

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.

Pattern Letters (metallic) to put on patterns of castings. H. W. Knight, Seneca Falls, N. Y.

Wanted.—A Hardware and Malleable Iron Salesman, familiar with the Western trade. State experiences, references, and terms. St. Louis Malleable Iron Co., St. Louis, Mo.

Wanted.—To correspond with New York and Eastern parties who make a specialty of manufacturing small tin articles, in regard to the manufacturing of a small, patented, staple article in tin. Everything ready to go to work. Experimental stage passed. Address Dew & Robertson, Charleston, Ill.

Hull Vapor Cook Stoves.—Best in the world; sell everywhere. Agents wanted. Send for catalogue and terms. Hull Vapor Stove Co., Cleveland, Ohio.

A Handbook on the Teeth of Gears, \$1. Circular free. Gear Wheels and Gear Cutting. Send for Catalogue S. Geo. B. Grant, 66 Beverly Street, Boston, Mass.

All Scientific Books and App. cheap. School Electricity, N. Y.

Revolving Head Screw Machines. Three sizes on hand. Prices, F. O. B., \$300, \$350, and \$450. Brown & Sharpe Mfg. Co., Box 489, Providence, R. I.

Patent Combination Gauge. Handy tool. Send for catalogue. J. Stevens & Co., Box 28, Chicopee Falls, Mass.

Double Cutting-off and Centering Machine to eight inches in diameter. Pond Machine Tool Co., Worcester, Mass.

Wristers.—All varieties and sizes on one machine. Lamb Knitting Machine Co., Chicopee Falls, Mass.

Iron and Steel Drop Forgings of every description. Billings & Spencer Co., Hartford, Conn.

Several large Paper Mills have adopted Volney W. Mason & Co.'s Friction Pulleys for driving their machines. Providence, R. I.

Useful articles for both sexes are offered among the bargains advertised in this issue by J. A. Ross & Co., Boston, Mass. This firm warrants all goods, and makes bona fide offers.

The most complete catalogue of Scientific and Mechanical Books ever published will be sent free on application to Munn & Co., 361 Broadway, N. Y.

Wanted.—A good second-hand 50 horse power engine. Address, with description, the Brumby Chair Co., Marietta Ga.

Write to Munn & Co., 361 Broadway, N. Y., for catalogue of Scientific Books for sale by them.

Patent Cases reported in short-hand or on type-writer. Stenographers, with machines, supplied. Copying. 22 type writers in constant use. M. F. Seymour, 239 Broadway, N. Y.

Bevel Gears cut theoretically correct.—Full particulars and estimates. Brehmer Bros., 438 N. 12th St., Philadelphia, Pa.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Wood Working Machinery. Full line. Williamsport Machine Co., 110 W. 3d St., Williamsport, Pa., U. S. A.

Oars to face your course with speed and ease. At Alex. Beckers, Hoboken, N. J.

Shafting, Couplings, Hangers, Pulleys. Edison Shafting Mfg. Co., 36 Goerck St., N. Y. Catalogue and prices free. Air Compressors, Rock Drills. Jas. Clayton, B'klyn, N. Y.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Penna.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

The leading Non-conducting Covering for Boilers, Pipes, etc., is Wm. Berkefeld's Fossil Meal Composition: 1/4 inch thickness radiates less heat than any other covering does with two inches. Sold in dry state by the pound. Fossil Meal Co., 48 Cedar St., N. Y.

Try our Corundum and Emery Wheels for rapid cutting. Vitrified Wheel Co., 38 Elm St., Westfield, Mass.

The Providence Steam Engine Co., of Providence, R. I., are the sole builders of "The Improved Greene Engine."

Every variety of Rubber Belting, Hose, Packing, Gaskets, Springs, Tubing, Rubber Covered Rollers, Deckle Straps, Printers' Blankets, manufactured by Boston Belting Co., 226 Devonshire St., Boston, and 70 Reade St., New York.

Experimental Machinery Perfected, Machinery Patterns, Light Forgings, etc. Tolhurst Machine Works, Troy, N. Y.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 45 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

The Cyclone Steam Flue Cleaner on 30 days' trial to reliable parties. Crescent Mfg. Co. Cleveland, O.

Wanted.—Patented articles or machinery to manufacture and introduce. Lexington Mfg. Co., Lexington, Ky. "How to Keep Boilers Clean." Book sent free by James F. Hotchkiss, 86 John St., New York.

