1. For recipe for cement for fastening brass collars to kerosenelamps (not plaster of Paris). A. The following is recommended by Puscher; Caustic soda, 1 part; rosin, 3 parts; water, 5 parts; boil until complete saponification is effected and mix the product intimately with one half its weight of zinc oxide, white lead, chalk, or plaster of Paris. The latter is preferred, as it hardens more quickly. 2. I have some paint brushes which are quite hard (paint dried on them) and useless. Can you tell me how to remove paint without injuring brushes? A. Long soaking in benzole or carbonic sulphide will in some cases suffice.

(8) C. F. S. writes: 1. I have an open fire place or grate for heating rooms on first story, with airtight ash pits underneath in the cellar. There is an opening through which the ashes fall into the ash pit. How can I prevent the fine ashes from flying or blowing back when we let the ashes from under the grate down through the ash pit? A. You might make a box or trap having a door at the top and bottom. Into this, with the lower door closed, dump the ashes, then close the upper door and open the lower one. 2. Also, what will take tobacco and other stains out of marble? A. Moistened caustic lime with washing soda, and cover the marble with this for a few hours; then rinse and scour with strong soap-suds and a stiff brush, rinse again and rub dry with a cloth.

(9) H. H. M. asks: 1. With what number of wire shall I wind the core for the gas pipe magnet described in your paper some time ago, core to be of 1 inch pipe, 3 inches long? A. The size of wire depends upon the use to which the magnet is applied. 2. How much wire shall I use to make a good magnet? A. About 5 or 6 layers. 3. Will such a magnet, with three or four gravity cells, be sufficiently strong to make good telephone magnets? A. This form of magnet is not adapted to telephones. See SCIENTIFIC AMERICAN SUPPLEMENT No. 142, for directions for making telephones. 4. How should the coils be arranged; should each coil be independent, and all joined to a common conductor, or should there be one continuous circuit through them all? A. The telephones should all be in one circuit.

(10) W. S. A. asks what makes solid iron float in melted iron. Is it on the same principle as the floating of ice? A. Yes.

(11) H. P. W. writes: I have a riveted boiler iron tube two hundred and forty feet long and twenty-eight feet diameter to lead the water to a turbine wheel. Can I protect it against rusting by painting, and with what kind of paint? A. Apply one or two good coats of asphaltum varnish, allowing each coating to dry or harden thoroughly. If the water moves with great velocity, paint or varnish will not last very long on the interior.

(12) B. F. S. asks: 1. Can you tell me how asphaltum is prepared or where it is obtained? A. Asphaltum, also known as bitumen, is a black, glossy, brittle resin, probably formed by the gradual oxidation of petroleum. It occurs very abundantly on the island of Trinidad, on the northern coast of South America, at the mouth of the Orinoco, on the waters of the Dead Sea (anciently *Lacus Asphaltites*), and in several other localities. It is somewhat soluble in alcohol, and readily so in naphtha, benzole, and turpentine. It is used in varnish making (iron varnish), in engraving copper and steel with an etching ground, and as an oil paint. Asphalt mixed with gravel, sand, lime, limestone, etc., is largely used for paving purposes, being durable and somewhat elastic. 2. What are its uses, and can it be used with success in cold climates on account of frost? A. As far as we know it has been used for this and other similar purposes in cold climates with good results.

(13) A. P. asks: To increase the speed of our mill, which would be the most advantageous, to increase the size of pulley on shaft or decrease the size of pulley on mill spindle? A. The former.

(14) G. M. asks: 1. Is it necessary for the helix to exactly fit the bar of steel to be magnetized? A. No, but a good fit gives the best results. 2. How much and what size wire must I use for making magnets? A. This depends entirely on the size of the magnet and the power of the battery. See SCIENTIFIC AMERICAN SUPPLEMENT No. 142, directions for making telephone magnets. 3. Can it be made any stronger by leaving it in longer, than pushing it once nearly through and then back to its place and then breaking the current? A. No.

(15) C. R. H. asks: Is it possible for a number of persons to move a table by electricity by placing their hands upon it, without pressing upon it? A. No.

(16) "Imperial" asks in what country locomotives were invented, and when. A. In France, 1769, by Cugnot.

(17) N. H. B. asks for recipe for bronze blacking for leather. A. Make a concentrated solution of RRB methyl violet in a boiling solution of 4 parts shellac in 1 part of borax, and about 15 or 20 parts of soft water.

(18) J. B. asks: 1. What chemicals are used in Babcock fire extinguishers? A. The tank is half filled with a strong solution of carbonate or bicarbonate of soda, over which is suspended a leaden cup containing commercial sulphuric acid. 2. Can I use the chemical for fire extinguisher without using their apparatus? A. Yes. 3. Is there any other chemical which will act and answer for the same purposes? A. Carbonates of lime, potassa, iron, etc., with any of the stronger acids, will answer nearly as well, if economy is not considered. The acids must of course be kept in vessels not corroded by them.

(19) G. J. asks: What is a horse power? From whence did it originate? What is the horse power of the United States? A. A horse power is the equivalent of 33,000 foot lbs. of work per minute. The expression was first used by James Watt, we believe. According to the census of the United States, taken in 1870, the steam power employed in manufactures was 1,215,711 horse power, and the water power, 1,130,431 horse power.

