

**AN OLD CONCERN, RE-ESTABLISHED.**

Horace Waters & Son, dealers in musical instruments in this city, made an assignment not long ago to secure their creditors. Mr. Waters, Sr., after thirty years' experience, hopes, by enterprise, economy, and fair dealing, to re-establish his business and to retain his old customers. To this end, he has opened a store a No. 40 East 14th St., and acts as agent for a number of leading musical instrument manufacturers.

**Business and Personal.**

*The Charge for Insertion under this heading 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.*

There is no delay, no firing up, no ashes, no extra insurance, and no coal bills, for manufacturers using the Backus Water Motor. It is the most economical power known for driving turning lathes, scroll saws, grinders, printing presses, sewing machines, etc. Four horse power at 40 pounds pressure. It is noiseless, neat, compact, steady, and, above all, very cheap. Will work at any pressure above 15 pounds. Send for circular, addressing the manufacturers, The Backus Water Motor Company, Newark, N. J.

The best results are obtained by the Imp. Eureka Turbine Wheel and Barber's Pat. Pulverizing Mills. Send for descriptive pamphlets to Barber & Son, Allentown, Pa.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price \$2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Best Turkey Emery in bbls., kegs, and cases. Special rates for large quantities. Greene, Tweed & Co., 13 Park Place, New York.

Solid and Opening Die Bolt Cutters, Screw Plates, and Taps. The Pratt & Whitney Co., Hartford, Conn.

Wanted—A 24 hand Stationary Engine, about 15 to 20 H.P. J. Davis, Limestoneville, Montour Co., Pa.

Wanted—Engineers and others to sell Barr's "Combustion of Coal." \$5 a day made after working hours. Address Yohn Bros., Indianapolis, Ind.

The advertisement of the Aultman & Taylor Company, which attracted so much attention last week, will appear again in the next issue.

Bunnell's Dynamo-Electric Machine for Gold, Silver, Copper, and Nickel Plating. An improved, reliable, and powerful machine, for \$75. Bunnell, Electrician, 112 Liberty St., New York.

Makers of Engines, Lathes, Jig Saws, etc., for amateur use, send circulars to 310 York Ave., Phila., Pa.

Pattern Makers can get Metallic Pattern Letters to letter patterns, of H. W. Knight, Seneca Falls, N. Y.

For Sale.—One Corliss Engine, in first-class order, having been used but little; cylinder 10 in. diameter, 24 in. stroke. Kelly & Ludwig, 722 Filbert St., Philadelphia, Pa.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Rubber Belting, Packing, Hose, and all kinds of manufacturers' supplies. Greene, Tweed & Co., 13 Park Pl., N. Y.

The address of John Byrne, maker of the 4 1/2 in. telescope, with which the companion of Sirius was recently seen, is 314 East 21st St., New York city.

Sawyer's Own Book, Illustrated. Over 100 pages of valuable information. How to straighten saws, etc. Sent free by mail to any part of the world. Send your full address to Emerson, Smith & Co., Beaver Falls, Pa.

For Sale or Royalty.—Goodwin's Music Leaf Turner. Patented March 4, 1879. No. 212,846. Address O. H. Goodwin, P. O., San Francisco, Cal.

The H. W. Johns Mfg. Co., 87 Malden Lane, New York, are sole manufacturers of the Genuine Asbestos Liquid Paints, Boiler Coverings, Fireproof Coatings, etc.

Gears.—All kinds and sizes. New list. Light machine work, models, etc. Geo. B. Grant, 98 Beverly St., Boston, Mass.

Slate, Barrel, Keg, and Hoghead Machinery a specialty, by E. & M. Holmes, Buffalo, N. Y.

Improved Blind Staples. B. C. Davis, Binghamton, N. Y.

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

H. Prentiss & Co., 14 Day St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in. Swing. Address Star Tool Co., Providence, R. I.

The Horton Lathe Chucks; prices reduced 30 percent. Address The E. Horton & Son Co., Windsor Locks, Conn.

