

Business and Personal.

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Notes & Queries

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(4221) A. H. asks: 1. Could I use a cup made out of tin plate for the Lalande-Chaperon battery described in SUPPLEMENT, No. 792, and in "Experimental Science," instead of cast iron? A. A cup of tin plate would not be very serviceable. Use cast iron or glass in preference. 2. What is the black oxide converted to by the action of the battery? Is it to pure copper? A. Pure copper. 3. Have a lot of copper scrap; how can I convert into black oxide? A. Heat to strong red heat in air and pound or shake off oxide as fast as it forms.

(4222) C. A. B. asks: 1. If the needle of an ordinary galvanometer is deflected say 30° by two different cells of battery, does it denote that they have the same voltage or amperage? A. It depends upon the character of your galvanometer. If its resistance is very high, it is practically a voltmeter, and shows that the voltage of the two batteries is the same; but if its resistance is very low it acts as an ammeter and indicates that the amperage of the two cells is practically the same. 2. If one cell deflects say 20° and the other 30°, what is the rule for estimating their comparative voltage or amperage? Is it as the square of these numbers? A. This depends so much upon the character and proportions of the galvanometer that it does not admit of a very direct reply. If your galvanometer acts as a tangent galvanometer, the current will be proportional to the tangents of the angle of deflection. 3. What is the voltage and amperage of the ordinary Grove battery

(small size), and also of the gravity battery? A. The voltage of the Grove battery is about 1.9 or 2. As the resistance of the Grove cell is about one-half an ohm, the battery will yield a current of nearly 4 amperes. The resistance of the gravity battery averages about 3 ohms, and its electromotive force being about 1 volt, it would yield a current of 1/3 of an ampere. 4. In the construction of a storage battery, how large square should each of a pair of lead plates be in order to obtain one ampere hour? A. Plates 5 1/2 by 12 have a voltaic capacity of 14 ampere hours per pair. 5. What size of iron wire and what length of same can be heated to redness by one ampere? Thus affording an approximate method of measurement. A. As wire of the same nominal size from different manufactories varies considerably, your proposed test would be of no value. 6. How many ampere hours and what would be the voltage of a storage battery of six cells connected in series each cell containing two lead plates 6 by 8 inches? A. The electromotive force would be about 12 volts. Its voltaic capacity would be 14 ampere hours per pair of plates.

(4223) G. E. T. writes: Outside of the question as to adaptability, what are a few of the occupations that are most promising to the rising generation of young men, business that are new, at least comparatively so, and, at the same time, sure, both as regards the financial and the physical and moral phases of the question? Could you direct me how to get a beginning in any such, and work up? Am a young married man, 25, a stenographer, graduate 1885 of high school in Ohio, with physics and chemistry favorite studies. Might it be possible for me to materially modify the confining, sedentary nature of my present work by combination with something requiring a good proportion of manual exertion? If this were possible, it seems to me it would considerably reduce the otherwise frequent tendency to nervous irritability. I am always an enthusiastic reader of SCIENTIFIC AMERICAN. Believing that your knowledge of some such embryo enterprises, to whom it might not be unprofitable for me to make application, and perhaps right here in my own city, is much more extensive than mine could possibly be, I take this liberty to intrude upon your valuable time. A. Among the thousand and one ways of livelihood in this age of progress and invention, we feel our incapacity to enumerate in detail the business ways to success for the energetic and persevering young man. Adaptability must not be left out of the question; if you do, you are sure to fail. Find what you would most like to do, and what you would feel contented with under any conditions, and do it with all your might. Do not forget that there is always room at the head of the class. There is no royal road to financial success in these times, although the lucky strings may still hang out. The new ways are devious and misty. Better follow the trodden paths of well known business ways than fall into the quagmire of adventure. Finally we advise the development of present employment to its best income, and take up a systematic study of any profession or business best suited to your taste and devote all your spare time in becoming familiar with all its aspects, when in the near future you may be able to make the change smoothly and without strain upon the necessities due to your social condition.

(4224) W. A.—A water glass such as you require is made by inserting a plain piece of glass in the lower end of a tube, and making the joint watertight, so that the tube can be forced down into the water, leaving the upper surface of the glass dry. The size of the glass is immaterial. The object of this arrangement is to secure a smooth plane surface and to prevent reflection from the surface of the water.

