

## 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.

Portable and Stationary Engines; Boilers of all kinds; 45 Cortlandt St., N. Y. Erie City Iron Works, Erie, Pa. Alcott's Turbine received the Centennial Medal.

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

New Lathe Attachments, such as Gear Cutting, Tap and Spine Slotting. W. P. Hopkins, Lawrence, Mass.

Wanted.—A situation by a practical man as Manager or Foreman in a Machine Shop or general repairs of any kind. Can give references. Address W. Wathe, Woonsocket, R. I.

Removal.—Messrs. Goodnow & Wightman, makers of Small Tools, Model Engines, etc., have removed from 23 Cornhill to 176 Washington St., Boston Mass.

I want 2d hand 48 in. Gap Lathe. O. S., Bridgeton, N. J.

Wanted.—Engagement by a practical Mechanical Draughtsman. Can design and superintend erection of Machinery. Address Charles Richards, 15 Webster St., Cleveland, O.

Band Saws, \$100; Scroll Saws, \$75; Planers, \$150; Universal Wood Workers and Hand Planers, \$150, and upwards. Bentel, Margedant & Co., Hamilton, Ohio.

For Sale.—A Set of Eccentric or Die Rolls, with Bed Plate. Housings and gearing all complete, in first class order. Henry Diston & Sons, Front and Laurel Sts., Philadelphia, Pa.

Diamond Self Clamp Paper Cutter; Howard's Parallel Vise. Howard Iron Works, Buffalo, N. Y.

For Sale.—Canadian Patent for best Portable Forge in market. Successfully introduced in United States. Address Buffalo Forge Company, Buffalo, N. Y.

Best Steam Pipe & Boiler Covering. P. Carey, Dayton, O. Cornice Brakes. J. M. Robinson & Co., Cincinnati, O.

Sperm Oil, Pure. Wm. F. Nye, New Bedford, Mass.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

Painters' Metal Graining Plates. J. J. Callow, Cleveland, O.

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

Boilers & Engines cheap. Lovegrove & Co., Phila., Pa.

Foot Lathes, Fret Saws, 6c., 90 pp. E. Brown, Lowell, Ms.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

Pulverizing Mills for all hard substance and grinding purposes. Walker Bros. & Co., 23d and Wood St., Phila.

Skinner Portable Engine, Improved, 2 1/2 to 10 H. P. Skinner & Wood, Erie, Pa.

Daniels' Planers of all sizes, both new and 2d hand. Send for circular. Steptoe & Co., 214 W. 2d St., Cin., O.

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

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

Zero Refrigerator, with cooler. Centennial award. Send for catalogue. A. M. Lesley, 372 Sixth Ave., N. Y.

For the best Bone Mill and Mineral Crushing Machines—five sizes, great variety of work—address Bangh & Sons, Philadelphia, Pa.

The only genuine Gelsir Self-regulating Grain Separator. Address the Geiser Manuf. Co., Waynesboro' Franklin Co., Pa.

Safety Linen Hose, Protects factories and stores. Saves insurance. Greene, Tweed & Co., 18 Park Place, N. Y.

Machine Cut Brass Gear Wheels for Models, etc. (New List.) D. Gilbert & Son, 212 Chester St., Phila., Pa.

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.

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

Cheap but Good. The "Roberts Engine," see cut in this paper, June 1st, 1878. Also horizontal and vertical engines and boilers. E. E. Roberts, 107 Liberty St., N. Y.

Best Turbine Water Wheel, Alcott's, Mt. Holly, N. J.

For Shafting, Pulleys, Hangers, etc., send for price list and discount to Hilles & Jones, Wilmington, Del.

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. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

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

Polishing Tools and Supplies. Send for new price list. Greene, Tweed & Co., 18 Park Place, 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.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page.

Bound Volumes of the Scientific American.—I have on hand bound volumes of the Scientific American, which I will sell (singly or together) at \$1 each, to be sent by express. See advertisement on page 398. John Edwards, P. O. Box 786, N. Y.

Friction Churches for heavy work. Can be run at high speeds and start gradual. Safety Elevators and Hoisting Machinery a specialty. D. Frisbie & Co., New Haven, Ct.