Mills, Engines, and Boilers for all purposes and of every description. Send for circulars. Newell Universal Mill Co., 10 Barclay Street, N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J. For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Send for Monthly Machinery List to the George Place Machinery Company, 121 Chambers and 103 Reade Streets, New York.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, \$40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty, St., New York.

Curtis Pressure Regulator and Steam Trap. See p. 222.

For Steam and Power Pumping Machinery of Single and Duplex Pattern, embracing boiler feed, fire and low pressure pumps, independent condensing outfits, vacuum, hydraulic, artesian, and deep well pumps, air compressors, address Geo. F. Blake Mfg. Co., 44 Washington, St., Boston; 97 Liberty St., N. Y. Send for catalogue.

Woodwork'g Mach'y, Rollstone Mach. Co. Adv., p. 222.

Anti-Friction Bearings for Shafting, Cars, Wagons, etc. Price list free. John G. Avery, Spencer, Mass.

A lot of new Chucks of all sizes, slightly damaged, at half price. A. F. Cushman, Hartford, Ct.

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

Friction Clutch Pulleys. D. Frisbie & Co., Phila.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv., p. 254.

Experimental Tools and Machinery Perfected; all kinds. Interchangeable Tool Co., 313 North 2d St., Brooklyn, N. Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 254.

\$.250 buys a Keyless Drawer Lock that has not been picked. Miller Lock Works, Philadelphia, Pa.

Shipman Steam Engine.—Small power practical engines burning kerosene. Shipman Engine Co., Boston. See page 253.

Catalogue of Books, 128 pages, for Engineers and Electricians, sent free. E. & F. N. Spon, 35 Murray Street, N. Y.

The best Steam Pumps for Boiler Feeding. Valley Machine Works, Easthampton, Mass.



HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question. Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for Prompt Answers by Letter, should be accompanied with remittance of \$1 to \$5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each. Minerals sent for examination should be distinctly marked or labeled.

(1) E. P.—There is no easy way of tinning cast iron. All the processes for tinning on other metals work but indifferently upon cast iron.

(2) C. H. D. asks: How much steam pressure can be carried in a chamber made of cast iron 6 feet diameter by 7 feet high, thickness of iron 1 inch, and if such a chamber can be strengthened, by having braces of cast iron put in, to safely carry 30 pounds pressure? A. As the form of the chamber is indefinite, we cannot answer. If it is a cylinder, with the heads thoroughly stayed by bolts from head to head inside, or a hemispherical head with strong flanges on cylinder and head well bolted, it will stand the pressure. You must provide for 60 tons pressure on each head.

(3) F. E. D. asks if a boiler made out of 10 tubes wrought iron, 1 1/2 feet high, 2 inches in diameter, would generate enough steam to run an engine 3 1/2 inch stroke, 1 1/2 bore. A. The 10 tubes alone would not be more than half enough as a boiler to run your engine. The engine with sufficient steam will run the lathe. You will need 15 feet of fire surface in the boiler. A vertical tubular boiler is the best.

(4) R. H. writes: I have an engine 2x3; what size boat would it run? A. A small Whitehall boat; 4 miles an hour will be good speed.

(5) S. F. McG.—Dry paper is a very good insulator of electricity. If wet, it of course becomes nearly as good a conductor as the fluid with which it is wet. Keep dry it is about as good as gutta percha.

(6) T. O. L. asks: How do the American watches compare with the Swiss watches? A. The American in all the medium and low priced grades take the lead; in the very high-priced hand made watches, the Swiss watches are usually counted the best, though as to which is actually the best there are many doubters.

(7) L. H. C.—It is impossible to charge a Leyden jar directly from a magneto-electric machine. You might do it by employing an induction coil, and charging the Leyden jar from the secondary discharge of the coil.

(8) A Subscriber asks: Is there any liquid or preparation that will take the yellow color out of piano keys? A. Hydrogen peroxide might do it; that is probably the best bleaching agent that we have for any such use, but sunlight is the agent principally used heretofore.

(9) B. B. McC. asks: Is the electricity which produces the electric light a manufactured article, or is it a natural element simply collected and stored, and not manufactured? A. Electricity may be said to be manufactured. It is certainly produced by the expenditure of power in a machine, and the product, whatever it is, is sold like other manufactured things. We do not know that it is a natural element. It is probably a condition or state of natural elements.

(10) T. H. asks if the electric light will fade goods. A. We think not to any appreciable extent.

(11) B. C.—Stourbridge loam is a variety of fire clay mined at Stourbridge, in England. It is doubtful if it can be obtained in this country. For general uses it can readily be substituted by the ordinary fire clay.

