

(3549) E. W. M. writes: We have several large plunger batteries for running a motor, and after the solution has been in the cells a long time, the salts settle in the bottom, and we find that it is very hard to remove without breaking the glass jar. Will you please give us a good way to clean the salts out without breaking the jar? A. By filling your cells with water and inverting them in a vessel of water, the salts in the bottom of the cells will be readily dissolved out.

(3550) C. H. C. writes: I have 14 ft. boiler, 54 in. shell, sixty 3 in. flues, 24 in. diameter smoke stack, 60 ft. high; rocking grate 54 in. wide by 37 in. deep to bridge wall; engine 10 by 12, speed 180. The draught seems defective, combustion imperfect, consumption of fuel, mostly shavings (some soft coal), excessive, and very hard firing, boiler new. Can you tell me wherein lies the trouble or defect, and suggest a remedy? A. Your boiler and engine appear to be well balanced as to power, but the smoke stack is too small for burning shavings, and probably the fire chamber is too small and not arranged for burning shavings and soft coal. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 624, for illustrated lecture on boiler furnaces for various kinds of fuel. 2. Name one or two best works, in plain, simple language, on construction, setting, management, or firing modern steam boilers, with price. Several I have are too English and too algebraic for the simple mind of my engineer. A. "Useful Things to Know about Steam Boilers," by Tower, \$2 mailed; also "Steam Making or Boiler Practice," by Smith, \$2.50 mailed.

(3551) E. S. asks: How to make a cement which will mend broken minerals, etc. A. 1. Use best fish glue (hot) and tie well. 2. Starch, 1/4 oz.; white sugar, 1 oz.; gum arabic, 1/4 oz. Dissolve the gum in a little hot water, and the sugar and starch, and boil until the starch is cooked.—From the new "Scientific American Cyclopaedia of Receipts, Notes and Queries." In press.

(3552) H. A. A. asks: 1. In making the "Simple Electric Motor," described on page 497, "Experimental Science," does it matter if I use three or four pieces of wire for the armature core, the ends not being joined? A. It is immaterial how many pieces of wire you use in the construction of the core of your armature. 2. Would not No. 20 or 22 wire do for winding the armature? A. Yes; provided you use a current adapted to such winding. 3. If the brush-holding disk is made so that the brushes may be placed in different positions, would it not make the motor run at different speed? A. Yes; but this method of regulating a motor is not economical.

(3553) A. M. asks what platinum silver is? Is it platinized silver? A. Platinum silver is an alloy consisting of platinum 1 part, silver 2 parts.

(3554) F. D. asks for a receipt for making a paste for bill posting and paper hanging of all kinds, that will not freeze or get thick in the winter, or tell me where I can get the prepared paste or the materials for making same. A. All ordinary paste will freeze when subjected to a freezing temperature. Make your paste of good flour mixed smoothly with cold water to a thin creamy consistency. Cook over a water bath until it thickens, but remove it from the water bath before it begins to look clear. When nearly cold add from five to ten per cent of alcohol. Also twenty drops of oil of cloves to every gallon of paste. The alcohol prevents freezing, and the oil of cloves prevents it from souring.

(3555) W. F. B. asks if there is any such thing as soluble beeswax, and if so, the formula for making it. If not, could you tell me how I could prepare beeswax, so that I could use it with a small brush to paint letters on brass to etch? A. Beeswax can be dissolved in turpentine, and the fixed and volatile oils. It dissolves in 35 parts of ether and 11 parts of chloroform. The last solution would be suitable for your purpose.

(3556) Librarian asks if there is an article which will restore the color to faded black book covers. I have heard that ether is useful, but hesitate to use it or anything else, except on authority. A. The agent to use, if any can be successfully employed, depends on the nature of the color. A solution of an iron salt in water might be of use, but any such application would tend to impair the finish of the leather. We should advise the use of nothing except book-binder's varnish, which might be blackened by the addition of nigrosine or aniline black.

(3557) F. R. W. asks if there is any preparation or fluid that I can print or write with that will change its color on being moistened. Or is there any preparation that I can use to make a very delicate or invisible line with, and on being moistened will show up very plain? A. Write with an aqueous solution of tannin, using a gold or quill pen. Develop by moistening the writing with a weak solution of sulphate of iron. The writing when developed will be nearly black.

