

Business and Personal.

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Mechanical Working Drawings a Specialty. Pemberton & Scott, 37 Park Row, room 30.

Portable and Stationary Engines; Boilers of all kinds; 45 Cortlandt St., N. Y. Erie City Iron Works, Erie, Pa. Gold after crushed, separately. Joshua Limestone ore being divided. Address Davis ville, Pa.

Boilers & Engines cheap. Lovegrove & Co., Phila., Pa. Alcott's Turbine received the Centennial Medal.

Vertical Scientific Grain Mills. A. W. Straub & Co., Phila. 35 ft. Bement & Son Lathes; 3 ft. over bed; turns 16 ft.; self-acting carriage. F. M. Swegan, 287 Water St.

\$8.—Morton's Number One Scroll Saw; stand, treadle motion, bevel table, etc. Send for circular. J. D. Foot, 22 Platt St., N. Y.

Colorless Lacquer. H. H. Hempler, Washington, D. C.

Wanted.—Hydraulic Pump, duplex or single, fill a cylinder 15 in. diameter, 20 ft. a minute, 500 lbs. pressure. Hinkley, 321 Dartmouth St., Boston, Mass.

For Sale.—Patent on an article of general utility; original and attractive. Box 539, Pittsburgh, Pa.

Wanted.—Addresses of Lamp Burner and Camp Chair Manufacturers. C. M. Lungren, 708 Lexington St., Baltimore, Md.

For Small Engine Castings, address Wm. D. Rich, 123 Exchange Place, Philadelphia, Pa.

Union Eyelet Company, Providence, R. I., Manufacturers of Patented Novelty.

A rare opportunity for a Moulder or Machinist with a small capital to invest in a good business. For particulars, apply to or address W. B. McKeldin, Athens, E. Tenn.

An American gentleman, established over 18 years in Paris, wishes to develop in Europe some American patent or special industry. Best references given and required. Address J. Getz, 5 Petit Carreau Paris, France.

Foundry and Machine Shop for sale. Now running and in good order. For particulars address Cofran & Bromich, Topeka, Kansas.

Wanted.—2d hand Fan for Cupola. E. L. Black, Gann, O. 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. Forsaith & Co., Manchester, N. H.

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

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

Self-Feeding Upright Drilling Machine, of superior construction; drills holes from 1/2 to 1/2 inch in diameter. Pratt & Whitney Company, Hartford, Conn.

Lansell's Steam Siphon pumps sandy and gritty water as easily as clean. Leng & Ogden, 212 Pearl St., N. Y.

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

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 61 Nassau St., N. Y.

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

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use proves them stronger and more durable than wrought iron. See advertisement, page 206.

Galvanized Iron Cornice Machines.—The most Improved, Straight and Circular. Prices reduced. Calvin Carr, Cleveland, O., & Hewes Machine Wks., Newark, N. J.

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

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

Wanted.—A first-class business man with \$10,000 to invest, and capable of assuming the general management of a Machine Shop and Foundry in Western Canada. Shop now in operation; connections first-class; and security unquestionable. F. W. Glen, Oshawa, Ontario.

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

Walrath's Improved Portable Engines best in market; 3 to 8 H. P. Peter Walrath, Chittenango, N. Y.

For book on Lubricants, R. J. Charé, 134 M. Lane, N. Y. 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, Ferracute 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. Forsaith & 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.

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

Notes & Queries

J. D.—You do not send sufficient data, but you can readily make the calculation for yourself, on the supposition that you will have to supply about 450 cubic feet of water per minute.—E. M.—We do not recommend special manufactures in these columns.—M. & Co.—Ashes will answer quite well.—J. S.—Consult Percy's "Refractory Materials and Fuel," and Svedelius' "Handbook for Charcoal Burners."—B. L. D.—Wrought iron weighs about 480 lbs. per cubic foot. From this you can make your calculations.—A. C. G.—See SCIENTIFIC AMERICAN, vol. 36, p. 203, and p. 155 (25), March 9, 1878.—A. L.—See SCIENTIFIC AMERICAN, November 10, 1877, p. 299 (8).—W. K. L.—See SCIENTIFIC AMERICAN, March 2, p. 129 (23).—A. S.—See SCIENTIFIC AMERICAN, March 16, 1878, p. 171.—W. H. A.—It would depend upon the system adopted, and the special circumstances of the case. You should refer the matter to an engineer.—J. R.—See SCIENTIFIC AMERICAN, pp. 33 and 225, vol. 33.—R. K. S.—See SCIENTIFIC AMERICAN, December 27, 1873. You will also find a good method described in Trautwine's "Engineer's Pocket Book."—C. H. M.—The perpetual motion machine described by you has been tried many times with numerous variations; and, it is unnecessary to add, with equal want of success. Consult Dircks' "Perpetuum Mobile."—J. G.—See description of leaching process in Percy's "Metallurgy."—P. P.—Address the inspector of your district. He will furnish information regarding qualifications necessary for obtaining a license.—M. & Co.—There have been many boilers set in the manner described, and operated successfully when the draught was not violently forced.—S. R. L.—See p. 698, SUPPLEMENT, October 28, 1876.—L. D.—See answer No. 45, p. 268, of SCIENTIFIC AMERICAN of October 27, 1877.—W. S.—There is a difference between the instrument described and that to which you refer.—F. W.—Sample of oil not received.—B. G. N.—See SCIENTIFIC AMERICAN of August 23, 1873.—C. R.—You will find a good summary of the art of tanning in the American Cyclopaedia, and for fuller information you may consult Dusauc's "Treatise on Tanning."