(12) Ind.—We think that the direction of the current through a patient's body, when a battery is applied to a person, has very little to do with its effect.

(13) G. T. asks how to fasten the tin foil sections on an electrical machine to the glass disk. A. Varnish both the tin foil and the glass disk, and when the varnish is nearly dry press the two together. Use shellac varnish.

(14) A. F. S.—The special manipulation to obtain flat surfaces on lenses and small mirrors for telescopes has been published in books and but partially described in journals. In SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 139, 318; you will find the subject illustrated.

(15) W. H. T. asks the best way to repair a split in garden hose. A. Wind the hose with canvas, well coated with gutta percha or rubber cement.

(16) L.—The rain liberates the odors of plants by moistening their surface and opening their pores, the evaporation of the moisture carrying the odors with it. We know of no way to collect odors except by distillation from their natural sources.

(17) A. D. E. asks: What is the number of revolutions the dynamo machine described in No. 161 will make, and the number of revolutions the armature should make to give good results? A. About 1,500.

(18) J. L. P. asks: Is ten pounds sufficient power to register ten pounds on a spring balance, when held in each hand? A. A pull of ten pounds on each end of the spring balance between your hands is ten pounds on the balance and ten pounds for each hand.

(19) J. C. asks: How many horse power ought a boiler, properly set, of the following dimensions to develop: 16 feet long, 38 inches diameter, two 10 inch flues, good engine and about 80 pounds pressure? A. Your boiler is nominally 15 horse power. You may obtain from 20 to 25 horse power, indicated, at 80 pounds with a good engine.

(20) J. C. F. asks: What size and pitch of propeller is best suited for a yawl boat 18 feet long, 6 feet wide, and 26 inches deep, driven by a 2 horse power engine running 550 revolutions per minute? Weight of machinery, 700 pounds. How fast could such a boat go? A. A 20 inch wheel with 3 1/2 foot pitch may give you a speed of 8 miles per hour.

(21) J. H. writes: I wish to construct an elevated tank to supply my house with water. I have thought I would build it of cypress; is there any preparation that I can use that is harmless, to prevent the water penetrating the wood, and that is tasteless? A. Do not know of anything that will be an improvement upon the clean cypress. You may oil the wood with boiled linseed oil, or paint it with Prince's metallic paint (oxide of iron) and boiled linseed oil. Let it thoroughly dry before using.

(22) W. W. asks how to make and clarify vinegar from cider in the shortest time. A. The manufacture of vinegar is essentially comprised in the exposure to the air, causing the oxidation of the cider at a temperature of from 75° to 85° Fah. The process of clarifying is given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 392.

(23) J. D.—Wire like the sample is unfit for a field magnet, as its very thick covering separates the different layers, so that much of the effect of the current is lost. It is probable that the trouble with your dynamo is in the adjustment of the commutator. Have you connected the wires of your field magnets, so as to render their poles dissimilar?

(24) B. B. H. writes: 1. I wish to prepare some electro-poison fluid for use in carbon batteries. Can I use tin vessels to mix my acids in without injury to the fluid? If not, what kind of vessels should I use? A. The acid will destroy a metal vessel; use porcelain or earthenware. 2. What does electro-poison fluid weigh per gallon? A. It depends upon the amount of bichromate of potash and sulphuric acid contained in the solution. 3. How long can this fluid be kept without spoiling? A. Indefinitely.

(25) H. U. writes: I have made a dynamo similar to that in SUPPLEMENT, No. 161, fields wound with No. 16 wire, armature with No. 24; by exciting the fields with a pint bichromate battery, I can bring an eight candle Edison lamp to incandescence. Now what I would like to know is, could I do any better by winding the armature with No. 18, as SUPPLEMENT No. 161 directs? Also, how wide should the slots on the commutator be? A. We do not think you could improve your dynamo by changing the armature, if you do not object to use a battery for charging the field magnet. The slots in the commutator should be about one-sixteenth of an inch wide.

(26) F. O. H.—Some electric bodies can be charged by stroking with a cat's skin or piece of silk, so that in a dry atmosphere they will retain their charge for some time. It has not been determined when the Eads ship railway will be commenced; probably as soon as the capital to build it is assured.

(27) L. R. asks the correct meaning of the tonnage of a vessel. A. The law defines very carefully how the tonnage of different vessels shall be calculated. An approximate rule for finding the gross tonnage is to multiply the length of keel between perpendiculars by the breadth of vessel and depth of hold, all in feet, and dividing the product by 100. It is generally assumed that 40 cubic feet shall constitute a ton, and the tonnage of a vessel is considered to be the multiple of this ton which most closely corresponds with the internal capacity of the vessel.

