See Sloane's "Arithmetic of Electricity," $1 by mail. 3. Please tell me if it is proper to say amperage or ampage. I have heard the word pronounced both ways. A. Amperage.

(6476) J. F. B. writes: Will you give me the approximate diameter of a windmill that will develop about one horse power with a twenty mile per hour breeze? Also what would be the increase in power with additional wind pressure, say of five and ten per cent? A. An 18 foot mill should be equal to 1 horse power. The increase of power will be as the square of the ratio of the velocity of the wind. Thus 10 per cent to 20 m. is 22 miles, and $\frac{22}{20}=1{\cdot}1$, the square of which is 1·21, so that the 1 horse power mill will yield 1·21 horse power with a 22 mile wind.

(6477) A. C. M. asks if two of the simple electric motors described in "Experimental Science" can be put on one shaft, and what horse power they would develop together at full capacity, also how many volts and amperes would the two motors require at full load, and whether each motor should be connected separately. A. You can connect as described, and get nearly two-tenths horse power at eight volts and eight or nine amperes.

(6478) W. B. asks: What is the best way to produce the greatest amount of heat by electricity? If possible, give several ways of producing heat by electricity, and state which is the best to create the greatest amount of heat. A. All methods of producing heat by electricity are based on the arc or on plain incandescence of a conductor. For examples of the first we refer you to our SUPPLEMENT, Nos. 904, 905, 901, 986, 610, 840, 635; for the latter method, used on the large scale in electric welding, we refer you to our SUPPLEMENT, Nos. 582, 682, 768, 892.

(6479) D. J. F., Newfoundland, writes: 1. What is a ship's metacenter, and how is the same found? A. The metacenter of a vessel is the point of intersection of the vertical line passing through the center of gravity of the vessel, when in its position of equilibrium, and a vertical line through the center of gravity of the water displaced when the body is careened or heeled over through any given angle, as of a vessel rolling in a sea. It is found by computing the center of gravity of the vessel as it floats when at rest, and the center of gravity of the mass of water displaced at any angle at which the vessel may be careened. The point of meeting of a vertical line from this last point at the angle of careening and the central line of the vessel is the metacenter. The height of this point above the center of gravity of the vessel is the measure of its stability. See Haswell's "Engineer's Pocket Book" for examples, $4 by mail. 2. How is the contour of the keel of a ship found, when the same is not straight, as is very often the case in wooden vessels? Is it found from the keelson? If so, how? And provided the ship be laden, how is it found? A. Irregularities in keel alignment can be approximated by examination of the lines of the keelson. When irregularities are suspected, the keel blocks are made adjustable to bring them to a bearing. With a loaded vessel the problem becomes complex and may require the service of a diver. 3. How is the dead rise, which governs the height of the bilge blocks which support a ship in dry dock, found? A. The bilge blocks should be adjustable in height and angle and also be movable to their proper bearing when the keel touches the keel blocks. The dead rise must also be found by examination inside or outside. 4. Is any treatise or book published giving directions for dry-docking ships? If so, please give the name, price, and where procurable? A. There is no work on dry-docking of ships. We have one copy of Stuart's "Naval Dry Docks of the United States," now out of print, price $6.00.

(6480) G. D. asks: Could you tell me why a permanent magnet was used in a telephone? I thought it was to give tension to the diaphragm. A. It is far more sensitive than an unpolarized core.

(6481) C. W. C. asks: 1. Is the large plunge battery, Fig. 394, in "Experimental Science," sufficient to run a one horse power motor? A. No. 2. Is the dynamo described in SUPPLEMENT, No. 600, with proportions and directions given, suitable for a motor? And if so, could it be driven with above battery, and what power would it have? A. It makes a good motor and can be run with about three times this battery, and would give about ¼ horse power for a short time only. The power would soon diminish. 3. How long would the battery run at full power on one charge? A. It would depend on the current taken from it. It would decrease rapidly after the first half hour.

(6482) H. K. M. asks: 1. How many horse power will it take to equal 1 kilowatt, or what is the relation between 1 horse power and 1 kilowatt? A. 1 horse power is equal to 0·7459 kilowatts. 2. You give a receipt for cleaning clothes, in SCIENTIFIC AMERICAN, of March 16, page 166. Does it make any difference how this should be mixed? If so, which should be mixed first? A. It makes little or no difference how the ingredients are mixed. 3. In your columns you advertise the "Kombi." Is it a success? How long will one last, and what will be expense of having negatives finished? A. Address the advertisers. They will give you all the information desired.

(6483) C. A. C. asks: 1. Which will work on the longest line (the line being metallic circuit) a Blake or a Hunning transmitter? A. We cannot undertake to pronounce upon the relative merits of the two transmitters. Both are good. The Hunning's transmitter is described in the SCIENTIFIC AMERICAN, vol. 64, No. 4. 2. What is the internal resistance of ordinary gravity batteries? A. Two to four ohms. 3. Some of the SCIENTIFIC AMERICANS tell how to make storage batteries. A. See SCIENTIFIC AMERICAN, vol. 62, No. 10; vol. 65, No. 22; vol. 68, No. 9; vol. 69, No. 20; and our SUPPLEMENT, Nos. 838, 845, and 997. 4. What is a two phase alternating dynamo? A. A dynamo of the simple alternating current type produces a single phase current. By special connections it may be made to give polyphase currents. In Walmsley's "Electric Current," $3 by mail, page 458 et seq. the production of polyphase currents is very well explained. A two phase dynamo gives a two phase current.