(3558) J. H. S. writes: I desire to know whether a cellar can be so constructed as to keep out the water; if so, how? The cellar in question is now built, but will not keep out water, though well cemented. A. A cellar can be constructed so as to be waterproof, if the bottom or floor is first covered with cement, the walls built thereon laid in cement, and the exterior of the wall covered with cement. This makes, practically, a watertight basin. The cement used must be the best Portland cement one part, clean sharp sand one part. After a cellar is built it is not so easy to make it waterproof. Still it can be done. Cover the exterior of the wall with the above cement, ditto the bottom, and work the cement in under the bottom of the wall. If these directions are followed, you will succeed. But if cheap materials are used and the work badly done, you will be sure to fail. A drain put around the outside of the wall or even inside below the cellar floor may be efficient in carrying off the water, if you can give it a good delivery.

(3559) G. A. asks: 1. How high a vacuum will the best piston air pump obtain? A. Within a very small fraction of an inch of a perfect

vacuum, as measured by a mercurial gauge. 2. What kind of air pump is used to make the vacuum in incandescent lamps? A. A piston air pump driven by power is often used for the first exhaustion followed by a mercurial pump. 3. How long does it take to make the vacuum? A. No exact time can be given; it depends on the relative size of the lamp or lamps and pumps. 4. Is there any difference between an air pump and a vacuum pump? If so, what? A. No. 5. What motive power is generally used in large establishments, to work vacuum pumps? A. The descent of mercury. 6. Does salt dissolve more rapidly in cold than in warm water? A. No. 7. What is the ratio of relative brightness used in classifying stars into their different magnitudes? A. The relation of the brilliancy of a star of a certain magnitude and that of the magnitude immediately preceding has been variously determined from 0.346 to 0.464. Zollner (1865) from magnitudes 1 to 6 gives 0.363, and Rosen (1869) from magnitudes 5 to 9.5 gives 0.398. For an excellent and fully illustrated treatise on mercurial air pumps, we refer you to our SUPPLEMENT, Nos. 629, 630, 631.

(3560) H. W. B. asks: 1. What is the E. M. F. of the small dynamo described in SUPPLEMENT No. 161, when provided with the drum armature described in SUPPLEMENT, No. 599? Also what fraction of a horse power is required to drive it? A. The E. M. F. of the dynamo referred to is 12 volts. We do not know that the current from the armature described in SUPPLEMENT, No. 599, has been measured, but it is considerably higher than that of the armature described in SUPPLEMENT, No. 161. 2. What is the E. M. F. of the machine described on page 499 of "Experimental Science," when wound with finer wire and used as a dynamo? Also what fraction of a horse power is required to drive it? A. It would be impossible to tell what the E. M. F. would be without knowing what changes have been made. The difference of one size in the wire makes a great difference in the E. M. F. About 1/2 of a horse power will be required in each case.

(3561) H. B. M. writes: 1. Will you kindly inform me how a strong aqueous solution of tannin can be rendered colorless without detriment to its chemical properties? A. Use the purest tannic acid and pure water. If this is not satisfactory, agitate with ether, and on standing the ether will rise to the surface, carrying much of the coloring matter with it. Draw off the lower solution for use. 2. Also the same inquiry as to the sulphate of iron. A. Dissolve carefully scraped bright crystals of ferrous sulphate (copperas) in water, covered with a thin layer of olive oil. This will give a nearly colorless solution. In neither case must you expect a strong, absolutely colorless solution.

(3562) W. L. V. says: One candle is 8 feet in height and 1 foot in diameter. Another candle is 8 inches in height and 1 inch in diameter. Their wicks are proportionate. Will they both burn the same time, or will the larger one burn the longer time? Give reason with answer. Is the focal distance of a lens increased or diminished by the density of the atmosphere? A. The small candle contains 6 1/4 cubic inches. The large candle contains 10,848 cubic inches, and would require 1,735 wicks of the size of the small candle to consume it in the same time. The focus of a lens varies with the density of the atmosphere, but too small for observation.

(3563) J. E. B. asks whether the armature to motor described in SUPPLEMENT, No. 641, has to have 12 coils. Can I make it with 8 coils? What size wire required? A. An armature with 8 coils will work, but as a rule the more coils used, the better. The size of the wire depends on the current used. For a battery current such as is recommended, No. 18 wire will answer.

