

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 is 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.

Mellen, Williams & Co., 57 Kilby St., Boston, Mass. Wiegand Sectional Steam Boiler. Aetna Rocking Grate Bar.

Magic Lanterns and Stereopticons of all prices. Views illustrating every subject for public exhibitions. Profitable business for a man with a small capital. Also lanterns for college and home amusement. 74 page catalogue free. McAlister, Mf. Optician, 49 Nassau St., N. Y.

Vertical Engines, 10 to 15 H. P., thoroughly well made. John Hartick & Co., 47 Gold street, New York.

National Steam Pump is now on exhibition at the American Institute; also 46 Cortlandt St., N. Y.

Machinists.—A good way for cutting screws of double, triple, or more threads, sent for 25 cents. E. Judd, Mt. Holly, N. J.

Steam Launch, new, 35 x 7½ ft.; engine, 6½ x 6 in.; 36 in. wheel; patent boiler; for sale at a sacrifice. Address D. C., Box 707, Yonkers, N. Y.

Three Drop Flue Boilers and Connections for sale, 6 x 26 ft.; also other Machinery, at Manhattan Sugar Refinery, 251 South St., New York.

J. M. Kurtz, Weston, Mo., desires to correspond with Manus. of Rules. See description in reading columns.

For Sale cheap.—A Two Horse Power Engine, new. Call on or address D. Juckett, Stanfordville, N. Y.

Right to manufacture a salable patented article desired by an old established house; would pay royalty or purchase. G. Thomas, Box 23, West Troy, N. Y.

To Manufacturers.—A saving of from 15 to 25 per cent of customary outlays can be effected by use of the Asbestos Liquid Paints, Roofing, Boiler Coverings, etc. Samples and full particulars will be sent free by the H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, who are the most extensive manufacturers in this line in the world.

Special Planers for Jointing and Surfacing, Band and Scroll Saws, Universal Wood-workers, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

Useful Books for Engineers and Mechanics. Catalogues free. E. & F. N. Spon, 446 Broome St., New York.

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.

The Lawrence Engine is the best. See ad. page 254.

For the most substantial Wood-Working Tools, address E. & F. Gleason, 52 Canal St., Philadelphia, Pa.

Wheelbarrows.—Over 50 styles, with felloe-plated, bolted wheels. Pugsley & Chapman, 8 Liberty St., N. Y.

Exhibition Magic Lantern and 60 Views, only \$25. Catalogue free. Outfits wanted. Theo. J. Harback, Importer and Manufacturer, 809 Filbert St., Phila., Pa.

North's Lathe Dog. 347 N. 4th St., Philadelphia, Pa. Sheet Metal Presses, Forrester Co., Bridgeton, N. J.

Use the Patent Improved Sheet Iron Roofing and Drip Crimped Siding made by A. Northrup & Co., Pittsburg, Pa. Send for circular and prices.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N. J. English Agency, 18 Caroline St., Birmingham.

Boilers ready for shipment, new and 2d hand. For a good boiler, send to Hilles & Jones, Wilmington, Del.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

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

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

Water Wheels, increased power. O. J. Bollinger, York, Pa.

We make steel castings from ¼ to 10,000 lbs. weight, 3 times as strong as cast iron. 12,000 Crank Shafts of this steel now running and proved superior to wrought iron. Circulars and price list free. Address Chester Steel Castings Co., Evelina St., Philadelphia, Pa.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in Scientific American of last week.

Cutters, shaped entirely by machinery, for cutting teeth of Gear Wheels. Pratt & Whitney Co., Manufacturers, Hartford, Conn.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See advertisement.

Address Star Tool Co., Providence, R. I., for Screw Cutting Engine Lathes of 13, 15, 18, and 21 in. swing.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y. Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

The Turbine Wheel made by Risdon & Co., Mt. Holly, N. J., gave the best results at Centennial test.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

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.

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

Notes & Queries

(1) A. F. McA. writes: I send you a scale from a boiler. What will dissolve it? What chemicals is it composed of? I have been using a siphon (steam) for lifting water from my well. Have had great difficulty in keeping my boiler supplied with water since I have been using it. Had none before. Is it because the water is warm in the tank? A. The incrustation consists chiefly of lime carbonate and sulphate, alumina, silica, iron, and organic matter—for the most part readily soluble in hydrochloric acid, which, however, cannot be used in boilers without corroding the iron. The thick portions of the incrustation will have to be removed by mechanical means. It may be somewhat softened by adding a little carbonate of soda to the feed water (about 1 lb. to 40 gallons); but where such addition is made it is necessary to guard against low water and to use the bottom blow out frequently. The proper use of the alkali and the blow out will, in a great measure, prevent the formation of incrustations. If the feed water contains much suspended matter it should be filtered. See p. 107 (31), current volume of the SCIENTIFIC AMERICAN.

