

**Business and Personal.**

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line.

**Mechanical Working Drawings a Specialty.** Pemberton & Scott, Draughtsmen, 37 Park Row, room 30.  
**Assays of Ores, Analyses of Minerals, Waters, Commercial Articles, etc.** Technical formulæ and processes. Laboratory, 33 Park Row, N. Y. Fuller & Stillman.  
**Vertical Scientific Grain Mills.** A.W. Straub & Co., Phila.  
**Wanted.**—Several Carpenters and a Blacksmith. Steady work. Address Industrial Home Co., Ionia, Fairfax Co., Va.  
**Fast Boat Engine Castings** of the type of the celebrated Steam Launch Flirt, for sale. Price, with working drawings, \$25; the same finished, \$150; larger sizes at proportional rates. Send for description. H. S. Maxim, M.E., room 74, Coal and Iron Exchange, or P. O. Box 1849, N. Y.  
**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.  
**Forney's "Catechism of the Locomotive,"** a book of 625 pages, 250 engravings; answers practical questions about a locomotive. Price \$2.50. Published and for sale by the Railroad Gazette, 71 Broadway, N. Y.  
**Agents wanted in every county** to sell our new Machine to file all kinds of Saws. Every one that uses a Saw will buy one. Price \$2.50. Illustrated Circulars, etc., free. E. Roth & Bro., New Oxford, Pa.  
**A gentleman, experienced in manufacturing Cane and Beet Sugars,** desires a situation. Is a good analyzer. Speaks four languages. P. O. Box 4132, N. Y.  
**Telephone parts for 25 c.;** works  $\frac{1}{2}$  mile. T. E. L., New Haven, Conn.  
**Artificial Human Eyes \$10 each;** assortment by express to select from. Dr. Walker, 94 State St., Rochester, N. Y.  
**Scroll Saw Designs.** Send for new illustrated sheet and price list. A. W. Morton, 104 John St., N. Y.  
**Union Eyelet Company, Providence, R. I.,** Manufacturers of Patented Novelties.  
**Entire outfit of Nail Mill,** 4, 6, 8, and 10 p., costing over \$3,000, we offer for \$650 to close an account. Apply quick, must be sold. Forsyth & Co., Manchester, N. H.  
**Improved Wood-working Machinery** made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.  
**Bolt Forging Machine & Power Hammers a specialty.** Send for circulars. Forsyth & Co., Manchester, N. H.  
**For Town and Village use, comb'd Hand Fire Engine & Horse Carriage,** \$350. Forsyth & Co., Manchester, N. H.  
**The Cameron Steam Pump** mounted in Phosphor Bronze is an indestructible machine. See ad. back page.  
**Friction Clutches warranted** to drive Circular Log Saws direct on the arbor; Upright Mill Spindles, which can be stopp'd instantly; Safety Elevators, and Hoisting Machinery. D. Frisbie & Co., New Haven, Conn.  
**Sperm Oil, Pure.** Wm. F. Nye, New Bedford, Mass.  
**For Solid Wrought Iron Beams, etc.,** see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.  
**John T. Noye & Son, Buffalo, N. Y.,** are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.  
**Power & Foot Presses, Ferracite Co.,** Bridgeton, N. J.  
**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.  
**1,000 2d hand machines for sale.** Send stamp for descriptive price list. Forsyth & Co., Manchester, N. H.  
**Steel Castings from one lb. to five thousand lbs.** Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.  
**For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts.,** Brooklyn, 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.  
**Wanted.**—Second-hand Gun Stocking, and other Gun Machinery. Address V. A. King, Lock Box 81, New Haven, Conn.  
**Manufacturers should try** the pure natural Lubricating oil. Produced and prepared by Geo. Allen, 13th street, Franklin, Pa. It does not gum or chill in cold weather, and wears as well as lard oil. Price by the barrel 30 cents per gallon. Packages of 10 gallons sent on receipt of \$3.75.  
**For Boults's Paneling, Moulding, and Dovetailing Machine,** and other wood-working machinery, address B. C. Machinery Co., Battle Creek, Mich.  
**Patent Scroll and Band Saws.** Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.  
**Chester Steel Castings Co.** make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 222.  
**Machine Diamonds, J. Dickinson,** 64 Nassau St., N. Y.  
**Silver Solder and small Tubing.** John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.  
**Weldless Cold-drawn Steel Boiler and Hydraulic Tubes.** Leng & Ogden, 212 Pearl St., N. Y.  
**For Best Insulated Telegraph Wire, Telephone Wire, and Flexible Cordage,** Eugene F. Phillips, 67 Stewart St., Providence, R. I.  
