

(5) R. L. S. asks the advantages in coking coal, which is now so extensively done at the mines before shipping to consumers. A. We do not know that there are any advantages in point of economy of cost over bituminous coal. Cleanliness in firing and a smokeless fire are always desirable if at not too much cost. The great value of coke is in the blast furnaces and the great coking establishments of Western Pennsylvania were originally established to meet this requirement. Competition in manufacture has thrown it into market for general consumption. 2. How is it that the common buzzard, and some other species of hawks, are able to float through the air without moving their wings or making any apparent effort, raising and lowering themselves at pleasure, even propelling themselves against the wind, while their wings are, seemingly motionless? A. When moving against the wind they sometimes appear to be motionless, for a few moments, but sustained in the same manner as a kite, the distance making them appear motionless when they are moving slowly. When they are sailing in a calm, they are always moving on an inclined path. It is our upward view which deceives us. When seen from the top of mountains their real motions are apparent. They gain speed on the downward sail and use it as momentum in nearly gaining their original level.

(6) Subscriber asks: Can you inform me of a combination of chemicals which will produce a degree of cold, say 20° or lower, which will continue for several hours, the said chemicals to be cheap and free from danger? A. We recommend ammonium nitrate and water as the simplest. Or, as a more complicated mixture, try the following:

- Sodium sulphate.....6 parts by weight.
Ammonium nitrate.....5 " "
Dilute nitric acid.....4 " " "

The last formula is very powerful, but has the objection of requiring the use of acid.

(7) C. C. B. asks: 1. What is the best material for a non-conductor to put between the registers and wood for a hot air furnace? A. Soapstone frames to set the register in are the best. 2. Of what metals and what proportion are counterfeit silver dollars made of, and the quickest way to detect them? A. The composition of counterfeit dollars varies a good deal. Detect them by their lightness and absence of ring; also, by the appearance of the die work. 3. Would you suggest Kansas as being a good place for a machine shop? A. Kansas is a large agricultural State, with a population of over a million. There is room for a good number of machine shops, but we do not know how well the demand is filled. 4. What is best to administer to assist nature in cases of diphtheria and fevers? A. For the treatment of diphtheria, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 281, 50, 369, 51, 125, 249, 373. For the treatment of fevers, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 358, 239, 172, 251, 143.

(8) W. W. B. asks (1) how to best raise a pine pole measuring 50 feet in length and about 6 inches in diameter at tip end, pole to be put in a hole 4 to 5 feet deep. A. Such a pole should be easily raised with pikes and guy ropes, placing its foot against a plank set in the hole. A small trench may be cut, so that the foot of the pole will rest against the plank below the surface of the ground. The telegraph poles are raised in this manner. 2. About how many Leclanche cells will be required to run a current (sufficiently strong to ring a call bell) through four miles of barb wire, the wire being stapled to fence posts? A. 2 to 4 cells, according to perfection of insulation. Satisfaction will only be obtained in dry weather.

(9) F. D. L. asks: Which moves first in starting a steam engine—the valve or piston? A. Being connected with the shaft, they both move at once. The motion of each has an infinitesimal stop on the centers. In this manner the valve may stop while the piston is moving. The valve nut is often loose, so that the valve stops an appreciable time at the change of stroke.

(10) G. B. asks the best material for small gear wheels about 12 inches in diameter, running at a speed of about 500 revolutions. A. Cast iron is universally used. For fast running gear, the teeth should be cut.

(11) T. S. asks: What is the best steam packing for a stuffing box of a rotary spindle? A. Cotton wicking saturated with plumbago and oil is as good as anything.

(12) L. M. asks: 1. Is it necessary to balance a three cylinder, high speed, upright, double acting engine where the cranks are at 120 degrees apart? A. No. 2. Is it necessary to balance a three cylinder, high speed, upright, single acting engine, the cranks also at 120 degrees apart, and where the steam is at the top of pistons? A. Yes.