(2) J. T. A. asks how the best improved shoemaker's ink is made. A. See pp. 316 (4), vol. 38, and 252 (48), vol. 37, SCIENTIFIC AMERICAN.

(3) Nemo asks for a few hints as to how he can take plaster casts of a human face and hair. A. Place the subject upon his back, with the head raised to the normal position by a pillow of bran or sand, cover the parts intended to be cast with a film of olive or true almond oil, applied with a feather brush or lump of cotton; plug the ears with cotton wool, and insert two quills or pieces of glass tubing in the nostrils and secure the space around them with cotton. When all is ready mix the plaster of Paris with warm water to about the consistency of cream, and with this cover the face from the forehead downward to the lower border of the chin. The eyes should be firmly closed, but in such a manner as not to cause distortion by too violent compression. Then cover the parts of the chest and arms to be represented, carrying the plaster upwards, so as to join the cast of the face. Then (when properly set) carefully remove each, and soak or brush it with linseed oil boiled with a little sugar of lead or litharge. Instead of casting the face and chest in two separate pieces, it is preferable to make the casting in one piece, and to divide it into 4 or 5 sections before removing, by means of threads placed in position before the plaster is applied, and withdrawn when the latter has nearly set. The cast of the back of the head is usually taken by lowering it (well oiled) into a deep trencher partially filled with the liquid plaster, and the back of the neck with the subject face downward. When the mould is finished it is firmly tied together, the joints plugged with a little cotton wool, well oiled on the inside, and a sufficient quantity of tolerably fluid plaster poured in. When the outer portions of the model have nearly set the inner portions are scooped out, and the whole thoroughly dried before removing the mould. The model is trimmed with a sharp knife. If the eyes are not to be represented as closed they must be carved out from the mass.

(4) R. E. A.—See pp. 226 and 395, vol. 37, SCIENTIFIC AMERICAN.

(5) C. C. C. writes: 1. I wish to study chemistry with a view to becoming an analytical chemist and assayer. How long would it take me to complete the course in a university, and is it a good profession? A. The university course (chemical) usually occupies four years; consult the circulars and reports of any of those institutions. The services of ingenious, industrious, and practical chemists are always in demand and command high prices, but many fail in the profession for want of the peculiar natural aptitude or qualifications requisite. 2. Do all large manufacturing establishments have a chemist? A. Not all, but many, in this country.

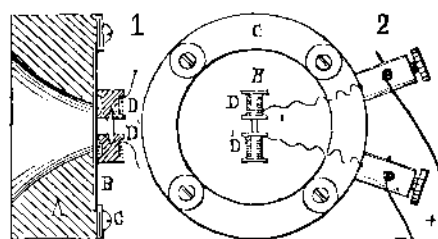
(6) H. S. C.—You may try the cements mentioned on pp. 171 (3), current volume, and 11 (3), vol. 38, SCIENTIFIC AMERICAN.

(7) E. H. O., Jr., referring to the dynamometer described in No. 9 of the current volume, asks: 1. Will the weight, W, be double the strain on the belt unless the diameter of the gear, D, = ½ that of the pulley, A, and the diameter of the gear, E, = that of D? 2. Must the diameter of B bear any ratio to that of either of the others, and if so, what and why? A. The dynamometer measures the power used in driving a machine by the force or weight necessary to hold in place the graduated lever or balance connected with the shaft of the wheel, W, so as to communicate the motion of the pulley, P, to the pulley, B. The diameter of the bevel gears has nothing to do with measuring the power, and may be more or less than that of the pulleys, provided they are equal with each other. If you place a weight of 1 lb. on each end of a lever or scale beam, it is evident

that the point of suspension of the scale beam must support the weight of 2 lbs. So the weight on the graduated lever must be equal to the strain of the belt on the rising side of the pulley, P, added to that on the opposite side of the pulley, B, which drives the machine: therefore each belt bears the strain of half the weight indicated by the balance, the pivot of the shaft of the pulleys being the fulcrum of motion of the balance. In other words, the fulcrum of the lever, which is the shaft of the pulleys, bears not only the weight on the graduated lever, but also the weight lifted at the other end.—S. B.

(8) J. W. S. asks: 1. Would a machine, if it could be made to run within itself, be termed perpetual motion? A. Yes. 2. Some people claim that the United States Government offered a reward to any person that could invent perpetual motion. Is this so? A. No.