(3564) E. J. B. asks (1) how to cover wood pulleys for making polishing and emery wheels. A. The best plan for making an emery wheel with a wooden core is to cover the wood with sole leather which contains no oil. The leather can be fastened with glue and shoe pegs. After the glue becomes dry the leather should be turned off and made smooth with sandpaper. It should then be coated with the best white glue and immediately rolled in the emery, which should be warm. When the wheel is dry, brush off the surplus emery. 2. Also how to make a straight magnet, same as magnet used in Bell telephone receiver. A. Harden a bar of steel at the ends, draw it to a purple and magnetize in a coil through which a strong current is passing.

(3565) F. S. asks for a receipt for manufacturing soldering flux for tin. A. We give two receipts: a. Dissolve 1 part lactic acid and 1 part glycerine in 5 parts of water. b. Melt together 1 pound olive oil, 1 pound of tallow, and 8 ounces resin. While the mass is still fluid, but has cooled a little, add with constant stirring 1/4 pint of water saturated with sal ammoniac.

(3566) W. S. M. asks: How many guns did the Monitor use in the engagement with the Merrimac? A. Two 11 inch guns.

(3567) F. D. S. writes: I want to pump up an elevation of six feet, at the rate of 8,000 cubic feet per minute. Would like to know how much power will be necessary, and the best kind of pump to use? A. You will need a pump indicating 125 horse power, and would require two water cylinders each 6 feet in diameter, and 8 feet stroke, if single acting.

(3568) Dr. A. D. asks the quantity in weight or in bulk of carbonate of ammonia used to raise one pound of flour. A. About one teaspoonful should suffice for one to one and a half pounds of flour. It is not generally used.

(3569) R. G. asks: Why do engineers multiply the square of the diameter of cylinder by the decimal 0.7854 to find the horse power of steam engine? If the steam pump will draw water 33 feet at sea level, how far will it draw when the elevation is 8,000 feet above sea level, and how much should the suction be shortened for every 500 feet from 8 000 to 13,000 H. P.? A. The square of the diameter in inches multiplied by 0.7854 equals the area of the cylinder in square inches. At 8,000 feet the greatest height of pump lift is 23 feet. At 9,000 feet, 22 feet. At 10,000 feet, 21 feet. At 11,000

feet, 20 feet. At 12,000 feet, 19 1/2 feet. At 13,000 feet, 18 1/2 feet.

(3570) J. W. M. writes: I would like to have you give a receipt for a paste for sticking labels on to tin. I have tried a number of receipts, but they are all a failure excepting I use an alkali acid, either of which will injure colored labels. What I want is a glue, cement, or paste that will stick paper colored labels to highly polished tin and nickel. A. To 2 table-spoonfuls of the best flour add a tablespoonful of brown sugar and a few drops corrosive sublimate. The whole to be boiled and continually stirred, to prevent its getting lumpy, till of the right thickness. To prevent mouldiness add a few drops of some essential oil, as oil of cloves.

(3571) A. V. S. writes: A young student of mechanical engineering would like to know a few of the most common causes of boiler explosions, and if any other gas than steam is ever the cause of explosions, and if there is always an explosive increase of pressure at the moment of explosion. A. You will find interesting and valuable information on boiler explosions, their cause and remedy, in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 463, 456, 581, with illustrations.

(3572) R. M. asks: Please give me a preparation of white ink that will adhere to a glazed card and not be easily washed off? A. Use zinc white or white lead, rubbed up with gum water to the proper consistency.

(3573) J. M. B. asks whether land will become enriched or impoverished if kept bare of vegetation. A. Land becomes impoverished and leached of the necessary constituents to vegetable growth by being kept bare of vegetation. The soluble elements of vegetation, carbonic acid, ammonia, phosphoric acid, potash, soda, sulphuric and hydrochloric acids, forming part of the constituents of vegetable life, are kept in circulation by a constant growth of vegetation. An unfed soil becomes barren from exhaustion from leaching, as it will also from overcropping, without artificial restoration of the elements withdrawn, which are necessary to sustain vegetable life.

(3574) P. W. asks: What is the best preparation to cover wood, to prevent horse manure from rotting it? A. Two coats of hot coal tar put on when the wood is dry.

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October 13, 1891,

AND EACH BEARING THAT DATE.

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