

(9) A. R. R. asks what is the best material to stick to metallic plate. A. Cloth can be cemented to polished iron shafts by first giving them a coat of best white lead paint; this being dried hard, coat with best Russian glue dissolved in water containing a little vinegar or acetic acid. See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(10) B. D. A. writes: We have in our city 12 inch water mains and 6 inch mains. Our fire plugs have an outlet of 2 1/4 inches diameter; where connections are made to plugs, water pressure is about 45 pounds per square inch. Will a greater amount of water be discharged from the 12 inch main than from the 6 inch main through the connections? A. The discharge will be nearly the same for all parts of the system for a single hydrant. The largest by a small percentage will be found in the hydrants nearest the source of supply. The 12 inch main probably being nearest the source of supply, has the least friction, and will give the strongest stream.

(11) W. D. C. asks whether the figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, can be placed so as to make 100, that is, using every one and only once? A. 50+37+6+4+1=98+2=100. Several other arrangements are possible of the figures before the equality mark, or the same answer comes by variously using the minus and plus signs in a great number of ways.

(12) P. E. C. says: I have a large collection of French stereoscopic views on glass; they are beautiful, and I would like very much to use them as slides for my "sciopticons," but they are all damaged with spots, I think from dampness. I took the binding paper off of some of them to see if they could be cleaned, but have failed in cleaning them. Will you explain the cause, also the way after cleaning to make them fit for use in the magic lantern? A. The slides referred to are made on an albumen film, and are sulphur toned. There is no possibility of restoring them so as to get rid of the spots. To render such slides of use in the magic lantern, apply a coating of any good transparent varnish, and then touch out the defects by a scraper and the aid of transparent pigments.

(13) H. G. W. asks: 1. Have you ever published a description of an electrical annunciator? A. You will find descriptions of annunciators in the back numbers of our papers. You will find them also in all electrical books. 2. Can you give me directions for making an inexpensive electric battery for open circuit work, such as electric bells, etc.? A. Probably the easiest made and the most satisfactory battery for open circuit work is that known as the Fuller battery, which consists of a porous cell filled to a depth of about a quarter of an inch with mercury and containing a conical or cylindrical piece of zinc for one pole of the battery, the porous cell being placed in a glass jar along with a plate of carbon. The porous cell is filled with water, and the glass jar outside of the porous cell is filled with the ordinary bichromate solution, formed by dissolving bichromate of potash to saturation in hot water, and adding to the solution when cold one-fifth its bulk of sulphuric acid. This solution for the Fuller battery will bear reducing from one-third to one-half with water. 3. Where can I get a good small foot power lathe, for working wood and metal, with and without slide rest and chucks? A. You can obtain good small foot power lathes from any of the dealers in machinery who advertise in our columns. 4. How strong a current will the dynamo-electricity machine described in SUPPLEMENT, No. 161 (I think that is the number), give in volts? A. About six volts. 5. What is the cost of one of them? A. From 40 to 50 dollars. 6. Will a current passed through a No. 16 wire induce a current in a No. 32 insulated wire wound around the large wire at right angles to its axis? A. It will induce a slight current in a fine wire. 7. Can the carbon from gas retorts be sawed into slabs for Grenet battery? A. Yes, but it is an expensive operation. 8. Is this a good solution for Grenet battery. If not, what is the best—sulphuric acid 3 pounds, bichromate potash 1 pound, water 1 pound? A. The solution given above will suit you.

(14) H. H. F. writes: Yesterday, after a warm rain, thousands of fish worms were on the sidewalks. Many were crushed by pedestrians. In an hour not one was to be seen, nor even the remains of a crushed one. Neither were any holes visible where they could have burrowed, though the mud was streaked where they had crawled. From whence do they come, and where do they go? A. This is not at all an uncommon occurrence with the common angle worm. They often, in the earlier part of the year, leave the ground during or after a rain, in myriads. They enter it again just as quickly, i. e., those that are not captured and devoured by birds and numerous enemies. Hence they come from the soil and go back to it.

(15) F. A. B.—For luminous paint see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 229, 249. Use 12 inch fly wheel, about 20 pounds. We recommend you to make a little more study of lathes, and try the operation of those in use before you make one.

