

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.

Small Automatic Cut-Off Engines—10 to 100 Horse Power a specialty—power, economy, and governing guaranteed. Buckeye Engine Co., 87 Liberty St., New York.

Drawings and Engravings of Machinery a specialty. Pemberton & Scott, draughtsmen, 37 Park Row, Room 30. Vertical Scientific Grain Mills. A. W. Straub & Co., Phila.

Assays of Ores, Analyses of Minerals, Waters, Commercial Articles, etc. Technical formulae and processes. Laboratory, 33 Park Row, N. Y. Fuller & Stillman.

Alcott's Turbine received the Centennial Medal.

"Economy" Gas Cooking Furnaces. Cool kitchen, cheap fuel. Circular and treatise free. A. W. Morton, 104 John St., N. Y.

For New and Second Hand Boilers, send to Hilles & Jones, Wilmington, Delaware.

Door Bolt Patent. Simple, Cheap, Effective. For sale, or to manufacture on royalty. Address D. A. Robinson, Union Springs, N. Y.

Friction Clutches 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.

Wanted, a 2nd hand printing press and type. C. Root, Cato, N. Y.

Wanted—a Situation by a Draughtsman and Mechanical Engineer of practical experience in the workshop. Salary no object. Address Engineer, 135 E. Wash. St., Indianapolis, Ind.

By the new Churn patented by George Sprague, Rockford, Iowa, butter is made in from 2 to 10 minutes; salted and washed in the Churn.

Novel Gyroscope Top. Patent (allowed) for sale or on royalty. T. S. Brown, 206 N. 3d St., St. Louis, Mo.

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

Supplies for Telephone and other electrical experiments. Jerome Redding & Co., 30 Hanover St., Boston.

For Mill Gearing, Shafting, Pulleys, and Hanger, address T. B. Wood & Co., Manufs. Chambersburg, Pa., for price.

Steam Yacht "Hiawatha" for sale.—Length, 40 ft.; beam, 8 ft. 5 in.; engine, 12 H. P.; speed, 12 miles. For particulars apply to J. M. Meredith, Exr., Malden Creek P. O., Berks Co., Pa.

24 inch Second-hand Planer, and 12 inch Jointer, or Buzz Planer, both in first-class order, for sale by Bentel, Margedant & Co., Hamilton, Ohio.

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

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.

Cornice Brakes. J. M. Robinson & Co., Cincinnati, O.

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. Forsaith & Co., Manchester, N. H.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page. Painters' Rapid Graining Process. J. J. Callow, Cleveland, O.

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

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

Safety Linen Hose for factories, hotels, and stores, as protection from fire. Greene, Tweed & Co., 18 Park Place, 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 39 Park Row, N. Y.

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

Warranted best Planers, Jointers, Universal Woodworkers, Band and Scroll Saws, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

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

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

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

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

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

Lansell's Steam Siphon pumps sandy and gritty water as easily as clean. Leng & Ogden, 212 Pearl St., N. Y. 1,000 2nd 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.

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

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

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 300. John Edwards, P. O. Box 786, N. Y.

NEW BOOKS AND PUBLICATIONS.

THE FARMER'S AND MECHANIC'S MANUAL. By W. S. Courtney. Revised and Enlarged by Geo. E. Waring, Jr. Sold by Subscription. E. B. Treat, 805 Broadway, New York City.

Colonel Waring says that in hunting through libraries for books giving data for various simple problems relating to farm work, he found plenty of volumes which contained almost everything except just what he happened to want to know. Any one who has searched for every day mechanical data in mechanical text books will recognize that experience as his own, and feel a prepossession in favor of the present work, in which the author says he has endeavored to place an immense amount of just that kind of practical information which working farmers need ready at hand at all times. To particularize all that is embodied would take much more space than is here available. There are chapters on measures of all kinds, on hydraulics, on fuel, on fences, on the horse and other farm animals, on keeping accounts, strength of materials, drainage, mechanism, painting, building, and so on through a long, varied, and useful category. All descriptions are plain and simple, an excellent index is provided, and there are over six hundred illustrations.

THE ANEROID BAROMETER; ITS CONSTRUCTION AND USE. Price 50 cents. D. Van Nostrand, Publisher, 23 Murray St., New York.

A valuable little hand book compiled from several authoritative sources, and quite fully covering its subject. It forms No. 35 of Van Nostrand's Science Series.

WOODWARD'S DRAWING STUDIES. Price \$6. Published by the American News Company.

An excellent collection of lithographed models prepared by competent artists and well suited for study in schools. All of the drawings are repeated in outline and shade so as to adapt them to all ages and all conditions of progress. The collection is well suited for the use of art students and schools.