(9) W. L. S. writes: I have made several forms of microphone, the most effective of which was constructed as follows: Referring to the accompanying engraving: The mouthpiece, A, was turned from walnut, and a ferrotypic plate, B, 2¼ inches in diameter, attached, a light ring of blotting paper being placed on



each side at its edge, and the whole secured by screwing over it a flat iron ring, C. Two little cups of gas carbon, D, D', are securely glued upon the disk as near its center as possible. In their cavities rest loosely the ends of a pointed rod of graphite about ⅛ inch long and ⅛ or ⅞ inch thick. It was cut from the core of an ordinary lead pencil. Around the body of each cup is carefully wrapped the exposed end of a piece of insulated copper wire, the other end of which is in connection with its binding screw. Interposing the microphone thus made, and a Bell telephone, in the circuit of one or two Grenet cells, the slightest scratch or rub of a feather was at once audible. The usual experiments with the microphone have been sufficiently described to obviate the necessity of repetition here. Placing the mouthpiece of the present instrument upon my body, a listener with the telephone at the other end of the line, about 200 feet distant, was able distinctly to hear the beating of my heart. The same was still audible, though more faintly, when merely a single finger was placed on the ferrotypic plate, and even when the contact was made by means of a short steel rod held between the fingers, while the further end rested as near as convenient to the middle of the disk. This experiment has been successfully repeated with different auditors. Thus far this form of microphone has not yielded satisfactory results when used as a telephone transmitter of articulate speech. Vocal music is taken up by it, but the reproduction is somewhat harsh. Whistling is transmitted less harshly, but not so satisfactorily as when an ordinary telephone is used. Several different sounding boards have been tried, including the one referred to, the sounding box of a tuning fork and that of a sonometer, a stretched membrane, and a mica plate, but I have found the ferrotypic disk best.

(10) N. S. writes: I wish to know if I can electroplate steel or iron with Mexican dollars, and what solution is needed? A. It will be necessary to purify the silver. The best solution for silver plating is the double cyanide of silver and potassium, prepared by dissolving the silver oxide or cyanide in excess of potassium cyanide.

(11) F. W. M. writes: Will you please inform me how large an engine it will take to run a lathe with as much power as an ordinary man? How large a boiler, upright, will it take to supply steam for such an engine? How many and what size tubes should you use? A. Make an engine with cylinder 2 x 3. Boiler 10 inches in diameter, 24 inches high, with 23 tubes, ¾ inch diameter and 12 inches long.

(12) C. T. asks how to prepare steel or brass articles for silver plating, so that the silver will not scale off when burnished. A. Immerse for a few minutes in a hot solution of potash or soda, rinse (without touching) in water, dip in dilute nitric acid, remove, and scour with a stiff brush and fine sand if necessary. Then attach the wire, dip again momentarily in the acid, pass quickly through clean water, and immediately place in circuit in the bath.

(13) L. S. I. wishes to know what are the reactions between the hyposulphite of soda (Na₂S₂O₃) and sulphate of lime (CaSO₄+2H₂O), and what is the resulting compound. A. If the calcium sulphate is neutral there will be no reaction.

(14) W. H. A. asks: 1. What is the motive power of vacuum pumps, and how is it applied? A. Steam is first condensed, thus letting the water into the pump chamber, from which it is then raised by direct steam pressure. 2. Has the pressure of liquids ever been used (as the principal motive power) for raising water from a lower to a higher level? A. There are numerous hydraulic motors utilizing this principle.

(15) A. M. W. asks whether it is necessary to have a microphone at each end of the line, and in what manner to place them in circuit. A. The microphone is simply a transmitter, and should be placed wherever a transmitter is required.

(16) J. A. P. writes: I have a 12 inch magnet and wish to make a battery. Please inform me in regard to the following: 1. What amount and what number of wire do I need on each revolving spool, and what shape should the spools be? A. It depends on the power of your magnet. We think that 2 ozs. of No. 40 wire on each soft iron core would answer. 2. Must the armature be removed or left on? A. When the machine is in use the armature must be removed. 3. Can the spool be attached to the magnet similar to the tele-

phone, and light steel armature made to revolve before the magnet, with success? A. We think not.

(17) J. B. U. asks: How many tons of ice will an ice house hold, 33 feet long, 33 feet wide, and 22 feet high? A. A ton of ice occupies a space of about 35 cubic feet.

Please inform me where I can get a book containing astronomical calculations. I wish to know how astronomers calculate the distance of the sun, moon, and stars from the earth. A. See the official government reports on eclipses and transits.

Where can I get a book containing a full description of the articles exhibited at the Centennial Exhibition? A. There is no one book containing this information.