1,000 2d hand machines for sale. Send stamp for descriptive price list. Forsaith & Co., Manchester, N. H.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Wrenches.—The Lipsey "Reliable" is strongest and best. Six inch sample by mail 60 cents. Roper Caloric Engine Manufacturing Co., 91 Washington St., N. Y.

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

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.

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

F Lunkenheimer's Brass Goods for Engine Builders, Automatic Oil Feeders, Glass Oil Cups, Cady Shaft Oilers, etc. Address Cincinnati Brass Works.

## NEW BOOKS AND PUBLICATIONS.

The Magazine of Art is a new illustrated monthly periodical, published by Cassell, Petter & Galpin, of London, Paris, and New York. It is devoted exclusively to what are known as the fine arts, in contradistinction to those pursuits which, while arts, are not included under the narrower and higher term of art. The initial number is quite up to the high standard which is aimed at; is replete with illustrations, some of the cuts being of unusual excellence; and the descriptive text and miscellaneous art notes furnish much interesting information. It is intended to draw largely upon the resources offered by the Paris Exhibition, with its great array of art treasures; and certainly the Magazine enters upon its career with remarkable facilities.

## Notes &amp; Queries

(1) A. P. asks how to prepare a strong solution of silver-potassium cyanide. A. Add to a solution of potassium cyanide silver nitrate solution until no further precipitation is occasioned; after settling, pour off the liquid and wash the precipitate several times with water; then dissolve it in the smallest possible quantity of a strong aqueous solution of potassium cyanide by the aid of gentle heat.

(2) A. P. R. writes: 1. I am about to put a feed water heater into the smoke arch of a boiler (locomotive type) on a steamboat. The heater will be made of several rows of steam pipe passing backward and forward by the ends of the tubes in the smoke arch, being heated by the heat from the furnace. The water is to be forced through the pipe by a Blake steam pump. Will it work well? A. Probably you will need a blower, or some equivalent. 2. Where should the check valve be put in? A. Place it close to the boiler, with a stop valve between that and the boiler.

(3) O. H. T. asks: What liquid can be vaporized with the least expenditure of heat? A. Perhaps liquid hydrogen. The boiling points of several of the more volatile liquids are as follows: Sulphurous anhydride, 17°6' Fah.; ethyl chloride, 51°9'; methyl bromide, 55°5'; aldehyde, 69°4'; methyl formate, 92°1'; ether (ethyl), 94°8'; ethyl bromide, 105°8'; methyl iodide, 111°4'; carbon disulphide, 118°5'; formic ether, 127°7'; acetone, 133°3'; methyl acetate, 133°3'; bromine, 145°4'; wood naphtha (methyl alcohol), 149°9'; ethyl iodide, 158°5'; acetic ether, 164°9'; alcohol (ethyl), 173°1'.

(4) A. O. asks: Is there any advantage in having a pair of cone pulleys turned, the one concave and the other convex on their face? A. We think not.

(5) F. S. asks: With what can the brass taps of steam boilers be varnished, to prevent tarnishing? A. Dilute alcoholic solution of shellac or sandarac is sometimes used. It should be applied while the metal is warm.

(6) W. P. asks for a formula for making an invisible ink which will become visible on the application of some dilute acid. A. Use dilute copperas (iron protosulphate); tannic acid or any liquid containing it (as strong tea) quickly develops a black ink when brought into contact with the writing. Dilute nitric acid or chlorine water will also render the writing visible, especially if treated afterward with a drop of ammonia or potassium ferrocyanide.

(7) C. K. asks: What will cement hard rubber? A. Fuse together equal parts of gutta percha and genuine asphaltum; apply a very little hot to the joint, closing the latter immediately with pressure.

(8) In answer to F. C., S. H. K., and others, who ask how to make an aquarium watertight.—The joints may be packed in caoutchouc, and further sealed with a cement prepared by melting together over a gentle fire 1 lb. of resin, 4 ozs. of good tar, and about 1 oz. of linseed oil. If an excess of oil is used the cement will become too fluid; to obviate this it should be tested before use by allowing a small quantity to cool under water, and if not sufficiently firm, allowed to simmer longer or have more tar and resin added. The cement should be poured in the angles of the aquarium while in a liquid state, but not when boiling, as it would crack the glass. The cement, when properly made, becomes firm in a few minutes.