(28) J. H. R. asks how to keep a leather band from slipping. The band is 2 inches wide, and connects a driving wheel 21 inches in diameter with

one of 4 inches, both of iron. A little good beeswax, rubbed on the inside while running, is sometimes a help for such difficulty, but a band of proper size to do the work should not slip if correctly put up.

(29) S. S. W.—The dominical letter denotes the Sabbath, or dies Domini, the Lord's day. The first seven letters of the alphabet are used for this purpose, the same letter standing for Sunday during a whole year, and after twenty-eight years the same letters returning in the same order. The golden number is a number showing the year of the lunar or Metonic cycle. It is reckoned from one to nineteen, and is so called from having formerly been written in the calendar in gold. Full information in regard to the methods of determining these letters can be found in the prayer book of the Protestant Episcopal Church.

(30) R. D. D. writes: In order to decide a wager, will ask the following question: If a cat and a half can kill a rat and a half in a minute and a half, how many cats will be required to kill 100 rats in 50 minutes? A prominent sporting paper has answered "Two cats," which we do not accept. A. According to the terms of this question, it requires one cat and a half to kill rats at the rate of one a minute, or three cats will kill two rats in a minute; therefore it would take three cats to kill one hundred rats in fifty minutes.

(31) L. Y. writes: 1. While coal-tarring fishing nets, the coal tar is slightly heated, and the gas that rises burns the faces and hands of those employed in handling the nets. What solution or wash could be used on the hands and face to prevent this burning, or what would be a remedy for it? Could anything be added to coal tar in tarring fishing nets to make them less adhesive while handling? If so, what is it? The same not being injurious to the twine. A. We would recommend you to use the so-called "paraffine varnish" specially prepared for covering nets by the New York Coal Tar Company. It is entirely without the objectionable qualities found by you. 2. What size machinery, viz., boiler, engine, and wheel, would be suitable for a boat 40 feet long, 8 feet beam, 5 feet in the hold, and drawing 4 feet aft? A. 16 horse power engine and boiler, 3 foot wheel. 3. How large a wheel would be suitable for an engine with a cylinder 6 1/2 inches by 8 inches, carrying 75 pounds steam? A. A 26 inch wheel.

(32) R. G. A. asks: Does the bulk (or displacement) of a boat in locking make any difference in the quantity of water drawn from the upper to lower level? Or is the same quantity required without regard to displacement, and what is the difference, if any, in quantity required in locking the same boat up or down? A. It takes the same volume of water to lock a boat either way. The displacement is equalized by the water leaving the lock when the boat enters, and entering the lock when the boat leaves, the lockage water being the area of the lock multiplied by the height. There is an excessive loss, proportioned to the displacement of each boat, when the lockage is all one way.

(33) J. G. T. & S. write: We have a steam boiler in our basement, with the engine and feed pump on the floor above; and wish to arrange some kind of water indicator with float to give us the depth of water in the boiler from the floor above. We have our steam gauge on the floor above at an elevation of eleven feet above boiler. What would be the variation with this distance from the ordinary distance? A. There is no system of water gauge indicator above the boiler that has as yet proved reliable, although there are several patents for such contrivances. A steam gauge may be arranged in connection with a pipe directly from the steam space to the height of the gauge, arranged so that the water of condensation can drip back to the boiler, thus making the pressure the same at the top of the tube as it is in the boiler. Attach the gauge to the top of the tube with a small siphon, the same as if the tube was the boiler. This will give the correct indication of the pressure in the boiler. If your present gauge connection pipe is filled with water, the gauge should be 5 pounds less than the pressure in the boiler.

(34) J. F. A. writes: I have a detached house with brick foundation walls, in soil of a clayey nature. The cellar is well concreted, but I find that after a heavy rain there is water in the cellar. How can this be effectually remedied? A. Possibly your yard is low next to the house and drains into the cellar; this you should be able to see by inspection in stormy weather. Every yard should be graded so that the storm water runs from the house, toward cesspools or a sewer connection. A cemented bottom will not resist the coming in of water when there is any head, as when the soil is saturated for some feet above the cellar bottom.

(35) L. J. S. writes: We have built several houses, and in some of them we built the walls with air spaces, and would like to know which is the best—to have the walls closed on top, so there is no circulation whatever in the air space, or is it just as good if the air space is open on the top of the wall? A. If the top of the air space opens inside the ice house, there is no need of closing it. If the open top is exposed to wind, it should be closed, as the wind blowing across it will produce a circulation.