(16) P. F. H.—The power of a jet depends entirely upon the pressure of steam and the form of the nozzle and jacket. In a plain pipe, as in your Fig. 1, a half pound pressure might be obtained under high pressure and best arrangement. Your Fig. 2 will have more power than Fig. 1. The pressure will vary with the size of the annular space between the jet and the outer pipe.

(17) F. F. C.—Tide mills seem to have gone out of use. We have no knowledge of makers. Any intelligent millwright should be able to construct an undershot tide wheel to work both ways by making a movable breast, or by setting the wheel in a movable frame to rise or fall with the tide. There are many ways of arranging such machines.

(18) P. M.—Devices for returning the tail race water to the flume are very old, the principle of which was by condensing steam in a large chamber, producing a vacuum, which would lift the water about 20 feet, when by operating large valves the water was discharged into the flume. It has no economy except under some peculiar circumstances.

(19) L. W. asks: 1. Is there a waste of fuel in using two boiler flues 8 inches by 8 inches in-

stead of one 8 inches by 12 inches? A. There should be no loss of heat from the use of the two flues. The friction on the increased wall surface will compensate for the larger size. If the boiler and the connecting flue to the chimneys are properly proportioned, there should be no waste of heat with any size chimney. 2. The party who put in the boiler advised me to fill it with water to prevent rusting, and a machinist advises me to drain it and build a kindling fire in it to dry out. Which is right? A. Lay up the boiler full of water that has been boiled, and close all air valves and vents while steam is on, to keep out air. Moist air rusts a boiler. Water that is free from air does not rust the boiler.

(20) J. W. asks: 1. How high are the highest buildings in New York? A. 125 to 175 feet. 2. What size rope is used for a life line? A. 3/4 to 1/2 inch diameter. 3. Is it necessary to have an invention patented before it is tested? A. You should at least have a caveat. 4. How can it be introduced? A. We think only by personal trial and business application.

(21) J. C. writes: If a chamber 2 feet long by 1 foot diameter is charged with the solution used in a fire extinguisher, how long would the pressure last and in what manner would the cylinder have to be charged in case you wished for a continuous exhaust through a 1/2 inch pipe? A. You may charge the cylinder to any desired pressure by varying the quantity of acid and carbonate. You cannot maintain a constant stream. The charge soon blows out, when a cleaning out and renewal is necessary. The cylinder should be charged nearly full with water, and with only enough chemicals to obtain the desired effect. The pressure may be anything from one to a hundred pounds.

(22) A. S.—We think you have selected a poor form of motor for your boat; better make a Trouve or a Depretz motor. You will find descriptions of Trouve's motor in SUPPLEMENT, No. 259, and Depretz motor in No. 212. You will also find a description of Grisoom's motor in SUPPLEMENT, No. 267. There is also a description of an electric motor as applied to small boats in SUPPLEMENT, No. 158. We would be unable say what the resistance of your wheel would be without knowing something of its form.

(23) W. A. H.—There are scientific theories in regard to celestial space set forth in the various later works on astronomy. Read Proctor's Myths and Marvels of Astronomy, which we can furnish for \$3. Meerschmum is said to absorb nicotine and oil from tobacco smoke.

(24) J. P. McN.—You can make the wire solder by first making a small float pan out of sheet iron, and punch some holes along one of its angles at bottom. Then pour the melted solder into the pan, and drag it along the surface of a piece of flat iron, so that the perforations will be close to the plate. The solder will flow through the holes and chill on the plate. A little practice will show you how fast to draw the pan. You cannot mix any acid with the solder. If the parts to be soldered are perfectly clean, good solder (2 parts tin 1 part lead) will take on the tin dry, but requires acid or resin to make it take on the iron.

(25) F. K.—Tarred roofing paper, or heavy building paper, if well fitted, so as to close all cracks and crannies, and folded against the framing, will make a great improvement in warmth over the naked siding, and may answer your purpose. It will not interfere with a further improvement hereafter by plastering or ceiling with wood, if found deficient on a winter's trial.