**The Turbine Wheel** made by Risdon & Co., Mt. Holly, N. J., gave the best results at Centennial test.  
**Vertical & Yacht Engines.** N. W. Twiss, New Haven, Ct.

**NEW BOOKS AND PUBLICATIONS.**  
**REPORTS OF JUDGES OF GROUPS 2, 5, 6, 7, AND 8, CENTENNIAL EXPOSITION.** J. B. Lippincott & Co., Publishers, Philadelphia.  
 The above-named reports relate respectively to pottery, glass, etc.; timber; fish and fish products; furniture, and fabrics. Abstracts of the reports of individual judges on each exhibit are given, and several longer papers are included, reviewing various classes of machines, products, etc., embodying much useful and interesting information.

**Notes & Queries**

A. L. B.—Consult Pepper's "Play Book of Chemistry" and "Chemical Magic," which you may obtain through publishers advertising in our columns.  
 —W. H. H.—We do not give addresses in this department, but you will see that the "Business and Personal" column can be used to obtain such information. As to freight rates you should apply to the agent. The United States laws require that all steamers should be managed by licensed officers.—W. C. B.—As we understand the arrangement, it would be better to place the pipe within an evaporator large enough to inclose it. You can use a pipe  $\frac{1}{2}$  to  $\frac{3}{4}$  inch in diameter.—F. C. R.—Altitude is determined by barometric observations. For calculations of latitude, longitude, and eclipses, consult a practical work on astronomy.—F. & Co.—Consult Normandy's "Commercial Handbook of Chemical Analysis" (edition of 1875).—E. B.—See answer No. 10, p. 123, current volume.—L. G.—See answer No. 28, p. 140, current volume.—T. L. H.—You should describe the arrangement of the apparatus.—E. C. H.—You will find the matter fully treated in Auchincloss on "Link and Valve Motion."—G. M. M.—See SCIENTIFIC AMERICAN, October 21, 1876, p. 265.—H. E. C.—See SCIENTIFIC AMERICAN, May 1, 1875.—A. J. McK.—A windmill will answer very well. Consult advertising columns for addresses of engine builders, or insert notice under head of "Business and Personal."—W. H. H. G.—There are a number of suitable devices in the market.—W. C. S. and E. S. J. are referred to answer No. 19, p. 155, SCIENTIFIC AMERICAN of March 9, 1878.—L. B.—We think you can get better results with one of the semi-steels, such as Bessemer or Siemens-Martin.—C. E. G.—Use two 2 x 3 inch cylinders; two screws, 12 to 15 inches in diameter, and 2 feet pitch; boiler, 2 feet in diameter and 4 feet high. The screws should be three-bladed, and set at an incline, so as to be submerged.—L. A. W.—Full instructions on tempering spiral springs are contained in SUPPLEMENT No. 20. You should make tests under the actual working conditions until you obtain satisfactory results.—J. D.—See SCIENTIFIC AMERICAN, March 30, 1878, p. 203.—A. F. G.—We think the plan described by you will answer.—G. S.—If the temperature of the air is constant, the pressure varies inversely as the volume. The formulæ to be used when the temperature varies are given in SCIENTIFIC AMERICAN, August 21, 1875, answer No. 14.—Z. S. R.—See SCIENTIFIC AMERICAN, May 1, 1875.—B. K.—The investors should consult a good engineer. We doubt whether any but an experienced workman could dye the fur as you wish. For addresses of manufacturers, insert a notice in "Business and Personal" column.—A. W. M.—Notwithstanding all the stories about the value of divining rods, the evidence of facts, as well as the opinion of scientific men, is decidedly against them.—H. C. D.—Use sheathing paper.—F. R. Consult Osborn's "Metallurgy of Iron and Steel;" Crookes & Rohrig's "Treatise on Metallurgy;" Overman's "Manufacture of Iron;" Percy's "Metallurgy," and other standard works, which you may obtain through dealers advertising in our columns.—A. S.—See answer to D. C. L., this page, and p. 91, vol. 30.

- (1) F. T. P. asks: What will cure stammering? A. Try speaking slowly.
- (2) F. B. H. asks: With what acid, or other means, can nickel be stripped from a piece of Britannia ware without injuring the surface of the latter? A. Nickel cannot readily be stripped from such an alloy cleanly. You may try a bath composed of a strong hot solution of an alkaline nitrate acidified with oil of vitriol. Dip, and rinse well in water; repeat if necessary. Experience may suggest some improvement.