(36) R. S. asks: If a flume 10 feet wide by 3 feet deep has to be replaced by two iron pipes, how large would the pipes have to be to contain as many square feet as the wooden flume? A. The tubes would require to be each 4 1/2 feet diameter to be equal to the flume 3 feet by 10 feet.

(37) S. L. W.—Mercury flasks hold about 1/2 gallon, and weigh about 12 pounds; they are good for one thousand lb. pressure. You could not compress more than 16 gallons of gas into a flask with any economy. This will give you 240 pounds pressure. We think that copper cylinders that are amply strong would be enough lighter and of more capacity for size than the mercury flasks. Any good coppersmith can make these cylinders.

(38) D. H. G. asks how to change back the poles of a 25 light dynamo that changed its poles from an unknown cause. There are other dynamos handy if they would be needed. A. You should reverse the polarity of your field magnets by the temporary application of a current from another dynamo.

2. Also how to temper steel for permanent magnets, and the best steel to use? A. Steel for permanent magnets should be tempered about like taps and dies, that is, the temper should be drawn to a straw color. Chrome steel is said to be the best for permanent magnets.

(39) F. L. P. writes: I wish to stain or dye vulcanized paper or papier mache, such as billiard balls or car wheels are made of. I have tried aniline dissolved in water, boiling hot; but have not been able to penetrate the surface of the paper, which is very hard. I have also tried lampblack and asphaltum without success. Would like to stain it different colors, but black principally. A. It will be necessary for you to color or dye the fiber before pressing it into shape. For black: Soak the material for 12 hours in an alcoholic solution of aniline hydrochloride, then remove and immerse in a dilute solution of potassium bichromate. Do not leave it in the last solution too long, or else the fiber may become decomposed. For blue: Use the blue aniline for cotton. For red: Use the Turkey red, and apply in the usual manner.

(40) L.—A mixture of oxalic and citric acids is probably the best compound to use for the purpose of removing ink from parchment. Chlorine or the alkalis would be likely to injure animal tissues. The removal of printer's ink from paper is hardly possible. It is accomplished to a limited extent by means of ether or a solution of soap in water; hot benzol, naphtha, and the like are also used.

(41) A. R. asks: Can you give me a receipt to remove freckles from the face without injury to the skin? A. A commonly used preparation for this purpose is:

- Sulpho-carbolate of zinc..... 2 parts.
Distilled glycerin..... .25 "
Rose water..... .25 "
Scented alcohol..... .5 "

To be applied twice daily for from half an hour to an hour, and then washed off with cold water. 2. What will remove warts painlessly? A. Touch the wart with a little nitrate of silver, or with nitric acid, or with aromatic vinegar. The silver salt will produce a black and the nitric acid a yellow stain, either of which will wear off in a short while. The vinegar scarcely discolors the skin. 3. Can a transmitter from a primary current without a secondary coil work with success? A. A transmitter without an induction coil may be used successfully on a short line. 4. Has it ever been tried? A. It is one of the earliest telephonic experiments.

(42) D. G. would like to know how to make a very good-smelling hair oil that will not be injurious to the hair. A. Castor oil 1/2 pint, 95 per cent alcohol 1/2 pint, tincture cantharides 1/4 ounce, oil of bergamot 2 drachms. Color a pale pink with alkanet root. Many of the hair oils consist simply of almond or olive oil scented with a few drops of otto of roses, oil of musk or neroli, etc.

(43) T. D. B. writes: I have made a pocket battery for running small incandescent lamp; it works well using for half an hour, and after that it will only redden the carbon; it consists of two hard rubber boxes each containing a carbon and zinc separated by a piece of hard rubber, and I use the following solution: Saturated solution of bichromate of potash with one-fifth weight sulphuric acid and 1/2 drachm bisulphate mercury to pound solution. I understand that those in the market can be used off and on throughout an evening. A. Keep your zinc well amalgamated, and add considerably more sulphuric acid. The kind of battery you describe is not very well adapted to continued use.

(44) E. W. R. asks a rule by which the horse power of different sizes of belts on various sizes of pulleys can be ascertained. A. For the width of belt for a given horse power, the formula is W = (d x V) / (V x W) = H. P. And for power transmitted by a given belt, H. P. = (V x W) / d. V=velocity of belt, d=diameter of pulley, W=width of belt. 4,500 and 1,000 are coefficients.