(4225) A. W. writes: 1. Referring to the simple motor described in SUPPLEMENT, No. 641, will a soft cast iron core for the armature do as well as the soft iron wire core? A. Cast iron does not answer well as an armature core. The core must be laminated to secure good results. 2. Will a soft cast iron field magnet do as well as the Russia iron magnet? A. A cast iron field magnet will answer very well. 3. Can the motor be run as a dynamo without altering? If not, what changes must be made? I have a small steam engine that I made, and has been pronounced to be a very good engine, by an expert machinist (cylinder 1 1/2 inch by 3 inches), and I am very anxious to run the motor or dynamo with it. Will you please tell me whether it will work or not (that is the motor)? How many revolutions ought the dynamo to make? A. Yes, but the electromotive force would be quite low. If you desire a higher electromotive force, wind the machine with finer wire. Your engine will undoubtedly run the motor when used as a dynamo, but we advise you to construct a better machine after the directions given for making the Edison dynamo in SUPPLEMENT, No. 844.

(4226) H. P. H. asks: 1. Why is insulated iron wire not used on field magnets? A. Because of the disadvantages due to its resistance. 2. Can an induction coil be made to give 50 to 100 volts and 2 to 10 amperes from a battery current of 10 amperes 5 volts; 15 volts 5 amperes? A. No. 3. Would reversing the current in an induction coil without breaking the circuit be an improvement on the vibrator? A. An induction coil worked with an alternating current will give equal impulses in opposite directions, and has advantages over an induction coil worked by direct current interrupted by a vibrator. 4. Will a storage battery made of tin plates coated with red lead be practicable? A. We think the tin plate would be rapidly corroded. 5. What would be the effect of joining the terminals of a half inch spark induction coil to the primary of another half spark induction coil? If I connect the two secondary currents, what kind of current will it produce in the primary? A. You would secure a tertiary current in the secondary wire of your induction coil, but it would be far less than you could secure by using a primary coil having a sufficient number of turns to utilize the secondary current of the first coil. Your proposed induction coil we think is impracticable.

(4227) W. A. S. asks: What current is used on the ordinary incandescent circuit, also what voltage? A. The current used in an ordinary Edison lamp is a half ampere. The total current on the circuit would depend on the number of lamps. The E. M. F. is 110 volts. 2. Could a person standing on an insulat-

ing stool handle bare electric light wires on an arc circuit without danger? A. There is always danger in handling arc light wires under any circumstances. 3. Is a compound or shunt-wound dynamo best for arc lighting purposes? A. We believe series-wound dynamos are commonly used for arc lighting.

(4228) H. J. F. asks: 1. Will you please give me a receipt for making a dry battery for hydrogen and oxygen, and what kind of vessels to use? A. If you refer to a battery for decomposing water, we would say that any battery will do it, provided you use a sufficient number of cells. You will find a dry battery described in SUPPLEMENT, No. 794. 2. If I make simple electric motor twice the size, can I, run a canoe 16 feet long, and how many miles an hour, and what part of a horse power would its strength be? A. A properly proportioned electric motor twice the size of the simple motor will run a boat of the size given. You can probably attain a speed of four miles per hour.

(4229) W. W. writes: Having seen in several articles (in some of our leading periodicals) on steam boiler explosions the frequent mention made of the proverbial saw mill engineer and his consequential explosions, and I being one of these unlucky waifs, would like to inquire how does he come to be a notorious outlaw? Is it through gross negligence on his part as a class, or is his boiler taxed harder than it should be, that is, why more saw mill boilers explode than any other class? A. As the explosions of saw mill boilers largely exceed in number those of the boilers of any other kind, and are from one-quarter to one-third of all the recorded explosions, there must be something in the management of saw mill machinery that perhaps engineers do not control. The overloading of boiler work and pressure beyond the safe condition of old boilers, by the instructions of parsimonious owners to inexperienced engineers, is probably at the bottom of the trouble. If a good engineer protests, the owner will find somebody to run his boiler, and the fraternity bears the ridicule.