- (3) W. W. asks: How is etching on zinc done? A. Heat the metal and cover it uniformly with a film of wax. Through this to the surface of the metal etch with a fine graver, then expose to dilute sulphuric or hydrochloric acid for a few minutes.
- (4) J. A. L. asks: How can I refill the porous cells of a Leclanché battery? A. Hold the top of the porous cup in a gas flame until the pitch with which it is sealed is softened, then draw out the carbon plate, and refill the cup with black oxide of manganese and pieces of gas coke, in about the proportion of five parts of the oxide of manganese to one of gas coke.  
 How can I solder a copper wire to a zinc plate? A. Have the surfaces of the metals scraped and thoroughly clean; moisten them with solution of zinc chloride, then lay on the joint a small piece of soft solder, and then melt with a blowpipe flame or heated sad iron.
- (5) N. W. H. asks: 1. Would an upright boiler, 50 square feet heating surface, rated at 5 horse power, be large enough to furnish steam for an engine 5 x 7, cutting off at two thirds, and 175 revolutions per minute? A. The boiler is rather small. 2. Is there any means except by the indicator to determine the actual horse power of small engines and boilers? A. You will find some notes on testing small engines and boilers in the SCIENTIFIC AMERICAN for October 31, 1874.
- (6) E. A. S. asks: What bath and battery do you recommend for nickel plating? A. Use a bath containing  $\frac{1}{4}$  lb. ammonio-nickel sulphate to each gallon of water. The nickel anodes should expose a somewhat larger surface in the bath than the work. Use a Smee battery (carbon negative), exposing zinc having a surface equal to that of the work in the bath, and an intensity equal to two or three couples of Smee. Clean (by scouring and acid dip) the work thoroughly, and place it in the bath, connected with the zinc of the battery—the nickel anodes being in connection with the carbon pole. The bath should be kept neutral with ammonia. See also page 209, this issue.
- (7) R. & T. ask for a recipe for a cement to be used for repairing glass, leather, etc. A. 1. Dissolve fine glue in strong hot acetic acid to form a thin paste. 2. Soften fine glue or isinglass by soaking in cold water, and dissolve it in the smallest possible quantity of proof spirits by aid of gentle heat over a

- water bath; in 2 ozs. of this mixture dissolve 10 grains of gum ammoniacum, and while still liquid add  $\frac{1}{2}$  drachm of mastic dissolved in 3 drachms of rectified spirit, and stir the mixture. Keep in stoppered bottle. For use melt by standing the bottle in warm water. 3. A fused mixture of pure asphaltum and gutta percha in about equal parts.
- (8) D. C. L. asks: What is the rule for calculating the power of a rotary engine? A. Multiply the area of the piston in square inches by the effective pressure in pounds per square inch, and by the speed of the center of the piston in feet per minute, and divide the product by 33,000.
- (9) B. F. W. asks: Will you be kind enough to inform me how I can calculate the distance at which the ball of a safety valve should be placed to blow off at any given pressure? A. Multiply the weight of the lever by the horizontal distance of its center of gravity from the fulcrum; the weight of the valve by its horizontal distance from the fulcrum; the area of the valve by the steam pressure and horizontal distance of the valve from the fulcrum. Add together the first two products, subtract their sum from the third product, and divide the difference by the weight of the ball.
- (10) J. P. D. asks: What is the greatest velocity ever attained by a ball from any sized gun? A. About 1,800 feet per second.
- (11) G. W. H. writes: I wish to bring water to my house from a street main, 650 feet distant. The pressure will be that due to a head of 125 feet. I would like to be able to throw a  $\frac{1}{4}$  or  $\frac{3}{8}$  inch stream 30 to 40 feet. Would it do to lay 2 inch wrought iron pipe one third the distance,  $1\frac{1}{2}$  inch pipe one third, and 1 inch the remaining distance, or would a smaller pipe answer? A. It would not be well to use any smaller pipes.
- (12) D. H. S. asks: 1. What is the weight of a large passenger locomotive? A. About 34 tons. 2. What is the weight of a locomotive boiler, as compared with that of a Cornish engine, both having the same heating surface? A. The locomotive boiler weighs much less per square foot of heating surface.
- (13) O. A. B. asks: About what width of face is required for a cast iron gear to transmit 12 horse power, one wheel large, and the other having 12 teeth, the cogs to be of 2 inches pitch, and have a speed of 260 feet per minute? A. From 3 to 4 inches will answer.
