

let on a hard wood block. Although the steel when cold would break like glass with this treatment, when slightly warmed it will yield to moderately heavy blows un- injured.

(5164) W. S. writes: 1. I hear that it costs \$2 a day to take cameras into the World's Fair grounds. Is that true? A. Yes. 2. Do they allow a camera taking a picture over 4x5 in the grounds? A. They do not, except in the case of photographers representing illustrated journals. Such photographers must obtain a special permit from the official photographer. 3. How many caustic potash batteries would it take to run a 3/4 horse power electric motor. Cell contains 2 copper plates 4x5 inches, and 1 zinc plate 4x5 inches. Batteries to be coupled up like a bichromate plunger battery. A. It will probably require not less than 20 cells. 4. What size wire would it be necessary to wind the motor to adapt it to the caustic potash battery? A. No. 20 wire will probably be about right. The motor should have a resistance of from 20 to 30 ohms, depending upon the manner in which the battery is connected up. 5. Does the battery make more fumes than the bichromate cell? A. No. 6. How many hours will a bichromate plunger battery work 6 cells, size of plates 1 1/2 inch by 4 inches? Will it work a motor for 5 hours? What is the voltage and amperage? A. 5 to 6 hours. The E. M. F. of each cell is 2 volts. The amperage depends upon the resistance in the circuit.

(5165) W. S. P. writes: 1. In regard to the induction coil in the home medical battery, what kind of wire is used in the primary coil, and how many feet? A. It will probably require 5 or 6 feet of No. 36 wire. 2. What number of wire or what kind is used in the secondary coil? How many feet in the secondary coil? A. 12 or 15 layers of No. 36 silk-covered magnet wire, 150 to 200 feet. 3. Do you think Grenet battery fluid is as good as elect opoion fluid for a Fuller bichromate battery? A. It is the same thing. 4. Is the Grenet fluid any good when it becomes black? A. No. 5. Could you give me some directions for making 3 pints of electropoion fluid? A. Make a saturated solution of bichromate of sodium in water, and slowly add one-fifth its bulk of commercial sulphuric acid.

(5166) C. T. V. asks: 1. What kind of electricity is that generated by the dynamo? A. Dynamic. 2. Why is so much precaution exercised in the stringing of fire alarm wires when only one wire is exposed to the dampness? A. Because the ground constitutes the other conductor, and any leakage from the wire to the ground impairs the efficiency of the line. 3. Can electricity, when grounded, be compared with water in regard to seeking its level? A. The earth is generally considered as an electrical reservoir; therefore the water analogy might be regarded as the proper one.

(5167) D. C. B. asks: 1. What is the E. M. F. of a nickel-plating dynamo of 40 gallons capacity? A. 7 or 8 volts. 2. About what size wire should I use on an electro-magnet to be used with this machine? A. This depends altogether on the size of the wire on the armature, but of course it will be necessary to use large wire, on account of the heavy current generated by the machine. 3. What is the cause of reverse current in plating dynamos, and how remedied? A. The secondary current from the plating vat. 4. It is a series-wound machine with a Siemens armature. I think its name is the "Little Giant." What change in the winding would adapt it for general experimental purposes? A. Wind the armature with finer wire. 5. What would be the power of the machine then? A. Without more data we cannot reply to this query. 6. Should the commutators of a dynamo change brushes when the poles of the armature are directly opposite the poles of the field magnet? A. It depends upon the winding of the armature. If the wires run from the coil straight out to the armature, the change should take place about half a way between the poles. 7. Is plaster of Paris a good insulator? A. When dry it is a fair insulator.

(5168) W. E. S. asks: 1. Will you give me the formula for charging a Bunsen battery? A. Make a saturated solution of bichromate of sodium in water; to this slowly add one-fifth its bulk of commercial sulphuric acid. 2. Will zinc melt? A. Zinc melts at 690° Fah. 3. Can it be moulded smooth? A. It can be cast smoothly in metal moulds. 4. In what number of the SCIENTIFIC AMERICAN does it tell how to make an induction coil? A. You will find a full description of an induction coil in SUPPLEMENT, No. 160.

(5169) H. W. B., Jr., writes: I have seen described in the Notes and Queries of your paper a battery composed of sheets of zinc and copper with blotting paper in between; will you tell me what the paper is wet with, how thick should the zincs and coppers and the paper be to secure the best results? What would be the voltage, amperage and resistance of one composed of ten sheets of zinc and ten of copper, 10 inches by 6 inches? A. One half of the sheets in the battery referred to should be saturated with a solution of zinc and the other half with a solution of sulphate of copper. The blotting paper saturated with the sulphate of copper should be in contact with the zinc, and that saturated with the sulphate of zinc should be in contact with the zinc. The zinc plates may be one-eighth of an inch, and for the copper any thickness will do, provided it is stiff enough to maintain its contact with the blotting paper. The voltage is about the same as that of a gravity, practically 1 volt, but the amperage is very small, owing to the resistance of the battery. Probably you will be able to secure a current of 3 or 4 amperes with such a battery.

(5170) G. R. asks the cause of holes about the size of a tackhead and larger on the sides of a stereotype plate, such as used on newspapers, after the tails are cut off. These holes form whether metal is poured hot or cold. A. The holes are caused by air, which in the operation of casting does not escape from the casting box.