(4230) E. J. K. asks: 1. Would two of the motors described in SUPPLEMENT, No. 641, run a row boat 12 or 14 feet long fitted with twin screws? A. Yes. 2. What is meant by the pitch of a propeller? A. It is the distance the screw would travel forward in one revolution if working in a rigid nut, or in other words, if one of the blades of the screw were widened so as to form one turn of a screw thread, the distance between the ends of the blade measured parallel to the shaft would be the pitch. 3. What pitch and diameter of propellers would be most suitable? A. The screw for such a motor should have a pitch of 8 inches and a diameter of 6 inches. 4. At what speed do you think they would drive it? A. Your boat would probably travel at the rate of about 3 or 4 miles an hour. 5. Can I increase the power of the motors by using more than 8 cells of battery to each motor? A. You would gain little by the use of more battery.

(4231) J. F. B. asks: 1. What is the resistance of an Edison 16 candle power lamp, and how much (length) No. 22 German silver wire will it take to equal it? A. About 115 ohms. It will require about 530 feet of No. 22 German silver wire to equal it in resistance. 2. In making a detector galvanometer for use on the Edison system, how much and what sort of wire should be used for the coil, wire to be wound on wooden ring with compass in center? A. Use enough No. 28 wire to secure its required sensitiveness and make the resistance of your galvanometer circuit equal to the resistance of an Edison lamp by the means of a rheostat. 3. What is the best way to remove oil from belts that are completely saturated with it? A. You can dissolve out the oil by using benzine or bisulphide of carbon. Both are highly inflammable.

(4232) M. S. S. asks: 1. What proportion of bichromate of sodium and water is used in the Fuller cell? A. Make a saturated solution of bichromate of sodium in water; to this slowly add one-fifth its weight of common sulphuric acid. 2. Does the zinc have to be of the shape shown in "Experimental Science," or could it be square? A. The conical form is generally preferred, but almost any shape will answer. 3. Of what material should the rod be which connects the zinc with the wire? A. Brass or copper. It should be well protected by means of gutta percha cement.

(4233) C. W. writes: 1. A says a one pint Bunsen will not run 10 hours on a motor. (Per answer SCIENTIFIC AMERICAN March 12, E. W.) B says it will. Which is right? A. It depends upon how the battery is used. On a short circuit it would probably run down in less than ten hours, but used on a circuit of proper resistance it will run 4 or 5 days, or a week, with one renewal of the electropin fluid. 2. Will a 1-16 horse power motor run a coffee mill, common size? A. We think not. Considerable power is required for running even a small coffee mill. Probably a one-eighth horse power motor would not be too large.

(4234) H. P. A. asks: 1. Could the field magnet for the motor described in SUPPLEMENT, No. 641, be made of one piece of wrought iron, ends welded together? A. Yes. 2. Is there any dry battery that can be carried in the pocket powerful enough to light a one-half candle power light? A. Probably a Burnley or Gasner dry battery could be made small enough for this purpose. It would require 2 or 3 cells. 3. Could a tube of glass be used instead of one of hard rubber to go through the washers used in the dynamo described in SUPPLEMENT, No. 600? A. Glass could be used, but it is liable to be broken and might make trouble.

(4235) E. L. asks: 1. How many batteries 5 by 9 inches charged with diluted sulphuric acid will it take to furnish power for a two horse power motor? A. Plain sulphuric acid batteries are not adapted for running motors because they polarize readily and the power ceases. The best battery for power is probably the Bunsen cell. It will require 12 or 14 large cells per horse power. 2. Which is the best to charge a battery—copper sulphate or sulphuric acid? A. You will find the electric power from primary batteries very troublesome and expensive.

(4236) T. B. says: Please inform me how to ascertain the necessary horse power to run a boat of given dimensions? A. The power to run a boat

depends upon required speed, form of boat and kind of wheel. The whole matter is discussed and tabulated in Haswell's Engineer's Pocket Book, pages 660, 661, 662. \$4 mailed.

(4237) W. F. W. writes: Your explanation of the "juggler automaton," in a recent number of the SCIENTIFIC AMERICAN, leads me to ask for an explanation of the famous chess and checker automaton at the Eden Musee of New York. A. The chess playing automaton to which you refer is supposed to contain an expert player. It is believed that the mechanism shown to those who witness the game has nothing whatever to do with the playing.

(4238) E. P. V. R. asks: What is it that the photographers use to spot positive pictures? I mean the spots caused by dust on the paper. A. Most photographers touch up with India ink or sepia.

