Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated: correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7542) J. D. asks: How many pounds of compression is required to the inch to make liquefied air? A. No amount of compression will liquefy the air, unless it is at the same time cooled to at least 220° Fah. below zero. When cooled to this temperature, a pressure of 585 pounds to the square inch is required to liquefy it. In practice a pressure of from 2,000 to 2,500 pounds per square inch is employed.

(7543) Q. writes: 1. I have a battery composed of four Edison-Lalande cells. What charge should be used in the cells? What E. M. F. should each cell have? What internal resistance should each cell have? A. The Edison-Lalande cell is charged with a 25 per cent solution of caustic potash in water, or one pound of caustic potash to three pounds of water. The E. M. F. of these cells is about seven-tenths of a volt. The internal resistance varies with the different forms from 0·02 ohm to 0·5 ohm. 2. What voltage should it take to electrolyze, at a fairly rapid rate, water, hydrochloric acid, copper sulphate, sodium chloride, sodium sulphate? A. All these substances will be decomposed at a fairly rapid rate with any voltage above 20 volts. 3. Where should one be able to procure, in Canada, sticks of commercial zinc about 6 inches long and ¾ inch in diameter, and suitable for use in home-made Bunsen cells? A. Zinc rods of this size must be made on special order. Address any dealer in metals. We should advise you not to use a large rod of zinc in a Bunsen cell, but either a plate bent into a cylinder or a Daniell's zinc. For these address any dealer in electrical supplies in our advertising columns. 4. Is there any relation between (a) hardness and density, (b) hardness and ductility, (c) density and ductility? A. No relation is known between these dissimilar properties of matter.

(7544) C. T. P. asks: 1. Would good Lowmoor iron forgings be better for the field magnets of the simple electric motor described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, than the Russian iron and have them jointed at each end? A. Any good soft wrought iron may be used for the field of the dynamo of SUPPLEMENT, No. 641. Cast iron can be used, but the dynamo will then have only one-half the output which it will have if wrought iron is used. 2. Please give the voltage and amperage of 8 cells of plunging bichromate batteries. A. The working voltage of the bichromate cell averages about 1·8. Eight cells will then have about 14 volts. The current on short circuit is very large, but drops rapidly. No figures can be given for every case, since so many factors enter into the problem: freshness and strength of solution, distance between plates, conditions of zincs. Four amperes is perhaps a fair figure on an ordinary circuit. 3. How large a storage battery would be required to give the same voltage and amperage and how to make one, and the difference in the cost of them. A. You will need the same number of storage cells as of potassium bichromate cells. A charging battery will also be required. The cost of both will be much greater than of one alone. A form of storage cell is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 845, price 10 cents.

(7545) F. B. F. writes: 1. I have a motor made from the drawings and specifications in the SUPPLEMENT, No. 641, which I wish to convert into a dynamo. What size wire and what quantity will it require on the field magnets? Also what size wire and what quantity and what style of armature will produce a current of 50 volts? A. There seems to be a confusion of ideas here. To convert the motor of SUPPLEMENT, No. 641, into a dynamo is one thing, to build a dynamo from the sketch inclosed is quite another thing. First, to convert the motor, connect to some source of power and run it up to full speed. In case it does not generate current, disconnect the field circuit and excite the field by a battery. Such small machines are quite likely not to be self-exciting. Second, it is not well to attempt to build a dynamo from your sketch. It is not well designed. The cores of field magnets are ⅜ by 1⅜ inches, having only ½ square inch area of cross section. Quite too small. The space left for a spool and wire is only ¾ inch by 2½ inches, too small for a winding for 50 volts. The pole pieces are much too heavy for the other parts, and the armature space too large. 2. How many, if any, 50 volt 16 candle power incandescent lamps will it light? What speed will it be required to run it? A. Your expectations in question 2 as to output are quite too large. Such a machine will not light any 16 candle power 50 volt lamps. It might be wound to light a few 6 candle power low voltage lamps. A dynamo which is only 10 inches by 5 inches by 2½ inches cannot furnish a heavy current. You cannot produce a 14 candle power lamp which can be lighted with one ampere at 14 volts. Three and four volts per candle is about as well as any one can do now. Our advice would be to find a plan fully developed for a dynamo which will do the amount of work you need to have done. You can light 8 to 10 lamps of 16 candle power with one horse power. 3. What size and what quantity of wire will it require on armature and field magnets to produce a current that will light 14 candle power 14 volt 1 ampere incandescent lamps, and how many will it light? At what speed will it be necessary to run the dynamo? A. There is a book giving plans for several sizes of dynamo from ⅛ horse power to a 20 light machine by Edward Trevert. This we can send you for $2.50 by mail.