(9) J. G. S. asks: What would be the approximate cost per mile of a narrow gauge railroad, complete, through a level country? A. The cost of such a railroad will, of course, depend on the character of the country and the length of the road. The following estimate was made for a road of 3 feet gauge, 100 miles long, over a prairie country: Grading, bridges, ties, tracks, stations, etc., \$9,520 per mile; rolling stock, \$3,791 per mile.

(10) W. H. H. asks: What is the process commonly practiced in bleaching white goods? A. The goods are first immersed in dilute solution of chloride of lime (bleaching powder), and then transferred to a vat containing very dilute sulphuric acid. This treatment may be repeated if necessary, and the material finally thoroughly washed.

(11) O. H. K. writes: I have a steam launch, and condense the exhaust through a copper pipe running around the stern close to the keel. Some persons tell me that the feed water will injure the boiler from the action of the copper pipe. Is this the case, and if so is there any remedy? A. Any deleterious action can be prevented in great measure by tinning the pipe.

(12) P. C. O. asks: How shall I loosen the scale in a steam boiler? A. Without knowing the character of the scale, we cannot suggest any remedy. Generally, by allowing the water to remain in the boiler until cold, the scale is softened so much that it can easily be removed. If there is a great accumulation, this blowing off must take place very frequently.

(13) W. & B. write: We have a garret room that we wish to ventilate so that we can work in it. It has a sheet iron roof, is 25 x 90 feet, and 7 feet high; has two windows in each end, but they do not give air enough. Could a fan be put in the roof; and if so, of what kind? A. If you have an opening to admit cool air, and another for the discharge of heated air, a suction blower placed by the latter opening, or a pressure blower by the former, will answer very well.

(14) S. E. T. writes: I am building a tank 7 x 8 feet, 6 feet deep, in my stable to hold water for household purposes. It is made of pine strips, 1 1/2 in. x 2 in., laid flat, with whitelead joints. Do you think it will be necessary to line it, and if so, what had I better use? A. It will not be necessary to use any lining, if properly made. If, however, you desire to do so, waterproof paper will answer very well.

Is it advisable to let the water from the leader of a hay window and piazza run into the trench filled with broken stone which forms the foundation of a drive way? A. We think not.

(15) C. D. asks: How shall I make a "bellows body" (like an accordion) for a camera, to be of 1/2 inch strips, 5/8 inches wide, and 8 inches high when finished? A. Cut the four strips to size, stitch the edges of the sides together at points 3 inches apart, push in the edges between each of these points to form the base of the hinges, and insert the gore pieces. These may be 3 inches wide and 3/4 or 3/8 inches long, slit lengthwise 1/2 to 1/4 inch on the middle line at each end, and the corners folded toward the center to form a square about 2 1/2 inches wide; then placed reverse side down and folded once to a triangle. A few blows with a mallet will then set the folds. The pieces are inserted, obtuse angle outward, in the seam edge of the hinge, and the slit edges unfolded and glued to the in-folded portions of the hinge.

(16) "Sapphire" asks what cement is used by lapidaries for cementing precious stones. A. Armenian or diamond cement. Soak singlass in water until it is soft; then dissolve it in the smallest possible quantity of proof spirits by the aid of gentle heat (over warm water); in 2 ozs. of this dissolve 10 grains of pale gum ammoniacum (in tears) by trituration in a mortar; then add six large tears of gum mastic dissolved in not more than 6 times their weight of rectified spirits. Keep in a well stoppered bottle, and soften for use by standing the bottle in hot water.

(17) W. H. A. asks for a recipe for making a good indelible ink, in shape that can be conveniently applied by means of a rubber stamp. A. Genuine asphaltum, 1 part; benzole, 4 parts; dissolve and temper with good printer's ink.

(18) R. H. H. writes: A friend and myself had a dispute in regard to steam boilers. I claim that, with a full supply of water in the boiler, and not using any steam, you can get pressure enough to burst the boiler by keeping up a hot fire. My friend claims a boiler cannot burst with steam pressure so long as the supply of water is kept up. A. If you get pressure enough, the boiler will be ruptured all the same, whether it contains water or not.

(19) F. G. S. asks for a recipe for black varnish. A. Amber, 1 lb.; fuse; add hot drying oil, 1/2 pint; powdered black rosin and Naples asphaltum, of each 3 ozs.; when properly incorporated and considerably cooled, add oil of turpentine, 1 pint. This is one of the finest black varnishes in use.