(13) J. M. A. asks how sulphurous acid may be made without much expense, and what apparatus would be needed? A. By treating hyposulphite or sulphite of soda with dilute sulphuric acid gas comes off freely, and should be received in pure water, which dissolves it and forms sulphurous acid. A bottle with perforated cork and an eduction tube is all that is required.

(14) F. W. S. writes: I would like to make a small induction coil for taking shocks. I have about 6 ounces No. 31 copper insulated wire, which I would like to use for the secondary coil. Will you please tell me what size and about how much wire I will need for the primary coil, and what size spool it will make? A. Use a bundle of wires a quarter of an inch thick and 2 1/2 long for core. On these wind one hundred feet No. 16 to 18 insulated wire, and on this the fine wire. Use layers of shellacked paper between the core and primary and between primary and secondary.

(15) E. B. D. asks in regard to the construction of Leyden jars? Say we use gallon jars. 1. How thick should the glass be? A. About 1/8 inch. 2. What is the best method of coating the jar with tin foil? A. Paste the tin foil on with flour paste over two-thirds the height of the jar and over the bottom, inside and outside. For inside use it in strips.

(16) A. E. S. writes: If a sphere of average wrought iron weighing 1 ton with a vacuum that renders it without specific gravity be filled with air, will the sphere be made heavier or lighter? And how much peratmospheric pressure? A. A vacuum does not deprive a substance of specific gravity. A hollow with vacuum within it is lighter than when filled with air; how much, depends on the volume of air introduced, which is not given in your question.

(17) C. W. H. says: I wish to construct a battery and lamp for an electric light to be used in connection with a microscope to throw an image upon a screen about 8 feet square. 1. Please explain construction of battery and lamp. I have a telegraph battery, 12 cups; can that be used? A. You need a much higher electro-motive force than 12 gravity cells will give. The lamp you can buy of Stout-Meadowcroft Co., 21 Ann Street, New York. They supply battery, lamp, and all for this express use. 2. I have a small medical battery in which I use sulphate of mercury; can a larger battery of that style be used? A. It could, but would be expensive to run.

(18) W. B. writes: I have four large gravity battery cells, half a mile of No. 18 cotton-covered magnet wire, and desire with these to make a powerful magnet. Please tell me how big should the soft iron core be. What is the best iron—cast or wrought? Need I put any insulator on the magnet before wrapping with wire, and is anything required between the layers? A. Use cores 1 1/4 round iron (Norway annealed), and about 10 inches long. Wind the wire on pasteboard tubes large enough to slide over the covers. Use two tubes for each leg, and wind each tube with a double layer. This gives you a number of combinations, to suit different battery strengths. Nothing more is required than wrapping of wire as an insulator.

(19) H. E. W. asks whether cotton seed oil is combustible; if so, what degree of heat it requires to explode it. Some of the Northern mills have been advised not to handle it, on account of its spontaneous combustibility. A. Cotton seed oil is not explosive in the ordinary sense. Mixed with waste, wood shavings, and the like, it is liable to heat, and so catch fire spontaneously. We should apprehend no more danger in handling it than in the case of linseed oil.

(20) G. H. A. says: I have lately made a workshop of an upper room, and have put in a lathe, boiler, and engine of a total weight of 2,400 pounds, resting upon 3 joists 3 inches by 9 inches by 16 feet 0 inches. Will it strengthen the floor sufficiently to enable it to carry the increased weight if I bolt three 3 inch by 8 inch joists to the existing ones? A. You had better use 4 inch by 8 inch joists bolted with 3/4 inch bolts about 10 inches apart. Take care to provide solid bearings for your new joists, wedging the ends up with tiles in cement.

(21) F. B. M.—The resistance to thrust in the case referred to depends upon the adhesion between the mortar and bricks, and varies from 12 to 24 pounds per square inch. Taking it at 20 pounds per inch, and the approximate resistance to thrust 300 inches we have 53 1/2 cwt., the thrust required to break the wall. The thrust of the beam mentioned would be as follows: Taking 5 1/2 cwt. per square for framing and 7 1/2 cwt. for slates, we have 33 cwt. direct thrust. This is neglecting the wind pressure, which in steep roofs is usually calculated at 36 cwt. per square, bringing the thrust up to 124 cwt.