(6484) A. L. asks: 1. How is it that a 15 candle power incandescent lamp, as well as a 16 candle power lamp, can be bought, the first one needing only about 15 volts to make it give the proper light, and the second one will require some 50, 75, or 125 volts to make it give the proper light? See E. S. Greeley's Catalogue, N. Y. A. The low voltage lamps are of proportionally lower resistance; hence they pass more current, so that the watts per candle power are the same in all. The watts is the unit of rate of work—the volt is merely the unit of electric pressure. 2. How is the aluminum iodine battery made, what are the elements and charging fluid, and what is its lasting power and quality, both with regard to material as well as electricity? A. Carbon and zinc are the electrodes; the excitantis a paste of aluminum chloride, zinc oxide, manganese dioxide and water; the depolarizer is iodine sulphide or a mixture of iodine and mercuric oxide. The battery proved unsatisfactory on the time test. The voltage was 1·4 to 1 65. An illustrated paper on the subject appeared in the Journal of the Franklin Institute for March and April, 1893.

(6485) E. A. Le S. asks: Where can I find the results of a complete analysis of common sea water? A. The following is of sea water from the British Channel:

Water	963·745
Sodium chloride	28·059
Potassium chloride	0·766
Magnesium chloride	3·666
Magnesium bromide	0·029
Magnesium sulphate	2·296
Calcium sulphate	1·406
Calcium carbonate	0·033

—Schweitzer.

(6486) P. C. S. asks: How can a Leyden jar be disruptively discharged so you can get a current vibrating with extreme rapidity? If a two quart jar were charged by a battery and then discharged as above, would the current be dangerous, or will it run one of Tesla's coils? A. The ordinary discharge of a Leyden jar is of the character you describe, but as the entire duration of the discharge is very short, it cannot be used for a Tesla coil.

(6487) J. M. B. says: Will you have the kindness to give a receipt for making camphor ice? Also do you publish a book on manufacturing perfumery and cosmetics? A. 1. Oil of sweet almonds, 2 ounces; spermaceti, 4 ounces; white wax, 2 ounces; camphor ½ ounce; melt them over a water bath, run in moulds of proper size and form. 2. Expressed oil of almonds and rose water, each 1 pound. White wax and spermaceti, each, 1 ounce. Camphor, 2 ounces. Oil of rosemary, 1 drachm. Melt together. Glycerine may be substituted in part for the oil and rose water. From our "Cyclopedia of Receipts, Notes and Queries," price $5, which contains several hundred formulas for cosmetics, perfumery, toilet preparations, etc.

(6488) C. H. asks: How many B. T. U. (or heat units) are there in one gallon of alcohol as compared to one gallon of coal oil? A. For a pound of alcohol the thermal units are 12,929; for a pound of petroleum, 27,531. You may take refined coal oil as of about twice the heating power of alcohol.

(6489) A. C. asks: 1. Of what number of wire and what size must I make an induction coil to lift one-third of a pound, and how much battery will be required to operate six of them at once? A. The size depends on the current you propose using. A core of one-quarter inch area must be charged with about 9,000 lines of force per square inch of section to have the desired traction, requiring perhaps twenty or thirty ampere turns. The question of leakage so complicates solenoid and straight bar calculations as to affect considerably their reliability. The ampere turns can be given by low potential batteries with low resistance coils or vice versa. 2. How large and at what distance apart shall I make holes in a tube 9-16 inch in diameter to make notes of a diatonic scale, the same to be made like a small boy's cane whistle? A. Arrange them on the principle that the undulations of the note vary with the length of the pipe as determined by the position of the holes. For narrow (1:12) stopped pipes the formula is $L=(2p+1)\frac{l}{4}$ and for open pipes $L=\frac{pl}{2}$; in which L=length of pipe, l=length of wave to be produced, p=any whole number. By taking p=1 you will get the length for the fundamental, and the other values of p will give the harmonics; l is obtained by the formula $l=\frac{1120}{n}$ in which n= the number of vibrations per second, which you can take from any table of the diatonic scale. Thus l is expressed in feet or a fraction of a foot. When the ratio of diameter: length : : 1:12 ceases to exist or to be exceeded, an arbitrary formula must be used. Consult Ganot's "Physics."

Query No. 6406.—In your answer to R. K. B., February 23, 1895, No. 6406, I am inclined to think his trouble does not lie with dirty contacts, but with an improper adjustment. I have frequently met with the same trouble, and bell would ring when several pushes were given successively. The successive pushes I believe give an accumulative series of vibrations to the bell hammer, and if synchronized properly will finally set the bell ringing. In such cases I generally investigate the adjustment screw and find it a little too far from the contact on the spring of the vibrating armature. —Thos. D. Gillespie, Pittsburg.

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