

citric acid, and 15 parts best Jamaica rum. Saturate with carbonic acid gas, fill in bottles, and keep for a few days in a moderately warm room; after this keep in a cool place.

(925) R. L. D.—The water line in the mercury flask boiler described in SUPPLEMENT 182 should be at a point about half way up the upper tier of flasks.

(926) A. S. asks how to make a rain box such as is used on the stage to represent rain. Also how to make and what powder to use in a flash box. Also how to represent the blowing of wind on the stage. A. For description of stage machinery we refer you to our SUPPLEMENT, No. 268, and to the SCIENTIFIC AMERICAN of December 22, 1888. Powdered resin, lycopodium, or magnesium powdered may be used in flash boxes.

(927) M. H. S. asks for a material which can be applied to or incorporated with paper which will render it waterproof. A waterproofing which is effectual and cheap is desired. A. Use spirit varnish, linseed oil, or melted paraffin.

(928) C. R. asks: Would it be practical to make the dimensions of the motor described in SUPPLEMENT, No. 641, about half size? Also would it be practical to use annealed cast iron for the cores and pole pieces of the electro-magnets instead of those bands of wrought iron? About how many batteries would it take of an E. M. F. of about two volts, strength of current about 5.5 amperes, to run a sewing machine or small electro-plater's lathe? A. The motor referred to cannot be made smaller to advantage. Cast iron will answer for the field magnet. It will require eight cells of the battery you describe to drive the motor.

(929) A. B. F. writes: 1. In close plating silver on carriage work, I have noticed that they use a file to scratch the iron in order to make the solder stick, which is a slow process. Why not use a belt machine or wheel with coarse emery? A. A rotary file might answer, but we think an emery belt would be objectionable on account of the particles of emery that might become embedded in the iron. 2. I have a large number of electric arc lamps under my care, and I find a great many of the rods crack in cold weather. Why is this? These rods are hollow. Would it help if the hollow rods had a vent hole to allow the hot air to escape when lamp stopped burning? A. The fault in the carbons is in the manufacture. They are probably too dense. 3. In stores where electric light wires run along the ceiling much dust collects on ceiling around the wires. What will remove this from ceiling? A. We know of nothing better than a stiff brush. The accumulation of dust cannot be prevented when the wires are very near or in contact with the ceiling.

(930) C. T. H. asks: 1. How much current in amperes No. 30 copper wire, American gauge, will stand without heating? A. 0.09 ampere. 2. What is the rule for finding capacity in amperes of any given size wire? A. Multiply the sectional area of the wire in inches by 1,900. The result will be the number of amperes the wire will safely carry.

(931) C. P. W. asks: What is the gum lac spoken of in the article about batteries in the SUPPLEMENT, No. 159? Also what kind of carbon, whether graphite or coke, and whether powdered or granulated, and in what proportion to use to make the depolarizer for an improved Leclanche battery, also whether the manganese dioxide should be powdered, or the natural crystals or ore. Also what is the gold beater's skin that is used for the diaphragm to the phonograph? A. The gum lac referred to is simply shellac. If drug stores do not keep it, inquire at the paint stores. The carbon is pulverized coke. The proportions are as follows:

Table with 2 columns: Material, Quantity. Manganese... 40 parts. Carbon... 52. Shellac... 5. Potassium bisulphide... 2.

Mix dry and compress under a pressure of 800 to 1,000 lb. per square inch at a temperature of 212° F. Gold beater's skin is a thin membrane taken from the intestines of the ox. Probably a thin piece of fish's bladder will answer your purpose.

(932) L. W.—In your simple electric motor, have you tested the polarity of the field magnet above and below the armature? Of course the upper and lower parts should have different polarity. If your field magnet is a made of sheet iron, we doubt if you will be able to generate a current without separately exciting the field.

(933) F. E. H. asks: Does a bichromate of potash battery need to be covered? A. The only advantage in a cover is to prevent evaporation.

(934) F. L. M.—You can work your relay and sounder on the line, but you will need a large battery, and the arrangement will prove uneconomical. Better dispose of your 150 ohm relay and replace it with one of the same resistance as the sounder.

(935) T. M. asks: 1. Would sheet zinc, if amalgamated, do in place of the cast zinc in the Bunsen battery? A. Yes; provided it is thick enough. It should not be less than 1/8 inch thick, and it might be 1/4 inch thick to advantage. 2. Should the side of porous cell be very thick? A. They should be of medium thickness. If too thin, they cause the battery to run down quickly. If too thick, the resistance of the battery will be unduly increased. 3. Can the carbon rods used in electric lights be used in the battery? A. Yes; after removing the copper coating with nitric acid.

(936) N. G. P. asks: What are the three best non-conductors of heat? A. It is hard to answer this question without qualification. For high degrees of heat zirconia is about the best non-conductor known, while lime and porous clay come close to it. Among building materials, plaster and sand mixed come very low, having less than one-fifth the conducting power of slate. Water is an exceedingly bad conductor, and it is by convection that heat is generally distributed through its mass.