(7546) J. E. D. writes: 1. Treating on the velocity of falling bodies, Avery's "Physics," on page 107, example 53, statement is made as follows: "From an upper window drop simultaneously, from each hand, an iron and a wooden ball, both of same size, but varying in weight, and observe that both reach the ground practically at the same time." A. The statement quoted above is the theoretical statement usually found without qualification in elementary text books of physics. For small, compact masses of heavy material, such as stone and common metal, falling not more than 200 feet in the open air the actual velocity acquired agrees very closely with that given by theory. 2. Will you kindly give formula governing say a lead ball weighing ten pounds, and a wooden ball of same size weighing one pound, dropped from an altitude of 1,000 feet where air pressure is fifteen pounds per square inch at ground? Kindly dilate upon theory, for there is a diversity of opinion here. A. When two bodies of the same size but of different weight fall through the air, the air resists motion unequally. The same laws of pressure which apply to a body at rest, against which the wind blows with a certain velocity, apply to these bodies. Since the same pressure is produced by a body moving against air at rest, as by the air moving with the same velocity against a body at rest. The formulas asked for are those for wind pressure against structures as given in works on engineering. The surface pressed upon is the area of the equator of the ball. The mean velocity of a falling body is the velocity at the middle of the time of its descent. The mean resistance of the air is that due to this velocity as per tables given in engineer's pocket books. This multiplied by surface pressed upon gives total resistance. The difference in air pressure for 1,000 feet is one-half pound per square inch. After all calculations and allowances have been made, the calculated result will probably differ widely from the result of experiment, just as the calculated wind pressure for a bridge differs widely from the real pressure. Nor are there any experimental results to be had. There is no place on the earth where a ball can be dropped in open air 1,000 feet. The Eiffel Tower is nearly this height, being 300 meters. Balls dropped down the shafts of mines nearly realize the conditions imposed.

(7547) W. J. K. asks: 1. What kind of lead is used for storage battery plates, cast or rolled? A. The plates of accumulators are of cast lead. 2. If litharge is used to coat the plates, how long will it take the plates to "form" so that they can be used? A. The length of time depends on the size of plate and strength of charging current, but it is always a number of hours. 3. If the cell is left uncharged, how will it be affected? A. The cell is rapidly destroyed. 4. If it is left charged, how will it be affected? A. If a cell is left charged or uncharged for any length of time without using it, a hard insoluble sulphate of lead is formed which hinders the action, uses up active material, and tends to disintegrate the plate. 5. Does the liquid in the cell ever have to be renewed? A. The sulphuric acid is not used up in the action of the cell, but remains and is used over and over again. 6. How can you tell when the cell is fully charged? A. A cell is charged to 2·5 volts charge till gas is given off rapidly from the plates. 7. About how many amperes will a cell give having five plates, each 3 inches by 1 inch? A. About six-tenths ampere.

(7548) G. H. F. asks: Will the heater described in SUPPLEMENT No. 1112 work on alternating current? A. Certainly. One sort of electric current may be transformed into heat as well as another. The heating effect of a current is proportional to the square of the current in amperes and to the resistance in ohms, or, expressed in letters, to C^2R.

(7549) J. R. C. writes: Please give something of the construction of a repeating coil. Such as used in connecting a ground circuit with metallic telephone circuit. A. A repeater coil is an induction coil whose two windings are put on together and are of equal length. One of the windings is used to complete the metallic circuit, the other to connect between the subscriber's wire and the ground, so as to complete his circuit without grounding the metallic circuit. Various sorts and modifications of this can be found in Poole's Telephone Handbook, price $1.50 by mail.

(7550) C. O. H. writes: 1. I am about to make a new armature of the drum type for motor 641, as I think it will have double the efficiency with the same amount of wire. How many wrought iron rings would be best to use and of what thickness? A. The best thing to do is to buy armature disks punched for the purpose with projections making grooves into which the coils are wound. These disks are about ⅛ inch thick. The armature will then be built as shown in SUPPLEMENT No. 600, price 10 cents. With paper disks alternating with the wrought iron disks, the armature core should be a little longer than the width of the pole pieces. 2. If practical, I should like to get 110 volts from it when run as a dynamo. Then what size wire should I use and how many layers? A. For 110 volts, use No. 30 A. W. G. single covered wire on armature and No. 28 A. W. G. single covered wire on fields, winding the coils to same size as in original form. 3. Should it be wound in twelve or more sections? A. Twelve is a good number of sections for the armature.

(7551) T. E. says: 1. I intend to make a storage battery of six cells, having a capacity of 100 ampere hours to each cell. They will be made on the Faure system. What would be the highest amperage that could be used in charging them (without injury)? A. Use 6 to 8 amperes per square foot of surface of positive plates, reckoning both sides in charging a storage battery. 2. How many hours would they run four 8-candle power lamps? A. To find the hours, multiply the amperes required for each lamp by 4 and divide the 100 ampere hours by this number. 3. Of how low voltage can a 16-candle power lamp be had? A. Sixteen-candle power lamps are usually made for 100 or for 50-volt circuits. With six cells you will not be able to use a light of more than 10 volts, and to obtain 16-candle power would require 5 to 6 amperes. No incandescent lamp is made to carry so large a current. 4. Does a dynamo and storage battery work well in a low temperature, such as 20 degrees below zero? A. We know no reason why a dynamo should not work just as well at the north pole as anywhere else. The liquid of a storage battery will not freeze at 20 degrees below zero, and the battery will work as long as the liquid is unfrozen.