(1) J. H. asks: 1. How may sulphuric acid be detected in vinegar? A. Add to a sample of the suspected vinegar a solution of barium chloride (in distilled or rain water); if a white precipitate forms, which does not redissolve on addition of strong nitric or hydrochloric acid, sulphuric acid is present. It is better to evaporate the sample of vinegar to be tested nearly to dryness in a clean porcelain dish, and to pour the concentrated fluid into a test tube partially filled with the solution of the barium salt. 2. How is the strength of vinegar commercially determined, and what is meant by "proof," "overproof," etc.? A. A sample of the vinegar is saturated, by agitation, with pure slaked lime, the clear liquor filtered off, and tested with an acetometer, an instrument resembling the hydrometer; sold with instructions by dealers in philosophical instruments. Proof vinegar contains 5 per cent of acetic acid, and will saturate 14 1/2 grains of crystallized sodium carbonate.

What is the quicksilver alloy used on mirrors? A. An amalgam of mercury and tin.

(2) J. D. C. writes: I have a 5-cell Daniell battery for medical use. 1. Can the current be utilized for illuminating purposes, and how? A. Your battery is not of sufficient power to produce an electric light that would be of use for purposes of illumination. Use a battery of 50 Grove's cells. 2. Of what should the points for giving off light be made, so as not to be consumed too rapidly? A. Make carbon points of a 1/4 inch square strip or pencil of gas retort carbon, which you may procure at the works where illuminating gas is manufactured.

(3) J. D. writes: I consume an immense amount of coal every crop at my sugar estate, nearly 800 tons, but at least one half the coal sold me is dust, which finds its way through the grate bars. 1. How could I burn the dust and not expose myself to such a loss? A. See p. 1295 of SUPPLEMENT, No. 82, vol. 4. 2. Which is the best and cheapest coal for producing steam? A. Anthracite nut coal is generally preferred if the boilers are large enough to supply abundant steam for the work to be done.

What is the weight of a gallon of cane juice at 10° density of Baumé? A. 10°/28 (or 10 1/2) lbs. avoirdupois at 62° Fah.

(4) L. G. asks: Do the engines on the Pennsylvania Railroad fill their tanks while running, without stopping for water? They did in 1876; do they at present? A. The engines drawing some of the trains do.

(5) C. W. B. asks: Can an engine supply itself with air sufficient to run it by the use of leverage and by letting the exhaust air back into the air pump? How much surplus power can be obtained? The leverage may be any practical length from the engine to the air pump. A. As we understand your meaning, we think not.

(6) P. R. asks for a recipe for making a glue to be used on damp wood. A. 1. Hamelin's cement: Soak pure glue in water until it is soft; then dissolve it in the smallest possible amount of proof spirit by the aid of a gentle heat. In 2 ozs. of this mixture dissolve 10 grains of gumammoniacum, and while still liquid add half a drachm of mastic dissolved in 3 drachms of rectified spirit. Stir well and keep the cement liquefied in a covered vessel over a hot water bath. It is essentially a solution of glue in mastic varnish. 2. Shellac, 4 ozs., borax, 1 oz.; boil in a little water until dissolved, and concentrate by heat to a paste.

(7) W. S. J. asks: What is the cause of color blindness, and is there any cure for it? I cannot see red apples on a tree at a little distance, the red and green looking just the same. A red light or red flag never attracts my notice, though a blue flag or light instantly does. I can see but three colors in the rainbow, and always call light brown or buff, green. If there is any remedy for the disease I should be glad to

know it. A. Dr. Young, adopting apparently the notion of Darwin, that the retina is active, not passive, in vision, regarded it as the simplest explanation of this defect to suppose that those fibers of the retina which are calculated to perceive red are absent or paralyzed. The followers of Gall and Spurzheim maintain that the faculty of distinguishing colors does not depend on the eye, but on a particular part of the brain, to which they give the name of the organ of color, and that the defect lies in this organ and not in the eye. On whatever cause a partial or complete insensibility to color depends, it is a state of vision for which there seems to be slight means of cure. Consult McKenzie "On the Eye," and p. 368, vol. 35, SCIENTIFIC AMERICAN.