S. C. A.—See pp. 241 and 284, vol. 37; and SUPPLEMENT, No. 49, p. 770.—A. H.—A coating of hydraulic cement will be the cheapest remedy to apply.—C. E. B.—The weight of the water must be added to the pressure on the lower gauge.—V. N.—See p. 299, vol. 37, answer No. 16.—B. E.—Your question is too general. The best distribution of the steam must be determined from a consideration of the size and character of the engine, the piston speed, and the steam pressure.—H. W.—Regarding bar magnets, see answer No. 16, p. 299, vol. 37. The question of infringement depends upon the mode of construction.—W. B.—A heating apparatus such as you describe could probably be fitted up by any good plumber.—F. S.—Consult Willard's "Practical Dairy Book" and Cowen's "Cook's Receipt Book."—L. H.—Send to any of the booksellers who advertise in the SCIENTIFIC AMERICAN, for circular.—G. F. W.—The information you desire has yet to be published, so far as we are aware.—A. D.—Probably any good carriage builder will furnish either the article or the plan.—E. N.—We see no difficulty in the proposed arrangement.—P. P., Jr.—There should be no difficulty with the boiler, and all the machinery will probably answer very well.—The correspondent writing from Charlestown, Mass., who forgot signature, will find the information desired in SCIENTIFIC AMERICAN of January 19, 1878, answer No. 37.—E. F. Y.—We incline to an affirmative answer to all your questions.—L. M. B.—See vol. 33, p. 339, for general instructions. There are some special forms in the market which are well spoken of.—W. B.—See p. 232 of SCIENTIFIC AMERICAN, April 13, 1878. It appears to us that there is no doubt as to the utility of the application of the telephone to diving and submarine work.—W. C. S.—It appears that you have obtained a result which is as good as is usually obtained with the instrument in its present form.—J. O'M.—It is a fact that coal exposed to the weather deteriorates to a considerable extent.—S. W. S.—It might be well to arrange the slats so that the sail would form a warped surface. See p. 241, vol. 32.—A. A.—The electric circuit through so many instruments has no doubt great resistance, and it may be necessary to use as many as 80 cells of Hill's battery to properly overcome it.—B. T. C.—We think you can suspend the zinc in the boiler without any injurious effect upon the water.

(1) P. E. L. asks: What are the best solutions for tempering mill picks? A. Most blacksmiths use clear water, but some add 1/2 lb. of salt per gallon of water.

(2) A. C. C. writes: I have been surveying and making maps of property, and cannot make the landmarks and compass bearings as laid down in the deeds agree with the present bearings. What is the variation or deviation of the compass for the past 25 years? A. You will probably have to obtain this information from old maps and deeds, and from the notebooks of former surveyors, if they are accessible. It often happens that in old deeds the bearings of lines are given, which lines are also referred to existing landmarks. A recent publication entitled "Magnetic Variation in America," by J. B. Stone, may possibly contain the information you require.

(3) L. G. S. writes: I wish to put a flagstaff made of wrought iron pipe on a building, say through the center of the roof. The telegraph wires are within 100 yards of the building. Would there be danger from lightning? A. It might be well to connect the iron flagstaff with the lightning rod.

(4) In answer to H. L. B.: Generally, if the fire is well covered, and the damper partly closed, the steam pressure does not rise. In regard to the scale, you may derive some benefit from the use of a filtering feed water heater.

(5) F. B. asks: 1. Will it do as well to have the valves of an air pump open in the side as upward (as in diagram)? A. The valves as shown will answer very well. 2. How large should the air chamber of a pump 1 1/2 inch bore and 3 inches stroke be, in order to raise water 6 or 7 feet in a 1/2 inch tube? A. Make the capacity of air chamber at least as great as displacement of pump piston per stroke.

(6) J. T. asks: At what date was our present system of figures invented, and by whom was it first introduced? A. The Arabs, through whom the existing system reached Europe, are said to have obtained it from Hindostan in the 10th century. The date of the original invention and name of the inventor are not known.

(7) W. P. R. asks: Could a steel spring be made powerful enough when wound up to propel a boat 20 feet long? A. While we could hardly recommend such a means of propulsion, it is possible. The great difficulty will be in winding up the spring, as by increasing its width or providing several springs you can increase the power to almost any desired extent.

(8) C. E. H. writes: Please explain the way in which the following formulæ relating to steam vessels are used:  $\frac{V^3 \times D^3}{I. H. P.}$  and  $\frac{V^3 \times \text{mid. sec.}}{I. H. P.}$ . A. The formulæ are used to compare the performance of different steamers, by substituting proper values for power, midship section, etc., and calculating the resulting constants.