- (14) R. B. asks: 1. When the Great Eastern broke her rudder at sea, some years ago, was the rudder itself carried away, or did the rudder post twist off and leave a short stub? A. The rudder post twisted off. 2. How was it temporarily fixed? A. By wrapping a chain around the collar bearing to control the rudder. The arrangement was described and illustrated in the SCIENTIFIC AMERICAN for October 26, 1861.
- (15) W. E. C. asks: Are owners of steam yachts liable to a penalty for not having a licensed engineer and pilot? A. The penalty is \$500 for each offense.
- (16) W. C. F. asks: What weight of hard coal would be required to heat 1,000 lbs. of wrought iron to 500° Fah., without allowance for waste of heat; and what percentage of the heat can be utilized in a well constructed furnace? A. In a perfect furnace this would require between 4 and 5 lbs. of coal. In practice you might realize from 40 to 50 per cent of the theoretical effect; but it is our impression that few small furnaces do as well as this.
- (17) F. J. S. asks: Is there any telephone which can be used without a battery? A. No battery is required to operate the telephone described in SCIENTIFIC AMERICAN, No. 14, vol. 37, and on p. 155, answer No. 19, of SCIENTIFIC AMERICAN of March 9, 1878.
- (18) G. L. writes: This is written with ink made precisely as directed in recipe given to G. F. (February 2.) It is rather pale when first applied, but will probably be a jet black when you receive it. [It is.] Now I would like to know (1) if there is anything I can add to it that will make it jet black as soon as written with, without thickening or destroying any of its requisites as a good ink. A. Add a little extract of logwood. 2. What will prevent thickening and evaporating? A. Keep it from the air. 3. Is there anything with a more pleasant odor than creosote, or without odor, that will prevent moulding? A. Oil of cloves is often employed.
- (19) B. M. and others ask for a recipe for ebonying wood. A. Apple, pear, and walnut, if fine grained, may be ebonyed by the following process: Boil in a glazed or enameled iron vessel with water, 4 ozs. of ground gallnuts, 1 oz. of logwood chips, and  $\frac{1}{2}$  oz. each of green vitriol and crystals of verdigris. Filter while warm, and brush the wood over with this repeatedly. Dry and brush over with strong cold solution of acetate of iron and dry. Repeat this several times, and finally dry in an oven at a moderate temperature, and oil or varnish.
- (20) S. H. P. asks: Which will haul the harder, a railroad car with journals 3 inches in diameter and 4  $\frac{1}{4}$  inches long, or the same car with journals  $3\frac{1}{2}$  x 5  $\frac{1}{4}$  inches, weight of car supposed to be the same? A. This matter can only be settled definitely by experiment. With very moderate pressure the small journal might require less power than the other, while by increasing the weight the result might be reversed. Which way will water run the faster, through a tunnel into large end and out of small, or into small end and out of large end? A. We imagine that the difference, if any, may be slightly in favor of the latter course.  
 How much does 1 cubic foot of mercury weigh, at varying temperatures? A. At 32° Fah. 849 lbs., at 60° 846 lbs., at 212° 836 lbs.  
 What degree of heat Fah. does it require to ignite common burning gas, kerosene oil, and common lard oil? A. The gas and oil ignite at red heat, and kerosene at almost any temperature, according to its quality. The temperature of ignition of different substances can be greatly lowered by special conditions.  
 What is the difference between a block 1 inch square and a 1 inch cube? As the terms are frequently used, there is no difference; but, speaking precisely, a block 1 inch square is a block with only two dimensions, or a plane surface.
- (21) L. H. J. asks: 1. What are the proper diameters for the supply and exhaust pipes, piston rod, and crank pin of a 2 x 4 inch horizontal engine, running at 500 revolutions per minute, with 80 lbs. pressure? A. Supply pipe,  $\frac{1}{2}$  inch; exhaust,  $\frac{3}{8}$  inch; piston rod,  $\frac{3}{8}$  inch; crank pin,  $\frac{3}{4}$  inch. 2. What will be the best way to pack the piston? A. Light cast iron rings will answer very well.
- (22) E. A. M. asks how to remove scale from iron and steel. A. The articles to be cleaned may be left for a few hours in a bath of sulphuric acid and water, and then scoured with sand.