(45) G. L. writes: Is it more economical to use a 100 horse power engine running at its utmost capacity, or a 150 horse engine, same power needed in each case? To supply steam for such engine, which is the most economical—to use two boilers which have to be filled very hard, or to put in a third boiler, of the same size as the other two, and use all three? A. The moderate use of engines and boilers is considered economical. The saving of fuel where there is ample boiler power is very apparent. The heated gases going up the chimney with heavy firing is a sure indication of waste. We recommend the larger engine and 3 boilers, lightly fired, with moderate pressure.

(46) C. H. B. asks a process that will etch steel, such as cutters perform in transferring pictures and monograms upon razors and knives. A. Cover all the parts not required to be etched with beeswax, or cover the whole with beeswax, and then make your lines through to the steel; then dip in dilute nitric acid.

(47) R. S. asks the process of giving a tempered blue color to the steel plate and malleable iron castings of a roller skate. Is it done by painting, japanning, or heating? A. In order to obtain an even blue, the work must have an even finish, and be made perfectly clean. Arrange a cast iron pot in a fire so as to heat it to the temperature of melted lead, or just below a red heat. Make a flat bottom basket of wire or wire cloth to sit in the iron box, on which place the work to be blued, as many pieces as you may find you can manage, always putting in pieces of about the same thickness and size, so that they will heat evenly. Make a ball to the basket, so that it can be easily handled. When the desired color is obtained, dip quickly in hot water to stop the progress of the bluing, for an instant only, so that enough heat may be retained to dry the articles. A cover to the iron box may sometimes be used to advantage to hasten the heating. Another way, much used, is to varnish the work with ultramarine varnish, which may be obtained from the varnish makers.

(48) J. D. O. writes: 1. I would like to know the manner of applying gas and air in gas engines.

I understand that gas and air are introduced into a vacuum and ignited, which causes an explosion, and so gives motion to the engine. A. There are two methods of using gas in gas engines. One is to draw the gas into the cylinder with a suitable proportion of air by the forward stroke of the piston, and then explode it under atmospheric pressure. The other method is to introduce the mixture of gas and air into the cylinder under compression, or to compress it in the cylinder, and explode it while in the compressed state. 2. How is the gas introduced? A. The common method is to allow the power piston to draw the gas and air into the cylinder by its forward motion. 3. How is the air introduced? A. The air is generally introduced by being simply drawn in through an open valve along with the gas. 4. Relative quantities of each? A. One volume of gas to eight or ten of air in non-compression engines, and one of gas to ten to fourteen of air in compression engines. 5. Process of ignition? A. There are several methods of igniting the gas. The most common method is by employment of gas jet, which in non-compressing engines is drawn directly into the explosive mixture contained by the cylinder. But in compressing engines it is drawn first into a chamber containing the combustible mixture, at atmospheric pressure, which is closed to the external air and then opened toward the cylinder, so as to communicate flame to the contents of the cylinder. 6. What size vacuum for one horse power? A. We do not understand what you mean by vacuum. 7. Does the patent on gas engines cover the manner of using gas and air only, or does it cover the combination of gas and air as a motive power? A. There are methods of using gas and air in gas engines which are not patented. There are other methods which are patented. The broad idea of generating power by the explosion of gas in a cylinder is not patented, and is public property.

(49) E. A. A.—You will find a description of the Bell telephone in SUPPLEMENT No. 142. If an ordinary acoustic telephone would answer your purpose, you can readily make one by connecting with the ends of a light wire cable line, cigar boxes, which will answer very well as transmitters and receivers.

(50) C. P. W. asks: 1. Will you explain the point of saturation in permanent magnets? A. The point of saturation in a permanent magnet is reached when the magnet becomes incapable of permanently retaining as much magnetism as the strongest helix or electro magnet can impart to it. 2. How powerful in proportion to their own weight can they be made? Can they support more than their own weight? If, so, how much? A. They have been made to lift 15 times their own weight, and small magnets have been made which would lift 25 times their own weight. 3. What is the longest distance they will attract, say chrome steel? A. As the attracting power of a magnet is inversely as the square of the distance, of course its power rapidly diminishes with the distance, so that the strongest magnet does not have any considerable power except in the immediate vicinity of its poles. 4. What kind of steel will make the best and strongest magnets? A. Chrome steel is said to be the best.

(51) T. R. G.—The office of the large wire in an induction coil is to produce intense magnetism in the core of the coil. There is no very well established relation between the primary and secondary coil, except that the primary coil should be capable of producing a magnetic field which will extend to the exterior of the secondary coil. You will find full description of induction coil in SUPPLEMENT, No. 160.