(22) W. B. asks: How many batteries (bichrom. bat.) will it take to run a seven candle power incandescent lamp? Carbon and zinc are 8 by 4 inches. A. 10 to 15 such cells, run as they probably would be in practice.

(23) A Subscriber asks: Will you give me a few points about the electro magnet that appeared in vol. liv., No. 7, February 13, 1886? 1. What is the electromotive volts and amperes necessary to run the electric motor illustrated in SCIENTIFIC AMERICAN, vol. liv., No. 7? A. About 50-70 volt-amperes. 2. The number of layers of wire used, and what is the weight of it? A. This depends on the exact size. Two or three pounds of wire should suffice. 3. What is the width and the thickness of the armature? A. Make the armature about 1 1/2 inch wide by 1/2 inch thick. 4. Should E project above flange the thickness of the armature? A. Make it project about 3/8 inch for stroke of 1 inch. 5. In winding the bobbin, where should the wire start and end at? A. Immaterial. 6. Is the commutator made of iron too? A. Make commutator of copper or brass.

(24) M. A. asks if one of the materials used in the manufacture of fireworks is meal powder. What is meal powder? A. It is powder that has been mixed and rolled, etc., but not yet compressed and granulated.

(25) L. A. writes: Want to know if there are any chemicals that will produce a gas and create a pressure, so that the said gas can be used expansively the same as steam? A. There are many chemicals that will do it. Limestone and muriatic acid will produce any pressure ordinarily required by evolving carbon dioxide gas.

(26) C. E. M. asks: 1. What is the amount of wire to be used in the dynamo described in SUPPLEMENT, 161? Also, how much (if any) candle power can it give with incandescent lamp? A. Five to six pounds in the field, and half pound in armature. It will give five to ten candle illuminating power. 2. I would also like to know the power of a steam engine which I have constructed (it is horizontal). The bore is 1 in., stroke 2 in., pressure 65 lb., speed 120, size of ports 1/2 in. round. A. If your speed is 120 revolutions per minute, it gives six one-hundredths of a horse power; if the speed is 120 strokes per minute, it is one-half that amount, or three one-hundredths horse power.

(27) W. Z. asks: In a telegraph sander the core of coils and bar of armature are nickel plated. Is the attractive power lessened by the nickel coating, and would it be better to have them bare iron where close together (on armature opposite core)? A. The nickel plating should not affect the working to any perceptible extent.

(28) H. S. P. asks: 1. How to take mil-dew out of a tent? A. Mix well together a spoonful of table salt, two of soft soap, two of powdered starch, and the juice of a lemon. Lay the mixture on both sides of the stain with a painter's brush, and then expose the tent out of doors day and night until the stain disappears. 2. How to make an emery wheel? A. Take a solid wheel of pine or any similar wood, and of the proper size. Turn the wheel true. Then prepare some best glue, and using it hot and thin, put it on the surface of the wheel with a brush. The first coat of glue should be a light one, and when it is dry a second one should be applied, and, as quickly as possible, as much emery should be sifted upon the wet surface as the glue will hold. When this is dry, another coat of glue and emery should be applied in the same way. See also the article on "Polishing Materials," contained in the SCIENTIFIC AMERICAN for Jan. 17, 1885.

(29) J. W. P. writes: I wish to boil a cigar holder to clean it out. What kind of oil should I use, etc.? A. The best thing to use is alcohol. Care must be taken to prevent this solvent from coming in contact with the outside of the meerschaum. All processes for coloring must be done by experts. These workmen keep their processes secret, and there are not more than two or three persons in the United States who are competent to do it.

(30) W. A. B. asks: 1. Is there an explosive compound known as glucodine? A. Glucodine is no longer manufactured. 2. Which possesses the greater destructive power, weight for weight—No. 1 dynamite or fulminate of mercury? A. Fulminate of mercury is the most intense, and therefore most local. 3. Why are not the higher explosives used in heavy artillery? A. Because they would destroy the guns. Progressive force is desired in artillery practice.

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