(20) O. A. S. asks: 1. In making an electro-magnet for a magneto-electric machine, is it better

to use coarse wire (No. 24) or fine wire (No. 32), and which gives the better result? A. The magnets are generally wound with coarse wire, from No. 4 to No. 16, according to the style of the machine. The armature is wound with fine wire for intensity and coarse wire for quantity. 2. Are "Notes and Queries" in the SCIENTIFIC AMERICAN Export Edition? A. Yes.

(21) C. H. A. asks: 1. Can charcoal be used for the carbon in the battery described in No. 149. SUPPLEMENT, in "How to Make an Electric Light"? A. No. 2. How is the wire fastened to the zinc plate? Will merely putting the wire through a hole in the zinc and twisting it answer? A. Yes. 3. Does the amalgam serve any purpose other than to keep the zinc from being destroyed rapidly? A. It improves the efficiency of the battery and keeps the zincs clean. 4. How can I make an iron mould for making carbon according to the directions given in the above mentioned article? A. Make a pattern and have it cast. 5. How is oxygen made from chlorate of potassa and binoxide of manganese? A. Potassium chlorate, 4 parts; pure manganese bin-oxide, 1 part; heat the mixture in a retort of porcelain, earthenware, glass, or iron, until no more gas is given off. 6. What is the peculiar odor which arises when hydrogen is being made with zinc shavings and sulphuric acid? A. It is due to impurities in the zinc, and may be removed by passing the gas through strong solutions of potash and silver nitrate. 7. Is there any truth in the statement that cotton is more quickly bleached when under peach or apple trees in bloom, than when placed anywhere else on the grass in the sun, the goods of course treated alike in other respects? A. No.

(22) C. F. S. asks if the true ratio of the circumference of a circle to its diameter has ever been found. A. If you mean the numerical value of this ratio, we answer, no; although the difference between the number used and the true number is so small as to be of no practical importance.

(23) J. R. G. writes: I see in SCIENTIFIC AMERICAN, January 4, the article "A Fast Little Side Wheeler" by C. A. Thompson, Owego, N. Y. He used vertical boiler and a small boat for private use. Please tell me whether his boat was commissioned by United States officers. I did not know that such a boiler would be allowed. I wanted to use such a boat, but the United States officers said it must be commissioned and I must use licensed pilot, captain, and engineer. A. All boats using steam power are subject to the United States inspection laws. In some sections of the country, we have heard that vertical boilers are not allowed, but we would be glad to receive more detailed information from inspectors or others who are familiar with the special regulations in such localities, and the reasons for the same.

(24) H. H. H. asks: 1. How does the injector work? Please give a full explanation. A. Bourne, in his "Treatise on the Steam Engine," gives a concise explanation which is quite satisfactory: "As the power resident in a jet of steam is expended in giving momentum to its particles, it is clear that any instrument which recovered this power from those particles, and expended it without waste, would produce the same effects which are producible by the expenditure of the same quantity of steam in an ordinary engine. This is what is done, with more or less efficacy, by Giffard's injector, an essential condition to the action of which is, that the water supplied to it shall not be so hot as to refuse to condense the steam. As the steam itself disappears, the power previously existing in it is expended in the propulsion of the water, and the amount of that power is sufficient to force the water into the boiler in opposition to the pressure of the steam." 2. Also, what is the size of the Great Eastern, and what size engine is used to run her? Give dimensions of cylinder. A. The Great Eastern is 680 feet long, 82 1/2 feet broad, and 58 feet depth of hold. She has four screw engines, 84 inches diameter of cylinder, 4 feet stroke, and four paddle engines, cylinders 74 inches in diameter, 14 feet stroke. 3. Also what is the size of the largest steamboat run on the Ohio river? A. We must ask some of our Ohio readers to answer this question.

(25) S. A. writes: I have a high pressure engine, 30 inches cylinder, 60 inches stroke. I think of putting in a condenser. Which will give the best result, a jet condenser or a surface condenser? I have a large pond of water of 5 feet fall that I can run through the surface condenser, which I think will save the expense of a pump. All the pump I would require would be a small one about 3 1/2 inches to draw the water from the condenser and force into the boiler. A. From your description we think your plan for the application of a surface condenser is good.

(26) Ph. D. says: In amalgamating zincs I have used a solution of 8 ounces of mercury in a mixture of 1 lb. of nitric and 5 lbs. of hydrochloric acid. It was only necessary to dip the zinc for a moment in the milky liquid thus prepared to obtain a good coating of mercury. Lately, using the same proportions and acids of the same quality (so the druggist tells me), I have met with poor success—the solution looks less milky and it is necessary to rub the metal hard with the brush to get any coating at all. The zincs are well cleaned before putting them in the mercury solution. Is it possible the temperature has an effect? A. The acids laterally used were probably stronger or warmer than formerly, in which case a larger proportion of mercuric salt formed. The milkiness is due to basic nitrates and calomel. Dilute the nitric acid a little and allow the solution to take place in the cold.

(27) T. S. asks how phosphorescent sulphide of calcium, called Canton's phosphorus, is prepared. A. 3 parts of clean oyster shells or mother-of-pearl are reduced to impalpable powder, mixed intimately with 1 part of flowers of sulphur, and the mixture strongly heated in a crucible for an hour. Grotthus directs that the powdered oyster shells be placed in alternate layers with the sulphur and heated for some time at a moderate temperature.

(28) T. D. F. asks how to make scidlitz powders. A. Tartrate of soda, 2 drachms; bicarbonate of soda, 2 scruples; mix and wrap in blue paper. Tartaric acid, 35 grains; powder, and put in white paper.