(52) N. J. W. writes: I have made a small dynamo after SUPPLEMENT, No. 161, that magnetizes electro magnets powerfully, and makes quite a light between a carbon and platinum point, but will not run one 3 candle power incandescent lamp. Has any one succeeded in making it run a 3 candle power incandescent lamp? A. You ought to be able to operate a three candle power incandescent lamp of lower resistance with the current from your dynamo. 2. In making a new armature having 4 coils, shall I use the same size wire, or would finer wire be better? A. In making your new armature, by employing finer wire, say No. 24, you will be able to produce a current of higher tension, which will work through greater resistance than the current from your present machine.

(53) E. R. S.—It would be impossible to give offhand the information you desire concerning the construction of the dynamo. The development of a dynamo of a new size or form requires a great deal of calculation, as well as much experiment. You had better consult some competent electrical engineer for the information you desire.—For a cement for fastening rubber to iron, melt together equal parts of pitch, gutta percha, and shellac. Apply the cement to the iron while the iron is warm.

(54) J. S. C. writes: If a barrel of oil (crude or refined) was say 30 feet from a stove, and there was 1/4 or 1/2 inch pipe running from the barrel into the stove, and if I would turn on the oil (in a spray) and light it, would it burn only at the end of the pipe (in the stove), or would the fire follow the pipe to the barrel and cause it to explode? A. If the spray were kept up under considerable pressure, the fire could not run back into the barrel. You can avoid danger of explosion by extending your spray pipe to the bottom of the barrel, so that it will always be covered with oil.

(55) H. H.—Dynamite, as is the case with other explosives, expands with equal force in all directions.

(56) G. S.—The solder you refer to as being applied so easily is probably what is called bismuth solder, and is made of two parts of tin and one part each of lead and bismuth, by weight. It makes a very easy flowing solder.

(57) E. N.—The steam from the top or outlet of your coil boiler should not pass directly to engine, but to a chamber, so that the water will be separated from the steam, and settle to the bottom of the coil through a direct pipe connection. An old locomotive boiler, tested hydrostatically to 140 pounds, should not be trusted with more than 75 pounds steam pressure.

(58) Z. L. asks for the proportions of metals used in bronze castings. A. Red bronze: cop-

per, 87; zinc, 13—yellow bronze: copper, 67; zinc, 31; tin, 2—statuary bronze: copper, 91; zinc, 5; tin, 2; lead, 2.

(59) G. W. L.—The Babcock fire extinguisher is charged with a solution of bicarbonate of soda in water and sulphuric acid in a lead bottle, which, when required, is turned over by a crank, spilling the acid into the charge of soda water. Carbonic acid gas is instantly generated, by which a pressure is obtained sufficient for throwing the whole contents of the apparatus with much force through a nozzle for fire purposes. Use of sulphuric acid 5 parts, bicarbonate of soda 6 parts, by weight. Other combinations are used, such as carbonate of ammonia, potash, etc. Iron can be used for the alkaline reservoirs. There are about 20 patents for fire extinguishers, mostly on the mechanical details.

(60) E. C. B. asks: Will coal oil saponify by uniting with any alkali, and is it ever used in the manufacture of soap? A. Yes, petroleum soap is in the New York markets.

(61) A. A.—For giving to cast zinc a genuine brass color, use for your dipping bath, for each quart of water, one-fifth ounce sulphate of copper, one-fifth ounce protochloride of tin. You may vary the shades by varying the proportions of the salts.

(62) G. W.—The following are dipping baths suitable for bird cages: nitric acid, 2 parts; sulphuric acid, 4 parts—or, sulphuric acid, 6 parts; nitric acid, 1 part; muriatic acid, 1 part; all by measure.

(63) R. M. H. asks the power necessary to overcome the resistance of a large horse street car on a level track, loaded with 50 persons. Also, to move the same loaded car up an incline represented by an angle of 10 degrees? A. For car on a level track, about 60 lb.; on an ascent of 10 degrees, 1,300 lb. To obtain an initial momentum will probably require far more, according to how near a perfect balance it is on which the car is resting, involving inequalities in axles, wheels, track, etc.

(64) P. M. L.—Pin points are supposed to be finished with a fine emery wheel revolving in the machine that makes the pin. You may put the points on pin tongues in a small way by twirling the points between the thumb and finger, upon a fine emery wheel running at high speed.