(26) A. E. C. writes: In a vessel that weighs 50 pounds, a fish weighing 5 pounds has been put. Will the vessel then weigh 55 pounds, or less? A. The water supports the fish, and both weigh 55 pounds.

(27) J. A.—The objective of a stereopticon would answer very well for a camera obscura. There should be placed above the objective a fine plate glass mirror at an angle of 45 degrees, to throw the image down through the objective. If you desire to show with a single lantern diagrams composed of white lines on blue ground, you should flow the glass with blue lacquer or with fine shellac or French spirit varnish colored with aniline blue. The common method of showing diagrams with a colored ground with two lanterns is to trace the diagram on a smoked glass for one lantern, and to project the blue by means of a blue glass placed in the other lantern.

(28) J. A. D. asks: 1. What causes a lobster to turn from green to red when boiled? A. From the action of the heat on its pigmentary matter; acids and also oil produce a similar effect, but in a manner not perfectly understood, except it is by the further oxidation of the coloring matter. 2. What the terms open and closed circuit infer; whether they are used synonymously with constant and not constant? A. An open circuit is one in which the current does not flow except when work is done. A closed circuit is one through which the current always flows, except when interrupted in doing work. The terms are not synonymous with "constant and not constant" currents. The current flowing from a battery like the gravity is said to be constant. The current from a battery like the Grenet is not constant, because it gradually and continually diminishes.

(29) W. E. McK. asks: 1. Where can I find a description of the compound microscope so clear that I could build one by it? I have all the tools and skill necessary for fine and accurate work, and would like to build a microscope such as would cost in the stores about one hundred dollars, and which would magnify from 50 to 600 diameters. A. We know of no description that would enable you to build such a microscope as you describe. Better borrow a stand and copy it. We would not advise you to try to make the objectives. 2. I am building an induction coil from the instruction given in SUPPLEMENT, No. 160, and would like to arrange it so that I could regulate the current so as to give shocks. Can I do so by fixing a brass tube to the plug (marked J in the drawing), and which would slide in between the tube, A, and the bundle of iron wires, I? A. Induction coil referred to is too large for giving shocks. You can regulate the current by making the magnetic core movable. Sliding it into the coil strengthens the current, and withdrawing it weakens

the current. 3. What is the object in having the secondary coil in two parts, and what is tea paper? A. To prevent short circuiting in the coil. Tea paper is a common white paper used in wrapping up tea. Any other paper of medium thickness will answer as well. 4. What is the melting point of the metal aluminum, and what solder can I use on it? It will not stand the heat to flow silver solder, and soft solder will not stick to it. A. About 700° C. We believe there is no good solder, at least not one that is generally known. 5. Please describe the manner in which pliers are made. What I want to find out is how they pass one jaw through the other and make such a nice fit. A. They pass one piece through a large enough opening in the other, then swage and finish them to shape, the one with the opening being cold, having already been shaped. 6. Jewelers use a metal disk for polishing flat surfaces; they call them laps; they are made of some alloy which looks as though lead, tin, or zinc was the principal metal, and are charged with emery. Can you tell me what the alloy is, and the proportions in which it is mixed? A. Laps are made of lead, an alloy of lead and tin, of copper, brass, or cast iron. 7. Would a small electric lamp made after the Brush model and with carbons 1/2 inch in diameter work well with 12 Bunsen cells, or what is called a carbon Smee battery, with bichromate solution? A. If well made, yes.

(30) T. J. writes: 1. I would like to know what nation has the largest man of war ship, name of, and the dimensions of it? A. We believe the British war ship Devastation is the most powerful afloat. Do not know its dimensions. 2. Also, I should like to know what is the best book I could procure to explain the difference of the different navies of the world, and where I could procure it? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 5, for comparison of German and American navy. Also No. 212 for Peruvian and Chilean iron clads in battle. Also No. 422 for an account of the largest ships of the British navy.

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

A. W. E.—The specimens are called fulgurites, and are vitrified sand tubes supposed to have been produced by the striking of lightning on sand.—D. S. H.—The specimen is sphalerite, or zinc blende, a valuable ore of zinc.

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