(8) J. H. B. writes: 1. I have a relay with two spools 1 1/2 by 3 1/2 inches. If I should unwind them and rewind the wire on spools 1 3/4 to 2 inches long, using all of the wire, would there be any difference in the sound? Would the short spools produce a heavier sound, or would they be the same as the longer ones? A. The difference in the sound produced by the alteration you mention would be slight. See answer No. 4, p. 155, SCIENTIFIC AMERICAN, March 9, 1878. 2. Would a relay with three or four spools produce a louder sound than one of two spools? A. That would depend on the relative resistance of the battery; and the wire used in the relay.

Please give me a recipe for a cheap varnish for brass steam throttles? A. Use a thin solution of shellac in alcohol.

(9) H. M. writes: I have a magnetic machine, intended for medical purposes, which I wish to adapt to making electrotypes. Will it answer? A. Your instrument produces an intense current of electricity, such as will produce physiological effects, as shocks, etc.; electro-plating is best performed with a quantity current of low intensity. Although it is possible to produce an electrotype with the instrument, you would find it more convenient to use a battery.

Which is the front end of a steam engine? In books I find it always given as the end farthest from the crank, while in practice I invariably find it called the end through which the piston rod passes. A. This is simply a technicality, and depends somewhat on the style of engine. If you regard as correct the latter interpretation which you mention, it would not generally apply to locomotive engines.

(10) W. G. L. asks: How can I polish a cow's horn by hand? I wish to polish a handsome horn without using wheels or machinery of any kind. A. We think you can polish it by careful scraping with the edge of a piece of broken glass, and then rubbing it with some smooth, hard substance.

(11) C. B. desires instructions for making a lime kiln on a small scale, in which to burn oyster shells. Will some of our correspondents enlighten him?

(12) H. W. B. asks: 1. What size wire is best for connecting telephones? Will No. 40 insulated answer? A. No. 40 wire will answer for very short circuits, but it is easily broken; for house service use about No. 19 copper wire insulated with cotton, and soaked in paraffin. 2. How should connecting wire be put up from one room to another (in the same house) so as to be as little visible as possible? A. The wire may be laid in the recesses or grooves of the base board moulding, or tucked under the edge of the carpet.

(13) S. R. asks: 1. What is the rule for finding the capacity of air pumps for jet and surface condensers? A. Having fixed the length of stroke and number of revolutions of the pump per minute, divide twice the number of cubic feet to be removed per minute by the speed of the pump piston in feet per minute. The quotient will be the area of the piston. 2. What is the rule for finding the capacity of condensers for simple and compound engines? A. A common practice is to make the cooling surface from two thirds to three quarters the boiler heating surface. 3. What is the rule for finding the position of the piston in the cylinder, when the crank is at half stroke, for different strokes and different lengths of connecting rod? A. If c is the length of the connecting rod, and r the length of crank, the piston is at a distance from mid-stroke equal to $c - \sqrt{c^2 - r^2}$.

(14) W. T. H. asks: What horse power has an engine having a 6 x 9 inch cylinder, running 300 revolutions per minute, using 200 lbs. steam to the square inch, cut off half way? A. You might get between 40 and 45 effective horse power, if the engine is well designed and built.

(15) J. D. B. O. writes: Please give me a plan for a small fountain having a perpendicular jet, which will supply itself from the same water over and over again without mechanical force of any kind, something on the plan of the siphon. A. We doubt whether anything of the kind has been or ever will be designed.

(16) W. J. writes: Wishing to tin some 1/2 inch round iron hooks, I pickled them for 24 hours in a strong sulphuric acid and water mixture, without success in removing the scale. It costs too much to scour them by hand. What can be done? A. It is doubtful if you can clean them sufficiently without scouring. Mechanical scourers can be used, however.

(17) L. C. S. writes: I have a common tobacco press, and desire to know the amount of pressure I obtain by pushing 100 lbs. on the end of a 9 foot lever, the screw being 4 inches in diameter, with 1/4 inch threads. A. Neglecting friction, the force applied is to the pressure produced, as the distance traveled where the pressure is applied is to the distance traveled by the force in the same time.

(18) L. A. W. asks: Can a spiral spring, made of good steel wire, be tempered so that it will retain its elasticity when subjected to constant hard usage? A. All spiral springs are apt to set in course of time. For mode of tempering, see SUPPLEMENT, Nos. 95 and 103.

(19) S. B. G. asks: Where did the river Jordan discharge its waters, before Sodom and Gomorrah were destroyed? A. The most generally accepted

theory of travelers is that the Jordan always discharged into the Dead Sea, and that the "Cities of the Plain" were situated on the southern border of the sea. Some suppose that the Jordan at one time flowed into the Red Sea, and that its course was depressed into a deeper valley by a geological change.