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

E. M.—No. 1 is a fine grained so-called micaceous hematite or specular iron ore. It has no value as a paint in this city. The color is not considered good. No. 2 is simply a large grain or crystal of the specular iron ore. The ore, if free from sulphur and phosphorus, might be valuable for the iron. An analysis would be necessary to determine this.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted April 7, 1885, AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Table listing various inventions and their patent numbers, including: Air apparatus, operating compressed, A. C. Douglass, 315,013; Alarm, See Burglar alarm; Aluminium, apparatus for obtaining, M. G. Farmer, 315,266; Anemometer, E. A. Edwards, 315,261; Animal shears, T. Brown, 315,237; Annunciator, McDuiff & Doherty, 315,313; Annunciator drops, resetting, C. W. Holtzer, 315,035; Apparel, wearing, Walmeyer & Ennis, 315,330; Armature springs, adjusting, J. F. Gilliland, 315,017; Automatic drill, J. Hughes, 315,411; Awning or shade, window and door, G. W. Cook, 315,250; Axle box, car, M. C. Harney, 315,278; Axle, carriage, H. Killam, 315,299; Axle lubricator, car, E. L. Cleveland, 315,002; Axle lubricator, car, F. J. Leibman, 315,042; Axle, vehicle, P. D. Kearney, 315,041; Bag, See Hand bag; Bags, etc., compound material suitable for the manufacture of lined coffee and sugar, T. Briggs, 315,385; Baling press, W. J. Perkins, 315,062; Barrel making machine, F. Myers, 315,434; Bath tub basin attachment, J. & W. J. Robinson, 315,342; Battery, See Secondary battery; Bearing, anti-friction, T. Tripp, 315,256; Bed slat support, F. G. Ford, 315,268; Bessemer process, G. Lauder, 315,150; Bicycle, E. G. Latta, 315,304; Bits, etc., extension shank for, I. P. Shotts, 315,079; Board, See Electrical switch board. Multiple switch board, Reed board; Boiler, See Steam boiler. Water tube boiler; Boiler ash pan, Anderson & Latimer, 315,215; Boiler for heating fruit in jars, F. M. Austen, 315,377; Bolster spring, S. C. Blaine, 315,392; Bookcase, etc., portable, W. H. Lackey, 315,301; Book, scrap, C. Patterson, 315,327; Boot or shoe tap, W. Quinlan, 315,068; Boot or shoe inner sole, G. W. Day, 315,254; Boring bar and centering mandrel, combined, P. W. Gates, 315,271; Box, See Axle box. File box. Guide box. Ice cream box. Paper box; Boxes, bales, etc., band for strapping, G. Nicholson, 315,438; Brace, See Trunk brace; Brake, See Car brake. Locomotive brake; Brake shoe, R. N. Allen, 315,213; Brick and tile machine, W. W. Wallace, 315,358; Brick machine brushing attachment, A. Itner, 315,414; Brick machine tile making attachment, J. B. Foster, 315,016; Brick, manufacture of, N. S. Willet, 315,200; Bridge, W. O. Douglas, 315,259; Bucket or receptacle for malt liquors, S. W. A. Wiegell, 315,198; Buckle, lever, W. E. Smith, 315,177; Buckles, snap hooks, etc., rope or strap attaching device for, W. C. Sly, 315,175; Burglar alarm, A. C. Gibson, 315,138; Burglar alarm, A. W. Hall, 315,140;

Table listing various inventions and their patent numbers, including: Burglar alarm, I. G. Leek, 315,152; Burglar alarm, electric, A. W. Hall, 315,139; Burglar alarm, match safe, and sash fastener, combined, D. T. Phillips, 315,439; Button, J. R. Pollock, 315,440; Button, P. H. Walsh, 315,191; Button and fastening, G. W. Prentice, 315,167; Button, collar, G. Krementz, 315,418; Button fastener, G. W. Prentice, 315,035; Button fastening machine, automatic, A. Hall, 315,275; Cables or ropes used to propel vehicles, covering for, C. Bullock, 314,386; Cam, H. W. Fowler, 315,270; Camera, See Portable camera; Cameras, instantaneous shutter for, H. W. Kellogg, 315,296; Can, See Milk can; Can fastener, F. J. Headley, 315,290; Cannon, pneumatic, W. G. Benedict, 314,991; Canopy, umbrella or parasol, W. H. Belknap, 315,224; Capsule machine, J. Krehbiel, 315,415 to 315,417; Car brake, automatic, W. Clayton, 315,125; Car brakes, operating, G. W. Darby, 315,012; Car coupling, A. B. 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