Also a recipe for a japan. A. Shellac, 1 oz.; wood naphtha, 4 ozs.; lamp black or ivory black to color.

(20) S. P. S. asks: What is the proper course of study for one who wishes to become a steam engineer? A. He should study works on mathematics, natural philosophy, and prime movers; and should also study actual examples of steam machinery. In addition, he should practice drawing and the use of machine tools.

(21) In answer to O. T. K.—If you take the dimensions of a large engine, say 24 x 48, you can get a fair idea of what is needed for an engine built on a smaller scale, 1/4 in the case you mention.

(22) C. W. K. asks: In the propulsion of a boat, is the speed attained in direct proportion to the power employed; if not, what proportion does the power bear to the speed? A. The ratio is not exactly determined, as it is not constant at all speeds. For moderate speeds, the power varies nearly as the cube of the speed.

(23) G. I. B. asks: What should be the dimensions of a floating dock large enough to lift and contain a vessel of the following dimensions: 300 feet long, 40 feet beam, and drawing 22 feet of water? A. Having fixed the shape of your dock, you may assume that each cubic foot of water displaced by it requires a load of 62 1/2 lbs., from which data you can obtain the requisite dimensions.

(24) W. S. W. writes: I have a clinker built boat, 20 feet long and 6 feet beam, which I wish to convert into a steam launch. Is a screw of more advantage than a paddle wheel, and if so, what size engine and what kind should I use to give a good rate of speed? A. You can use a vertical engine, 3 x 5, and a propeller with diameter equal to draught, and 3 feet pitch. We think this arrangement will be more desirable in some respects than paddle wheels. If the boat is very light, it may need to be stiffened somewhat for the machinery.

(25) In answer to T. L.—The expansion of various metals, on being heated 1°, is as follows:

Zinc	1-61920	Copper	1-104400
Pewter	1-78840	Gold	1-123120
Lead	1-63180	Wrought iron	1-149000
Tin	1-87840	Steel	1-151200
Silver	1-95040	Cast iron	1-162000

(26) T. A. P. asks: 1. Can I make a small rowboat by stretching canvas upon a wooden frame? A. Yes; such boats are sometimes used for hunting. They are easily damaged. 2. How can I make the canvas waterproof? A. Paint it, after securing to the frame, with whitelead or other good paint.

(27) In answer to J. R. E.—The samples of test paper appear to be georgina (dahlia) paper, prepared by steeping slips of white, uncalendered paper in a not over strong tincture of *Georgina purpurea*. It is found in most well ordered laboratories. Though ordinarily not quite as delicate in reaction as litmus, it may often be conveniently substituted for the latter. The faint purplish color of the paper is rendered pinkish red by dilute acids and green by weak alkalis.

(28) E. O. H. asks: At what rate does sound travel? A. At 1,090 feet per second in air, under ordinary conditions.

What preparation can be applied to the inside of pottery to make it waterproof? A. Almost any of the vitreous glazes will answer. Borax, flint, glass, etc., are commonly used.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. W. C.—Slate containing pyrites.—J. A. P.—The deposit consists mainly of clay, silica, lime sulphate iron oxide, and a little organic matter. It may be used as a cheap pigment, either before or after calcination. It does not contain phosphates.—J. J.—No. 1 is red Jasper, an impure quartz, the coloring matter of which is iron sesquioxide. No. 2 is *olerite*, containing iron pyrites, of no value.

## COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

Hearing by the Teeth. By W. B. W.  
Antiquity of Civilization. By F. S. J.  
Science of Light. By T. B. McC.  
A Mechanical Question. By J. D. H.  
Causes affecting the Taste of Drinking Waters. By J. L. M.

## Advertisements.

Inside Page, each insertion --- 75 cents a line.  
Back Page, each insertion --- \$1.00 a line.  
(About eight words to a line.)

Encouragements may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

EXPLOSIVE DUST. A COMPREHENSIVE description of the Dangers from Dust in various Manufactures and the Cause of many Fires. How combustible substances can explode. Spontaneous Combustion of Iron, Charcoal, and Lampblack in Air. Flour Dust and Brewery Dust Explosions. Explosions of Coal Dust in Mines. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 125. Price 10 cents. To be had at this office and of all newsdealers.

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