Lincoln's Milling Machines; 17 and 20 in. Screw Lathes. Phoenix Iron Works, Hartford, Conn.

Boilers ready for shipment. For a good Boiler send to Hilles & Jones, Wilmington, Del.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2318 Frankford Ave., Phila.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Linen Hose.—Sizes: 1 1/2 in., 20c.; 2 in., 25c.; 2 1/2 in., 29c. per foot, subject to large discount. For price lists of all sizes, also rubber lined linen hose, address Eureka Fire Hose Company, No. 13 Barclay St., New York.

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

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

Linen Hose.—All sizes, with or without couplers, in any quantity. Greene, Tweed & Co., 13 Park Pl., 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.

Band Saws a specialty. F. H. Clement, Rochester, N. Y.

American Fruit Drier Mfg. Co., Chambersburg, Pa.

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

Eclipse Portable Engine. See illustrated adv., p. 414.

Eagle Anvils, 9 cents per pound. Fully warranted.

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

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Acme Lathes.—Swing, 7 in.; turn, 19 in. long; back geared; screw cutting. Send 3 cent stamp for circular and price, to W. Donaldson, southwest corner Smith and Augusta, Cincinnati, Ohio.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., 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.

For Sale.—9 pieces 2 7-16 turned shaft, 11 feet long; coupled; good as new. Frisbie & Co., New Haven, Ct.

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

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Wood-working Machinery, Waymouth Lathes. Specialty, Wardwell Patent Saw Bench; it has no equal. Improved Patent Planers; Elevators; Dowel Machines. Rollstone Machine Company, Fitchburg, Mass.

Forsyth & Co., Manchester, N. H., and 213 Centre St., New York. Specialties.—Bolt Forging Machines, Power Hammers, Combined Hand Fire Engines and Hose Carriages, new and 2d hand machinery. Send stamp for illustrated catalogues, stating just what you want.

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.

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.

The Twiss Automatic Engine; Also Vertical and Yacht Engines. N. W. Twiss New Haven, Conn.

**NEW BOOKS AND PUBLICATIONS.**  
CAPTAIN LILL'S GRAPHICAL METHOD. By Lieutenant William H. Bixby, U. S. A. West Point, N. Y.; printed for author. Paper, pp. 16. Price 20 cents.

This graphical method for finding the real roots of numerical equations of any degree, if containing but one variable, was first exhibited by Captain Lill, of the Austrian service, in 1867. Lieutenant Bixby presents it for the first time in English, and adds a demonstration of its correctness.



**HINTS TO CORRESPONDENTS.**

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. B. T. asks: Does the horseshoe magnet lose its power by use, and where it is used in frequent contact with the steel parts of a machine will it so magnetize those parts as to render the magnet useless? A. A magnet by constant use is enfeebled, but it may be readily recharged.

(2) B. B. B. writes: Vol. XL., No. 22, p. 348, "Answers to Correspondents" (17), to R. J. F. Are you quite sure? The resistance increases with the square of the velocity, and a bullet with a heavy charge of powder may be flattened by firing it vertically down against the surface of a pail of water. A. The penetrating force increases as the square of the velocity; the resistance is not so increased, but is determined by the character of the resisting material. "The measure of the penetrating force is stated by all authorities to be the weight of the shot, multiplied by the square of the velocity at the moment of impact." Now as the velocity is greatest at the instant the projectile leaves the gun, the nearer the resisting material the deeper it must necessarily be penetrated.

(3) J. G. B. writes (1) whether it is not better to use a stripping solution in nickel plating; if so, should it not be made stronger than the regular plating solution? A. Good nickel platers consider such a solution unnecessary. 2. Am I right in using the carbon battery in nickel plating? A. Carbon (bichromate) batteries are often used, but the best plating is done with a battery of lower electro-motive force—such as that of Smee. 3. I have tried to dissolve platinum with 1 part nitric and 2 parts muriatic acids without success; please tell me why. A. Use more hydrochloric acid (1 of nitric to 3 of hydrochloric), and apply a moderate heat, decant the solution, and add fresh acid until all (if the metal is free from osmium and iridium) is dissolved. Platinum does not dissolve very rapidly. 4. How is bright gilding done? A. Without knowing something as to the surface you propose to gild, we cannot give the required information.