(5171) A. Z. writes: 1. In Wimshurst electric machine described in "Experimental Science," could vulcanite be used for rotary disks? Would they be better than glass? A. Vulcanite can be used for this purpose, but it deteriorates with time. 2. Is standard supporting journal and axles of wood or metal? A. They are of wood. 3. Are tin foil strips connecting brushes in electric connection with axle? A. No. 4. In trying to make Leyden jars we can hardly find any bottles or jars

or window glass that will retain the electricity. What kind of glass or how prepared will answer the purpose? A. Use soda glass. Lead glass is a conductor of electricity, although a very poor one. The glass jar should be very thoroughly dried and varnished with shellac before being coated with tinfoil.

(5172) O. C. C. asks: 1. Please tell me the gross weight, charged, of a primary battery maintaining (for motor power) after a fifteen minutes' run about 1/4 horse power. A. 50 to 60 pounds. 2. The shortest period in which such a battery (after say 15 minutes' service) will regain its prime strength? A. The battery will not of itself recover its original strength; it must be recharged. The process of fully recharging requires from 6 to 7 hours. 3. Which are the lighter and most serviceable—rubber or glass cells? A. Rubber cells.

(5173) T. T. writes: Recently during a thunder storm here a church was struck by lightning. The steeple was struck first, then the interior was visited, leaving a long streak where it had scorched the wall paper. It was afterward noticed that it followed an irregular gold stripe in the wall paper from the ceiling to the floor. Can you explain why this occurred? A. A very slight conductor serves to lead lightning in any direction, on account of its extremely high E. M. F.

(5174) M. C. P. writes: I wish to ask you a question in regard to my wood saw that I have just rigged up. It has a balance wheel weighing from 100 to 125 pounds, 26 inches in diameter, is a web wheel. I have been running it at about 1600 revolutions per minute. I run it with a horse power; the speed is sometimes higher, sometimes lower. Now, is it dangerous to run it at that speed? The machinist who cast the wheel said it was of good quality. My saw is 20 inches in diameter, and if I reduce the speed I am afraid it will not saw well. If it is not asking too much, please give me some information in regard to the matter. A. The tensional breaking strength of cast iron in the usual foundry practice cannot be trusted at more than 16,000 pounds per square inch. The safe load is made at one-sixth of the breaking strength per square inch or 2,666 pounds. The strain on the rim of your fly wheel at a speed of 1,600 revolutions per minute is 3,000 pounds per square inch, or a margin of a little over one-fifth of the breaking strain. This may be safe for good iron and a web wheel without flaws.

(5175) T. D. McC. asks: 1. In the Blake transmitter, is the fine wire wound next to core or on the outside? A. In the Blake transmitter the fine wire of the induction coil is wound upon the coarse wire. 2. Does primary circuit in an induction coil always refer to the inner circuit? A. Not necessarily, but according to the usual construction, the primary or coarse wire coil is placed on the core inside of the secondary coil.

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Railways or tramways, construction of perma- nent ways for, J. E. Billups..... 500,366
Railways, apparatus for supplying electricity to, M. H. Smith..... 500,256
Ratchet brace for bits or drills, D. M. Fulton..... 500,282
Ratchet wrench, G. W. Wood..... 500,177
Refrigerator, Metcalf & Doy..... 500,247
Register, See Cash register.
Regulator, See Pressure regulator.
Resawing machine, Surran & Greenhill..... 500,167
Resistance box, E. Weston..... 500,362
Revoluble screen, D. E. Phillips..... 500,508
Ring gauge, G. R. Hughes..... 500,180
Roller, See Street roller.
Roof rafter, A. Neracher..... 500,416
Roof rafter, and gable, W. C. Knier..... 500,519
Routing machine, A. B. Wagner..... 500,472
Saddle, E. S. Cross..... 500,472
Sash fastener, W. E. Mayo..... 500,254
Sawing machine, cold, G. Ehrhardt..... 500,193
Sawing machine, metal..... 500,194
Scale, bar holding weighing, M. B. Lloyd..... 500,537
Scoop, sifting, E. H. Whitton..... 500,447
Screen, See Revolvable screen.
Screw cutting dies, machine for the manufacture of, C. O. Harris..... 500,494
Screw, jack, Grimm & Willard..... 500,203
Scrubbing and mopping machine, Shively & Barry..... 500,221
Seat, See Bicycle seat. Car seat. Carriage jump seat.
Secondary battery, King & Clark..... 500,394
Sectional boiler, W. H. Page..... 500,507
Sewing machine, K. Vogel..... 500,515
Sewing machine needle threader, E. C. Jenkins..... 500,235
Sewing machine shuttle, E. Robertson..... 500,430
Shaft, vehicle, A. Friedmann, Jr..... 500,2-3
Sheet lifting and counting device, J. W. Darley, Jr..... 500,373
Sheet metal elbow, F. Dieckmann..... 500,119
Sheller, See Corn sheller.
Shir and manufacturing same, W. A. O'Brien..... 500,270
Shoe, W. Hall..... 500,385
Signal apparatus, W. H. Kirm..... 500,285
Sink or other analogous construction, Donegan & Duenkel..... 500,475
Slate picker, Stoessel & Fabringer..... 500,302
Soaps, process of and apparatus for the manufac- ture of kneaded or agglomerated, A. & E. dea Cressoniers..... 500,135
Sole channeling machine, C. P. Stanton..... 500,438
Spinning and baling machine, Monro & Courtenay..... 500,343
Spinning machine, J. A. Collins..... 500,518
Spoke bending machine, P. Gendron..... 500,388
Spring, See Vehicle spring. Wagon spring. Watchcase spring.