- (23) F. O. S. asks: 1. What horse power (I mean the measure so termed, not the equivalent strength of horses) does a yoke of oxen exert, and what proportional increase would be gained by connecting 2, 4, or 8 couples? A. In ordinary practice, 1 yoke of good oxen may exert  $1\frac{1}{2}$  horse power per day of 8 hours, and if they could be made to work together, each successive yoke would add the same amount of work. 2. Are portable engines made of a power equal to 8 yoke of oxen? A. Yes.
- (24) J. T. L. asks: 1. Given the value of a first water diamond of 1 carat, what is the rule for computing the price of similar stones of greater size? A. The common rule is to multiply the weight of the diamond by itself, and the product by the price of a single carat stone of the same grade. In practice, however, this and other rules do not hold absolutely good. Much depends upon the cutting and other characteristics, even of stones of apparently the same quality, and the fixed rules are always more or less deviated from. 2. What does it cost to have a diamond cut? A. The price is determined, on inspection, by the cutter. It varies greatly. 3. What did the Koh-i-noor, belonging to the crown of England, cost? A. It was presented by the East India Company. Its value is supposed to be about £2,000,000.
- (25) O. B. asks: 1. Which is the more powerful explosive, gun cotton or gunpowder? A. The former. 2. Is gun cotton liable to explode on concussion or by friction? A. Yes. 3. Is fine grained powder more powerful than coarse? A. It depends upon the use and mode of application. The size of the grains determines the rate of combustion; and, while the total effect may be the same, it may be applied through a longer or shorter space of time.
- (26) J. T. T. asks: 1. Is there any metallic or other hard substance to which clay made into mortar—as for bricks or stiffer—will not adhere when subjected to pressure? A. Possibly very smooth and hard metallic surfaces may answer. 2. What is understood by a horse power as compared with the power of men worked similarly? In other words, how many mendeos is a one horse power equal? A. Between 10 and 15, according to the character of work and men.
- (27) "Guitarist" asks: Is there any means of making the tone of a guitar louder than is usually the case? A. It can be done by improving the sounding board.
- (28) W. S. C. asks: How many horse power are required to grind and bolt 12 bushels of wheat per hour, and how many to grind 12 bushels of corn per hour, without bolting? A. We think 6 and 5 horse power, respectively, would be ample.
- (29) F. D. D. asks: What size of propeller will be advisable, for speed, with a  $6\frac{1}{2}$  x  $6\frac{1}{2}$  inch engine, in water 4 to 8 feet deep? A. Make a propeller about 3 feet in diameter, and  $4\frac{1}{2}$  feet pitch.
- (30) W. M. S. asks how to prevent a boat from water soaking. A. Use white lead mixed in linseed oil.
- (31) G. H. A. asks: What is the comparative cost of heating private and public buildings by furnaces and hot air, or steam pipes; also the comparative healthfulness of the two methods for schools, etc.? A. There is not much difference, as far as healthfulness is concerned, between steam and furnace heat, with well designed apparatus and good ventilation. For heating large buildings, steam heaters are frequently more economical than furnaces.
- (32) H. E. F. asks: 1. Will two engines work on one shaft if the engines run at different speed? A. They can be made to work by proper connections. 2. How fast should a 19 inch fan run to blow a fire under a boiler? A. Run it at the speed recommended by the maker. 3. Should it blow into the smoke stack or into the fire? A. It makes no great difference into which place it discharges.
- (33) J. V. C. asks: At what horse power is an engine working with cylinder 10 x 20, boiler pressure 70 lbs., and 125 revolutions per minute? A. Multiply effective pressure on piston, by area of piston, in square inches, and by speed of piston in feet per minute, and divide the product by 33,000.
- (34) E. H. asks: Would an engine of 2 horse power be large enough to run a steam launch 28 feet over all, 25 feet between uprights, 6 feet beam? What would be the speed, supposing the boat to be well modeled? A. With such an engine you might realize a speed of 3 or 4 miles an hour.
- (35) A. A. R. asks: What is the shortest reliable rule for calculating the capacity of circular cisterns? A. Multiply the square of the diameter in feet by 0.7854 times the height in feet. The product is the capacity in cubic feet.
- (36) J. F. W. asks: How can I remove scale from sheet steel? A. By an emery wheel, or by a bath of dilute sulphuric acid.  
 How can I tin malleable iron, so that it will be smooth and bright? A. The articles must first be thoroughly annealed while excluded from the air, and when cold submitted to a hot but dilute pickle of sulphuric acid. After the oxide is removed they should be cleaned in water. When dry, plunge them in a bath of hot palm oil, and when heated to the temperature of the oil