(18) S. W. D. asks (1) how the magnetism is retained in the telephone magnet. A. Permanent magnets are used. 2. Can it be done so that the north and south poles of a horseshoe magnet can be separately used? A. Telephones are made in which both poles of a horseshoe magnet are used.

(19) W. F. L. writes: Please explain why I cannot get a current through three or more Callaud cells when using ground wire that runs into moist ground and put around 10 or 12 feet of iron plates, so as to work a call bell on a common sander. A. Use a return wire or increase your battery power to 6 or 8 cells.

(20) H. W. B. writes: I am making a hydraulic ram, and I want to know what size to make the air chamber. The outlet to the ram is 1½ inch. The pipe that conducts the water to the ram 1¼ inch. Is there any rule to determine the size for different sized rams? A. We do not think there is any definite rule. Make the air chamber as large as convenient.

(21) W. R. H. asks: Is common ground oil or petroleum dangerous to use in steam boilers under steam pressure, object being to remove scale? A. We do not advise its use.

(22) B. H. W. asks for the best method of preserving a steam boiler that is not in use in the summer season from rust. Also the name, price, etc., of the best works on heating and ventilation. A. If you cannot keep the interior perfectly dry, leave the boiler full of water. Schumann's "Manual of Heating and Ventilation," price \$1.50, will answer your purpose very well.

(23) H. F. asks: 1. Has the steamer Plymouth Rock of New York got a walking beam? A. Yes. 2. What was her price when new? What are her dimensions and speed? A. Address the owners, Jarrett & Palmer.

Can you give me a good remedy for dyspepsia? A. Plain well cooked food and outdoor exercise.

(24) K. B. A. M. asks for a definition of the mechanical term "splines." A. It is identical with the term "feather," or, as defined by Webster, it is "a rectangular piece fitting the key-seats of a hub and a shaft, so that while the one may slide endwise on the other, both must revolve together."

(25) W. R. L. asks: What preparation can be put on a slip of paper which has lead penciling on it, to keep the marks from being erased? A. A thin wash of gum arabic in water is sometimes used by artists. Skimmed milk will also answer very well.

(26) A. B. asks: What can I put in the plaster of Paris to make it harder? I want to use it to make a phonograph as per SUPPLEMENT No. 133. A. Mix the plaster with strong aqueous alum solution in place of water. The mixture requires a somewhat longer time to set, but ultimately becomes very hard.

(27) E. R. writes: 1. There is a cable wire rope 200 feet long from wheel to wheel, and the two sections make it 400 feet. Running on three wheels, with no bearing between them, and when the rope is slack, it has considerable whipping and jumping all the while. Now if there was a tightener half way between the wheels, would it not prevent this trouble, which wears the rope out very fast by rubbing on the flange of wheel? A. Yes. 2. Would it require more power to run the business with those tighteners on? A. A little more. 3. We have had rubber packing for those wheels, but it being so costly, we have tried wood for packing, but when it rains the rope slips on the packing, thereby causing it to have an unsteady motion. What would be the best and cheapest packing? A. India rubber is the best material, but tarred oakum answers nearly as well and is much cheaper.

(28) G. B. C. asks: Can you tell me how to cement vulcanized India rubber stamps to brass? A. Melt together equal parts of good pitch and gutta percha. Use hot.

How is the purple ink made that is used with "Zucato's papyrograph?" A. Inks are prepared by dissolving any of the soluble aniline dyes in warm glycerine.

(29) C. O. M. asks: 1. How large a reservoir would it require to run an engine, 2 x 4 inch stroke, 75 revolutions per minute, for 10 hours? The reservoir to be filled with compressed air at pressure of 60 lbs. per square inch. A. Multiply capacity of cylinder per revolution by number of revolutions in 10 hours, and add from 10 to 20 per cent. 2. How much weight should be applied to the top of said reservoir to give a pressure of 60 lbs. per square inch? A. Cross section of reservoir in square inches multiplied by 60, with a slight allowance for friction of piston or plunger.

(30) C. W. O. asks: 1. What gives brass castings the bright gold color which we see on valve bodies? A. The application of a gold colored lacquer. See p. 299 (25), and 44 (39), vol. 38, SCIENTIFIC AMERICAN. 2. Is there a book on brass founding? A. Consult Larkin's "Brass and Iron Founder's Guide" and Overman's "Founder's Pocket Guide."

(31) E. F. D. asks how to make a cement that will adhere to glass and hold water. What I want is a cement for an aquarium. A. A good cement is composed of 3 ozs. of linseed oil, 4 ozs. of tar, and 1 lb. of resin. These are allowed to melt together over a gentle fire. If too much oil is used, the cement will run down the angles of the aquarium; to obviate this, it should be tested before using by allowing a small quan-