(4) E. N. asks (1) how to proportion a safety valve. A. See rule for calculating safety valves in answer (29), p. 267, vol. 40, SCIENTIFIC AMERICAN. 2. How to calculate the strength of boilers? A. We must refer you to rules published by Haswell, Clark, Molesworth, and other authors. A note to cover the whole question would be too long for our "Notes and Queries."

(5) L. B. asks how to preserve insects. A. Labouliere recommends plunging the insects, in the fresh state, into alcohol which has been saturated by digestion with arsenious acid (1 1/2 pint will take up about

14 troy grains of arsenic). The living insect put into this preparation absorbs about 0.003 of its own weight. When soaked in this liquid and dried the specimens are safe from the ravages of moths, *andrenus* or *dermestes*. This treatment does not affect the color of blue, green, or red beetles, if dried after soaking for 12 to 24 hours. *Hemiptera* and *orthoptera* can be treated in the same way; also the nests, cocoons, and chrysalides of insects.

(6) M. M. A. writes: In discussing the answer to question No. 30, of May 17, 1879, page 316, a few inquirers could not reconcile your answer with the principle that the "pressure of water increases as the depth." Would you kindly clear up the difficulty? A. A pipe to hold three times the quantity must have three times the area, or be 10 1/4 inches diameter nearly; now as strength of a pipe is inversely as the diameter, it is evident that if the strength were but just sufficient for a pipe 6 inches diameter, it would be entirely too weak for one 10 1/4 in. diameter.

(7) G. W. B. asks for instructions as to the proper kind, size, shape, etc., of furnace, that will be inexpensive to build, suitable for the economic melting of zinc in say fifty or hundred lb. lots. A. An ordinary cast iron melting pot, of sufficient capacity, seated on brickwork over a shallow furnace with a moderate draught, answers very well.

(8) G. H. H.—You may consult Britton's "Treatise on Dry Rot, and the Means of Preserving Timber from Destruction by Sea Worms, Beetles, Ants, etc."

(9) "Hercules" asks for an explanation of the difference between a "flue" and a "tubular" boiler. A. Formerly the distinction was between a welded tube drawn through dies and flues of so large a diameter that they were riveted together; but within the past 4 or 5 years the tube makers have enlarged their machinery, so that now welded and drawn tubes (or flues) are made up to 18 or 20 inches diameter, so that the line of distinction between the tube and flue is in a measure wiped out; probably in engineering language, flues of 6 inches diameter or less would be termed tubes, and larger diameters, flues.

(10) J. G. D. asks: 1. Suppose we place a gun perfectly level, 3 feet from the ground, and have force enough behind the ball to cause it to go 100 yards over a level plane. The question is, will the ball rise above the starting point, or can a ball be forced that distance without its rising above the level of the gun? A. It will not rise higher than the starting point. 2. Suppose we have the gun in the above position, and so arranged that the same spring that causes the first ball to start will also cause a second ball to fall from the same point to the ground. The question is, which ball will strike the ground first? A. If we understand your question, they will both fall in the same time.

(11) B. E. H. asks for the right ascension and declination of Mercury, Venus, Mars, Jupiter, and Saturn, for the 13th day of June, 1860. A. The following are the positions of the planets named at the time of transit at Washington, on the 13th of June, 1860, Washington mean time:

Mercury	...R. A.	6h 6m 07.0s	Dec. N. 25° 7' 28.5"
Venus	.....	8h 15m 57.16s	21° 14' 50.1"
Mars	.....	20h 13m 24.28s	23° 58' 8.7"
Jupiter	.....	7h 35m 12.13s	21° 17' 20.0"
Saturn	.....	9h 37m 56.22s	15° 34' 3.6"

2. How is right ascension and declination of the planets found for the past or future if it is known for any one time? A. That all the planets move in elliptical orbits is Kepler's first law, and that a line drawn between the centers of sun and planet sweeps over equal spaces in equal times is his second law, and answers your second question; but a complete elucidation of this would occupy too much of our space.