(4239) J. S. asks: 1. How can I make a small quantity, say a quart, of concentrated solution of sulphate of zinc, such as described for Trouve's blotting paper battery? (Naudet, pg. 112.) A. You can procure the crystals of sulphate of zinc at any drug store. Dissolve as much as possible in warm water, allowing the solution to cool. Some of the zinc sulphate will crystallize out; the remaining solution is a saturated solution, which is what you require for a battery. 2. What is the difference between a polarized bell and an ordinary call bell? A. In a polarized bell, the armature which actuates the bell hammer is magnetized so that it will be acted upon by an alternating current. 3. "Experimental Science," page 421, states that it has been found uneconomical to use lamps of a lower voltage than 60; how can the eight-light dynamo in SUPPLEMENT, No. 600, be made suitable for that voltage? A. You can increase the voltage of the eight-light dynamo by increasing its speed. 4. Will tin plate (tinned sheet iron) do for washers in drum armatures? A. They will answer very well. They should be separated by paper as in the case of iron disks. 5. When resistance is introduced in a primary or secondary battery circuit, is the consumption of chemicals in battery retarded, or is the same quantity of current generated and partly wasted in resistance, and will a dynamo require less power to run it while the extra resistance remains in circuit? A. The consumption of chemicals in the battery is retarded by the resistance, and the output of the dynamo is reduced by the resistance, so that it requires less power to drive it.

(4240) G. L. G. writes: 1. I am making an induction coil as described in "Experimental Science." What size single-covered wire should I use for secondary coil? A. No. 36. 2. What difference would it make if I should use a soft iron rod instead of wire? A. A soft iron rod will not magnetize or demagnetize as rapidly as a bundle of wires; besides, eddy currents will form in the rod, which would interfere with the working coil. 3. In making the condenser would it do to put the foil on the paper while the paper is wet with shellac, as the foil condenser is easy to handle? A. Yes.

(4241) Steady Reader asks: 1. If I make the simple motor, described in Hopkins, twice the size, linear measurement, how much more power would I obtain? At what speed per hour would it drive a 12 foot boat, and how many volts and amperes would be required to run it properly? What diameter should the propeller be, and what should be the speed of the motor? A. About four times. You would probably not attain more than four miles per hour. The screw for the motor of the size described should be about 10 inches in diameter. The motor should make a speed of about 1800, and the screw 300 to 400 revolutions per minute. 2. Why is a bundle of iron wire preferable to solid rod in magnets, etc.? Give scientific reason. A. A magnet core of wire or of laminated iron is preferred to solid iron on account of the rapidity with which it can be magnetized and demagnetized, also on account of the absence of eddy currents in the cores. 3. Of what use is a telescope on galvanometers? A. A telescope serves to magnify the movement of the galvanometer needle and scale, and allows a more accurate reading.

(4242) C. S. H. says: Being about to take up some profession, and having no particular bent toward either mechanical or civil engineering, I write to you to ask you if you would kindly answer the following questions through your valuable columns, viz.: Which of the above professions is the most lucrative? In which is there the more opening? In both these questions I mean as a general thing, which is the best place to learn them? What college or shop? A. Both professions as stated are lucrative to those that succeed. Success is the reward of mastership in the business as well as the knowledge necessary to either profession. A college course is a necessity unless you have natural talent and push to master the details. If you have no practical experience, the shop is the place to begin, for the experience necessary to the profession of a mechanical engineer. A position with a surveying party as rod or chain man has been the starting point with some of our successful civil engineers.

(4243) P. C. S. asks: 1. In the 8 light dynamo, what material is the base between the base proper and bottom of field made of? A. Wood. 2. How are the fields held to bottom and apart? A. By bolts extending through the base board and through the wooden piece at the bottom of the field magnet. 3. What is the base proper (having binding posts) made of? A. Wood. 4. Would it make any difference if armature shaft was made 3/4 inch with 1/2 trunnions? A. No. 5. Can the armature shaft-bearing yokes be made of brass instead of bronze? A. Yes. 6. Is the cross piece at top holding wire made of wood and just screwed to field magnets? A. It may be of wood; vulcanized fiber, however, is preferable. 7. Can you inform me of a book on gearing from which a person could learn to draught teeth? A. MacCord, Mechanical Drawing, price, paper \$2.50, cloth \$3.50.

(4244) J. R. asks how the ink is made and how it is used to protect the surface of glass from the white acid when used in etching floral and other designs such as are seen on table ware, etc.? Is there any book published on the subject? A. Beeswax is very generally used to protect glass in acid etching. Often the design is applied with diamond ink, a mix-