(7552) W. M. P. asks: 1. How can I change the current of a small magneto (10,000 ohms) so as to get an even and smooth current as from batteries? A. By running it so fast that the impulses of the current are as rapid as those from the battery, which, we hardly need to say, cannot be done. 2. Would it strengthen the current any in a dynamo (110 volts) to excite the fields separately? A. Yes; by just the amount of current which the resistance and self-induction of the field uses up. It is, however, cheaper to furnish this current from the dynamo itself than to provide it from some separate source, if the dynamo gives a direct current. If the dynamo is alternating, it must be separately excited. 3. I have a small one-quarter horse power motor, but do not know how many volts it is wound for. The fields are composed of a large iron ring and there are four places for windings. In each place is wrapped two layers of No. 20 wire. The armature is composed of an iron ring, with eight parts, and is wrapped with No. 24 wire. There is an additional part to the fields which fits inside the armature which looks like a two pole armature, but is fastened to the base. How could I change the windings on this motor so as to run it on a 10 volt current? 4. I have the castings for a small dynamo or motor fields, have place for but one winding, and this is 1⅜ by 1½. What size wire should I use to make this a dynamo and what to make it a motor? (The armature is a three pole one.) A. Get someone to measure the machines for you and calculate the necessary alterations. These questions illustrate what we are receiving every week—questions which cannot be answered because sufficient data are not given. 5. Is there any way to make a + magnet and a — one? I mean by putting a current into it so that you can shut it off whenever desired. A. No; a positive pole cannot be produced without a minus pole. 6. What use is a condenser to an induction coil? A. To give strength and efficiency to the discharge. 7. What is the difference between a spark coil and an induction coil? A. A spark coil has but a single winding through which the current flows and which gives a spark on breaking the circuit. The induction coil has two windings, and a current is obtained from the secondary whenever the current is made or broken in the primary. 8. Also, how and what is a step up transformer and a step down transformer, and what is the difference? A. By a step up transformer the voltage of a current is raised and by a step down transformer it is lowered. Both are induction coils. We would recommend to you the purchase of Hopkins' Experimental Science, price $4 by mail, and of the Electrical Library, price $5 by mail. From such books you can obtain the answers to such questions as the above, besides much other valuable information.

(7553) E. F. S. writes: For reply to question how to make an electric heater, you give me amount and size of wire to connect to arc light circuit. What I wanted was something to connect to ordinary incandescent circuit, even if the heating capacity is very small. A. The directions for an electric heater are the same, for any sort of circuit, arc or incandescent, direct or alternating. Divide the voltage of the circuit by the number of amperes desired and the quotient is the number of ohms of resistance which must be used. The quantity of wire can then be found from tables. If German silver is used, only one-thirteenth as much wire is needed as for copper. If iron is used, take twice as much as of German silver.

(7554) W. B. B. writes: 1. I am building the simple motor described in SUPPLEMENT No. 641. Where shall I connect the battery to the machine, Fig. 9? A. Connect the battery to the binding posts, g and g', in Fig. 9. 2. Please state how to make the battery to run the motor. A. You will find a battery especially adapted to such work as running this motor fully described, with drawings, in SUPPLEMENT No. 792, price 10 cents by mail.

(7555) M. L. asks: What is the meaning or derivation of the word "Breguet," used in describing certain watch movements—as "Breguet hair spring." The word is, of course, French, and cannot be found in dictionaries. A. "Breguet" is the name of a man, a Swiss watchmaker, Abraham Louis Breguet, born 1747, died 1823. See Webster's Dictionary, biographical section. His name is connected with his inventions.

(7556) A. C. S. writes: In your issue of November 12, under Notes and Queries in answer to H. J. L., you stated that the alternating current taken from the street line can be changed into a direct current by the use of a rotary transformer. Will you please publish in your paper for the benefit of the readers how such a transformer can be made? A. A rotary transformer is a motor and dynamo working together. It is used when a direct is to be changed to an alternating current or the reverse. The current to be transformed is used to drive the motor part and the motor drives the dynamo portion to generate the current desired. As the machine is usually built, only one field winding is used, but a double winding is put upon the armature, one of which is the motor circuit and the other the dynamo. We have not published the design for any such machine. A design is needed for each voltage to which the current is transformed. The company supplying the main current should be applied to for such transformers.

(7557) J. L. B. asks: 1. Can you furnish me with a process of cutting an oval-shaped hole from a plate of double thickness glass, without boring? A. A hole is first to be drilled through the glass with a corner of a file wet with camphor dissolved in turpentine. The plate should rest firmly on a small block of wood directly under the point of the tool, in order to avoid fracturing the glass. When the hole is drilled through it may be enlarged by a round file, wet in the same liquid. If the hole is to be quite large, it can be worked out to its full size by a hot iron, carefully used, cutting a narrow piece, each time starting from the hole and leading the crack into the hole a quarter way around. Patience and experience will, in time, enable you to do a good job. Don't try a plate of any value at first. 2. May the primary of an induction coil be made by using a spark coil? A. It might answer for a small coli, bnt you had better build your primary up, adapting it to the secondary.

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