(20) J. H. R. asks: Will it do to use the Bell telephone in circuit with the Morse telegraph? A. Yes; but if the magnet wire of the telephone is very fine and has great resistance, it should be connected so as to be in a partial or split circuit with the main line. See answer No. 19, p. 155, SCIENTIFIC AMERICAN of March 9, 1878.

(21) V. & G. write: Our grate bars are 16 inches below our boiler. Would we gain anything by raising them? We burn slack (soft) coal. A. No.

(22) C. S. M. writes: If I wish to ascertain the exact amount of rain which falls on a certain spot, say on a steep hillside, should the top of the gauge be horizontal, or should it incline as the hillside does? A. Horizontal, generally.

(23) J. F. W. writes: When a locomotive is drifting backward and you throw the reverse bar forward, it will fly back if not secured in the quadrant. Where does it get its leverage from? A. If the action occurs, it is due to the compression in the cylinders.

(24) F. S. L. writes: A vessel is going at a certain speed, and it is desired to double its speed. How much more power must be used? A. The exact ratio is not known. By the common rule it would take about 8 times the power.

(25) W. F. U. asks: If three men are to carry a 30 foot iron rail, where must the hand stick be placed so that each man will have an equal load, one man being placed at one end? A. 7 1/2 feet from the other end, if the weight of the hand stick is disregarded.

(26) F. V. C. asks: Can a steamboat ascend as steep a grade as a locomotive drawing a train of cars, and what is the steepest practicable grade a steamboat can ascend and descend, the water being, say, 2 feet deep? A. The locomotive would have the advantage over the steamer. If you find the velocity of the water in the rapid to be 20 miles an hour, the speed of the boat, to be able to ascend, must be something more than this, and the practical limits are determined by the possible speed of the steamer.

(27) A. M. A. writes: One night I left a pail of water on a stone well box. The next morning I found it frozen over, and in the center was a spike of ice about 6 inches long and sharp at the top. What was the cause? A. Without knowing all the circumstances, we may not be able to explain the matter correctly, but we presume it was due to the expansion in freezing, if there were no outside interference. Perhaps other readers have observed similar phenomena on which they have reasoned. If so, we would be glad to hear from them.

(28) J. W. K. writes: We have a 3 horse power engine and boiler, fed from a tank which holds about five barrels, lined throughout with zinc, and made steam tight by soldering all joints. The tank has been in use 10 months. We use soft water from a tin roof painted with yellow ochre. The exhaust is blown directly into the tank at one end, and passes the length of the tank over the water, and what does not condense is carried off through a large tin conductor pipe 15 feet long, arranged so as to carry back all steam condensed before it reaches the outlet, thus using the water over several times. The water is nearly boiling hot when thrown into the boiler. An examination shows the zinc around the top of the tank and near the exhaust pipe to be badly corroded and crumbled. (Sample inclosed.) Will the water that has been in contact with this corroded zinc damage the boiler; and, if so, what will be the effect? A. We do not think the boiler will be injured by the zinc; but from the sample sent we are inclined to think that scale may be deposited in the boiler. It would be well to examine.

(29) W. B. asks: Does soda ash prevent scale from forming in boilers? Will it cause foaming? Is it injurious to the boiler? A. It has been recommended for preventing scale, and does not generally cause any inconvenience or injury.

(30) W. H. A. writes: A metallic pipe is standing vertically, supported so that the lower end is free from the ground. At the lower end is a valve which opens downward. The area of valve surface is 5 inches. Air is excluded from the pipe. What depth of water in the pipe will open the valve, the pipe being so long as to permit a vacuum to be formed above the water? A. The height of the column of water will be about 35 feet.

(31) F. B. S. asks: 1. Would it injure the steel in small tools to heat them red hot in a melting ladle or iron box in a common coal fire; that is, where the coal contains sulphur? Should the ladle or box be covered? A. It would be better to cover the tools with charcoal to prevent decarbonization. 2. How are small tools usually heated for hardening? A. In a charcoal or coal fire in which the gas is burnt out of the coal. The most recent practice for a quantity of tools is to heat in a flux of one half salt and one half potassium cyanide.

(32) P. M. asks: What is the difference in power between running a 60 saw cotton gin with 80 feet of shafting, and with a 42 foot belt from the engine pulley—with the proper shafting and pulleys in the two cases? A. As we understand the question, we do not think there will be much difference.

(33) J. F. W. writes: I have been firing a locomotive engine about a year, and never had any trouble in keeping steam up to the standard until within the last three months. The engine is cared for precisely as before, I use the same kind of coal, and I cannot see any difference in the way the fire burns. What is the difficulty? A. It may be caused by incrustations on the heating surfaces, which prevent the transmission of heat to the water to a considerable extent. From your account this seems probable.