(9) S. C. D.—The scarlet color appears to be coralline, a dye derived from phenol or carbolic acid. It costs about 90 cents an ounce. The violet compares well with Hofmann's "R," or methyl "R.B."

(10) F. C. asks: How can I make an effective filter for muddy water? A. Conduct the water into the bottom of a large cask or hogshead half filled with washed silicious gravel, grading finer towards the top; then a thick layer of well burned, coarsely granular charcoal well covered with small gravel, thus nearly filling the vessel. Where a larger quantity of water is required than can be properly filtered in this manner, it is generally more satisfactory, within reasonable limits, to increase the number rather than the size of such filters. See also answer No. 39, SCIENTIFIC AMERICAN, p. 251, October 17, 1874.

(11) J. B. asks: What power engine and what size and pitch of screw will a boat 40 feet long and 13 feet beam require; boat to be used for fishing and hunting purposes, flat bottom, and as light draught as practicable? A. If a very light draught is needed, it may be well to use two screws, from 18 to 20 inches in diameter, and you can drive them both with a 7 x 9 engine.

(12) N. S. B. asks: How can I bleach a very fine Florida bathing sponge, without injuring it in any way? A. You may try soaking in sulphite of soda solution and subsequently washing thoroughly in water. See SUPPLEMENT, No. 38, p. 606.

(13) T. W. I. asks: How can I thin some very thick boiled linseed oil, for use in polishing wood? A. Mix spirits of turpentine with it.

What is the best color to temper fine drills to? A. A clear purple.

What is meant by the "pitch" of a screw propeller? A. The degree of twist in the blades, like the pitch of a screw thread.

How can I render light cotton cloth waterproof? A. Moisten the cloth, on the wrong side, first with a weak solution of isinglass, and when dry, with an infusion of nut galls. Or use a solution of common bar soap instead of the isinglass, and another of alum in place of the galls.

Can I make a telephone of a short circuit without using a battery? A. See answer No. 19, p. 155, SCIENTIFIC AMERICAN, March 9, 1878.

(14) In answer to H. L.—Numerous experiments, by independent investigators, confirm the statement that the maximum density of water is reached at a temperature of about 39° Fah., so that expansion takes place whether the temperature is decreased or is raised above this point.

(15) T. S. asks: What is the formula for finding the horse power of a stationary engine? A. Find how many foot lbs. of work the engine performs in one minute, and divide this quantity by 33,000. The quotient is the horse power of the engine.

(16) I. P. H. asks: 1. What battery do you consider the best for plating and electrotyping for an amateur to use? A. Smee's, or some simple form of sulphate of copper battery. 2. What material do electrotypers use for making moulds for letter work? A. Beeswax.

(17) L. D. asks: How many cells of Bunsen's or Grove's batteries are required to produce an electric light capable of lighting a room 20 x 35 feet? A. About 20.

How can I make a telephone? A. See answer No. 19, p. 155, current volume.

Why are the zincs in a battery connected with the carbons, when there are more than one cell, and not the zinc to zinc? A. They may be connected in either way. If it is desired to produce an intense current of electricity, the pairs are connected in the first way you mention; but if a quantity current is desired, then all the zincs are connected as one zinc, and all the carbons as one carbon, and a wire joining the two will conduct a current of quantity electricity.

(18) O. B. M. writes: 1. I have constructed an acoustic telephone by taking two tin cylinders, each having one sheepskin head. A small hole is made in each head, and a string run from one to the other. I can hear distinctly 50 feet, but the string must not touch anything between. A. The string which joins the instruments may be stretched a long distance and around corners, if supported at each corner by a short piece of string fastened to a tree or post, or other convenient object. 2. If I take wire can I carry sound 500 yards by having it directly attached to the necks of bottles as telegraph wires are? A. Using the instruments you describe, most if not all of the sound vibration would be lost at the bottle neck supports.

(19) "Constant Reader."—Drawing is taught at all technical schools. Free instruction is given at the Cooper Institute in this city. The supply of ordinary draughtsmen is at present, we think, rather in excess of the demand. First class draughtsmen can generally find employment, at a good price.

(20) T. E. M. asks: Does the piston of a locomotive, when running, come back in the cylinder the same as in a stationary engine, or is its motion always forward? A. The piston moves backward and forward with reference to any point of the cylinder, while it may be continually moving forward with reference to some point on the ground.

(21) L. H. J. asks: Can clockwork, acting through the medium of a spring or the force of gravity, be considered as a prime mover or a transmitter? My friend contends that the elastic force of the spring and force of gravity on the weight are true forces of nature, and that therefore such clockwork is a prime mover from the definition of that term. I hold that it is merely a transmitter, because as much work has to be expended upon it as is given out. A. We think your view of the case is the correct one.