(12) D. F. writes: I read in one of your back numbers that if 14 grains of bichromate of potassium were dissolved in one ounce of gelatine and poured upon a ground glass plate, and dried in the dark, by placing a negative over the dried bichromate surface and exposing it to the rays of sunshine for a few minutes, then ink it over with printer's ink and place it in a water bath, after which the water will cause all parts that the light did not come in contact with to float away, leaving the image standing in bold relief, from which any number of prints could be taken by merely using it as a dye, upon plain paper. I did just as the paper said, and made a sad failure. So that you may thoroughly understand me, I have given you the process in full. Can you give me further information? A. Like many others you have misinterpreted the necessarily brief instructions, and have attempted the process without informing yourself as to its rationale. You will find much useful information respecting photo-printing processes in Vogel's "Chemistry of Sight and Photography," and in the back numbers of the SCIENTIFIC AMERICAN.

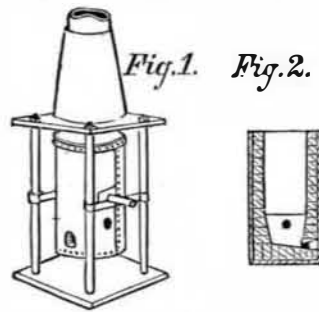
(13) C. W. H. asks: How are postage stamps printed: what kind of ink is used? A. They are printed in sheets of 200 each in heavy presses, with fine copper plate inks. The precise composition of these inks is not made public by the government printers or bank note companies. The colors are: blue 1 cent stamp, ultramarine—sulphide of sodium and iron and silicate of alumina; red 2 cent stamp—vermillion—sulphide of mercury; red 90 cent stamp—carmine; green 3 cent—Prussian blue with chrome yellow.

(14) S. A. J. asks (1) if there is any way to clean or keep clean the roof of the furnace of an upright tubular boiler where there are no hand holes. I have used locomotive and stationary boilers, but this is the first upright, and I am at a loss to keep it clean. A. You should have some small cleaning holes at the level of the crown of the furnace to clean and wash off the plate. 2. Also, where should the gauge cocks be? I have noticed in short boilers they are nearer the furnace than long ones: is there a rule for them? A. There is no rule; they should be low enough to leave sufficient steam room.

(15) J. T. B. asks: 1. How far up from the entrance of flue into a chimney ought a steam jet be introduced to increase draught? A. It depends upon

the height of chimney and pressure of the escape steam; the jet should be able to drive the whole column of air in the chimney at a rapid velocity. 2. In what form should jet be fixed in chimney? A. A cone with the end of opening bell shaped. 3. Will it injure materially a brick stack? A. No, if the temperature of gases in chimney is sufficient to prevent condensation.

(16) C. O. M. asks how to make a small furnace suitable for melting from 10 to 25 lb. of cast iron; what to use to produce sufficient blast. A. The accompanying figures will give a very good idea of a small cupola for melting iron. Fig. 1 being a perspective view, and Fig. 2 a section of the cupola. The body is made of heavy sheet iron, lined with fire brick, and provided with trunnions by which it is supported on cross bars in a frame composed of two iron plates about two feet square, separated by four 1/2 foot columns of 3 inch gas pipe, the whole being fastened together by four long bolts which pass through both plates and through the columns. The upper plate has a large opening and a flange or collar for receiving the base of the chimney. The cupola has openings on opposite sides to receive the blast nozzles or tuyeres, and a tap hole in front. It should be about 3 feet high, and 14 inches internal diameter. The base of the chimney should have a door through which to charge the cupola. The blast may be supplied with a large bellows, but a small fan blower will answer much better. For the quantity of iron mentioned a cupola two thirds the size given would answer.