(937) D. J. B. asks: 1. How to cut the round hollow glass for a lubricator? A. To cut glass tubing for lubricators and water gauges, break the end off from a round file of suitable size, so as to have a sharp edge to the point. Insert the file inside of the glass tube and carefully scratch around the inner surface at the proper distance. A crack will follow the file, when the tube can be easily broken at the file mark. Try it on an old tube, as a little practice may be required. 2. How to find the dead center of a steam engine, in order to set the slide valve. A. For all practical purposes for setting the valve, the dead center may be obtained by marking the extreme positions of the gibs on the slide, moving the flywheel both ways across the dead center to check the mark, when the mean difference can be marked on the flywheel by a fixed pointer, and the difference divided, when the flywheel can be moved, so that the differential mark will coincide with the pointer. 3. What kind of oil would you recommend the best for high speed engine? A. You require the best "cylinder oil" for high speed engines. It is known in the oil trade.

(938) G. B.—Cast iron for nickel plating should be finished fine with a soft emery buff, made by covering a wheel with leather and applying fine emery, about No. 100 to 120, with glue. Goods that are not flat are sometimes finished in a tumbling machine to the desired finish for nickeling.

(939) E.—Iron sliding poles in engine houses would have less friction than brass, if kept bright and smooth. The brass poles do not rust and are easily kept bright. Their appearance also probably recommends the brass poles to firemen. The iron poles, besides, will rust so much as to stain the hands in one wet day.

(940) G. H. R.—Acoustic telephones requiring no batteries are now used to some extent in the U. S., and are much cheaper than the price you name. They are in use for distances over a thousand feet. These telephones are made of thin metallic disks or combinations of metal and hard rubber disks 3 to 4 inches in diameter, attached at their centers to a wire of hard copper or steel stretched between the points of communication. The disks are held in frames fastened to the building. In long distances the wires may be suspended in rubber slings to poles. In fact, it is the common toy telephone on a large scale. For the horse power of a water way, approximately, measure the area or section of a stream (its mean depth multiplied by the width in feet) at a convenient place for measurement of the velocity in feet per minute by the floating of an object in the water. Multiply the area by the velocity, which will give the number of cubic feet passing per minute. Multiply this product by 62.5 (pounds per cubic foot), and the last product by the height in feet which can be obtained or utilized upon a wheel or turbine. Divide the whole product by 33,000 for the horse power. Of this power you may utilize about 75 per cent.

(941) W. S. asks: 1. Would glass cells answer for plunger battery (such as you described in the SCIENTIFIC AMERICAN) as well as mill board? A. Except for liability to breakage, glass is the best material for plunging battery cells. 2. What will be the best liquid solution to use in the battery? A. Into a cold saturated solution of bichromate of potash in water slowly pour sulphuric acid, one-fifth of the volume of the solution by measure. This mixture should be made in a glazed earthen vessel. 3. Would sheet iron in 4 or 6 foot lengths, joined with rivets to make the full length, not do better than butting them? A. There is no advantage in riveting the pieces of iron together. 4. Would not light hoop iron do as well as sheet iron? A. Yes. 5. What is it that becomes exhausted in the battery; is it the zinc or the carbons or both? A. The zinc and the solution. The carbon plates are not affected. 6. Will it be necessary to renew the solution when the zinc or carbons become exhausted? A. The solution requires frequent renewal. The zinc will last some time if properly amalgamated.

(942) W. M. S. asks: 1. How much of the energy is lost in charging and discharging a storage battery? A. About 10 per cent. 2. How must I adjust the brushes of simple electric motor which has a commutator like a large one? A. Arrange the commutator brushes so that they will touch the commutator at points opposite the center of the spaces between the arms of the field magnet. 3. What is the best book which tells all about electricity, motors, dynamos, storage batteries, etc.? A. Probably the best single book for your purpose is "Electricity in the Service of Man," by Urbinsky. 4. How many volts does it take to kill a person instantly? A. It requires an electromotive force of from 600 volts upward. 5. Does a so-called "interrupter" make it easier for a current to pass through the body? A. The interrupter does not facilitate the passage of the current through the body, but it intensifies the effect of the current upon the nerves.

(943) F. W. S. writes: 1. How shall I proceed to extract the perfume from the petals of roses or other flowers by the use of grease? A. Melt a mixture of purified lard and purified tallow over a water bath and immerse an equal weight of rose petals in it. After they have been stirred well together, keep covered for 24 hours, stirring occasionally the cool mass. Remelt and keep in fusion another day, with frequent stirring. Strain through a coarse cloth and repeat a number of times; twelve repetitions with fresh petals is prescribed. After all is done, allow the melted pomade to settle, and pour off into pots. 2. What is black soap? A. Black soap is the name given to the crude soap separated by remelting from the first saponification. It is also applied to a farrier's soap made from fish oils and potash. 3. Give a formula for a good white rose extract without the use of pomades? A. Distill 5 quarts of rectified spirits from 3 lb. of rose petals; repeat with the same distillate but with a fresh portion of petals a number of times until sufficiently strong. At the end of the operation only distill one gallon, and do it rapidly. Or simply add a little atar of roses to alcohol and perfume to suit the taste. 4. How is coumarin prepared? A. Tonkabean are cut up finely, and are heated for a long time with alcohol (0.863 spec. gr.) nearly to boiling. The tincture is poured off and the process is repeated. The tinctures are mixed and the alcohol is distilled off until the residual liquid is turbid, when four times the bulk of water is added. It is heated to boiling, filtered, and coumarin separates on cooling. One pound of beans gave 108 grains of coumarin.

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