(22) T. P. F. asks: 1. Does the percentage of slip of a screw propeller with a boat having a fine run increase with the number of revolutions? A. With a well designed screw, there is not a great difference in slip for a considerable variation of speed. 2. What is the least amount of slip for the propeller of a steam yacht? A. From 7 to 8 per cent, we believe. 3. What is the greatest number of miles ever made in one hour by a 50 foot steam yacht without tide or current to help? A. There are no reliable records of continuous speed for such vessels higher than 20 or 21 miles an hour. Some of the new English steam torpedo boats are credited with a speed of 27 knots an hour, probably measured over a short course, and the distance per hour computed from the rate thus acquired.

(23) G. V. B. asks: What will prevent the steel parts of drawing instruments from rusting? A. Clean them occasionally with an oiled rag.

(24) L. S. T. writes: 1. In the early part of the winter I filled a small keg with cider that had been made in the fall. From this keg I filled a small glass bottle which was perfectly clean. They were both placed in the same cellar, the bottle being corked tight, and the keg having the bung out; at this time the cider in the keg is about the same as it was when put in, while that which was put in the bottle is a No. 1 vinegar with a very high color. What caused the cider in the bottle to make vinegar in such a short time? A. It was probably due to impurities from the bottle, cork, or funnel used in filling. 2. Is there anything injurious to vinegar about lead pipe, that is, if vinegar be run through the pipe? A. Vinegar quickly corrodes lead, forming soluble lead acetate (sugar of lead), which is very poisonous. 3. What would be the result if block tin pipe were used? A. Vinegar has little, if any, effect on pure block tin pipe.

(25) W. S. asks how to make gold lacquer. A. 1. Shellac, 3 ozs.; turmeric, 1 oz.; dragon's blood, 1/4 oz.; alcohol, 1 pint. Digest for a week, with occasional stirring, decant and filter. 2. Digest in separate portions of wood naphtha or wine spirits an excess of turmeric and dragon's blood; dissolve shellac in 5 parts of alcohol or wood naphtha (methyl alcohol), and color with the above tinctures (filtered) to suit.

(26) M. H. T. & Co.—The sample sent us consists principally of a solution of resin and oil or resinous alumina soap in oil of turpentine and benzine or kerosene. Pale alcoholic shellac would doubtless answer as well. You may try also: 1. Gum caoutchouc dissolved in a mixture of carbon disulphide with six per cent of strongest alcohol. 2. An aluminous soap dissolved in turpentine oil. The latter dries quite slowly, the former rapidly at ordinary temperatures. The aluminous soap is prepared by adding to a dilute, boiling solution of common yellow (resin) soap, solution of aluminic sulphate (alum cake) as long as a precipitate forms; washing and drying the precipitate at 250° Fah., and dissolving it in warm oil of turpentine.

(27) R. C. asks: What is the method employed in testing the hardness of metals and alloys? A. If by hardness is meant the power of resisting abrasion, we do not know that there is a standard scale in use other than that of Mohs and Breithaup, usually employed by mineralogists. In this scale is taken as No. 1 and the diamond as No. 10; the intermediates being: 2, gypsum (cryst.); 3, calcspar (transparent variety); 4, fluorspar (cryst.); 5, apatite (transp.); 6, orthoclase (white, cleavable); 7, clear quartz; 8, topaz (transp.); 9, sapphire (cleavable). No. 3 is of about the hardness of pure copper; it scratches and is scratched by the latter. No. 7 is about as hard as file steel. Fine gold=2.5 to 3. Silver has nearly the same hardness as gold. Zinc=2. Lead=1.5.

(28) A. F. asks: Can a magnet be made strong enough to lift a cubic foot of solid iron or steel from the ground, if the magnet be placed from 2 to 3 feet above? A. This would require a combination of about four U-shaped electro-magnets, each having a hollow iron core 6 inches in diameter and 30 inches long.

(29) F. M. M. writes: In your answer to the inquiry of G. F. F. in regard to premium offered by the State of New York for a steam canal boat that would not wash the banks, you stated that the premium had been awarded. Please state to whom the premium was awarded, amount of award paid, and on what device the award was made. A. Wm. Baxter received \$35,000, David P. Dobbins \$15,000, and Theodore Davis \$5,000. You will find full accounts of the boats for which the awards were made in the Reports of the Commission appointed to investigate the subject.

(30) L. P. C. asks: 1. How many 2 quart cells of Daniell's battery will it require to give shocks? A. 100, unless an induction coil is used. 2. Will common wood charcoal answer for the carbon in a Bunsen cell? A. Not properly; it is too light. The gas coke, obtained from the retorts used in the manufacture of common illuminating gas, is the proper material for this purpose.