(17) C. E. S. asks: What are the ingredients used in making the copper ruby stain for ornamenting the common glass petroleum lamp cisterns and cheap vases? A. Use a soft (lead) glass containing about 3 per cent of protoxide of copper. Stir the pot occasionally with a stick of green wood, or add a little tartar, to prevent higher oxidation of the copper, which would then produce a greenish glass. The proper color appears only upon annealing.

(18) N. W. asks: How can I cut a round hole in a pane of glass and save the pane—do not care about saving the inside; want to cut a hole 6 inches in diameter; have tried a diamond without success? A. Use a copper tube of the size of the required hole; revolve it in contact with the glass, and supply it with emery and water.

(19) G. P. asks: 1. Can eggs and pears be preserved by being kept in rarefied air or in air-tight jars? A. No, not practically. 2. Can eggs preserved with lime be changed so as not to show it? A. Dip them momentarily in acetic acid, then in cold water, and let dry in the air. 3. What is the most successful way to preserve apples and pears? A. Either by thorough desiccation, or in sugar sirup or glycerine from which the air has been expelled by boiling.

(20) R. D. K. asks: 1. What is the specific heat; specific gravity (in liquid and gaseous state respectively); caloric of fluidity or latent heat; volume at boiling point under pressure of atmosphere; point of congelation; point of liquefaction under given pressure; and atomic weight of each of the following substances, stating unity—Chloride of methyl, ether, nitrous sulphurous oxide, ethyl chloride, methyl bromide, aldehyde, methyl forminate, ethyl bromide, methyl iodide, carbon disulphide, bromine, acetic ether, hydrogen, and ammonia? A. Specific heat—1.2266, nitrous oxide 0.3447, sulphurous oxide 0.3144, ethyl chloride 0.6096, ethyl bromide 0.7026, carbon disulphide 0.4122, bromine 0.3040, acetic ether 1.2184, hydrogen 0.2354, ammonia 0.2996. Specific gravity—ethyl ether +20°, 0.713; 0°, 0.736. Nitrous oxide 1.525, sulphurous oxide 2.21, ethyl chloride 0.874, methyl bromide 1.66, aldehyde 0.807, ethyl bromide 1.47, methyl iodide 2.22, carbon disulphide 1.27, bromine (liquid) 2.976 (vapor) 5.54, hydrogen 0.0693, ammonia 0.589. Latent heat (steam = 1)—methyl formate 0.219, methyl iodide 0.086, carbon disulphide 0.162, bromine 0.085, acetic ether 0.173. For other data required consult "Constants of Nature," published by the Smithsonian Institute, Washington.

(21) J. B. writes: My house is at the bottom of a hill; after a heavy rain the water bursts in through cellar walls and bottom. How can I prevent it? Would cement answer the purpose? The house is too near the line of another's land to admit of digging a drain. A. Doubtful if cementing would be effective; better carry a drain below the cellar bottom.

(22) F. C. S. asks: 1. What is the power of an engine with (7) seven inch stroke, (6) six inch bore, running (120) one hundred and twenty revolutions per minute, with (60) sixty pounds of steam? A. See p. 267 (4), current volume of the SCIENTIFIC AMERICAN. 2. Is the steam pipe 1 1/2 inch (outside measure), large enough to supply steam for such an engine? A. Yes.

(23) J. J. S. asks how to determine, without a test, which will be the north or south pole of an electro-magnet. A. In electro-magnets, the south pole is always found at that end where the positive current enters a righthanded helix. See forms of electro-magnets, with 51 engravings, in SUPPLEMENT, No. 182.

(24) J. R. asks how it is that dynamite is said to exert a greater force downward, and gunpowder upward when they explode? A. This is a misconception. Nitroglycerine (the explosive agent in dynamite) yields on exploding about 900 times its volume of gas; gunpowder but 300. This gas, suddenly liberated, must displace a portion of the atmosphere, which presses with a weight of about 9 tons upon each square yard of surface. To lift such a weight in the exceedingly short space of time occupied in the explosion of a charge of nitro-