

Business and Personal.

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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 This is for our information and not for publication.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.

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.

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(4086) B. C. J. asks: 1. Would you kindly answer in your paper the following question: Do you know of any practical dry storage battery, for closed circuit work? A. We know of no practical dry storage battery. 2. Can a storage battery be charged by an alternating current? A. No.

(4087) R. H. T. writes: 1. I have built a motor similar to that described in SUPPLEMENT, No. 641. Forged iron magnet with 5 lb. No. 18 wire on it, armature 14 coils No. 20 wire, 4 layers, 8 convolutions. Would I burn out No. 12 plug if I were to attach it to our circuit of 110 volts, Edison system, or would I in any way destroy motor? A. The motor referred to is not suited to the Edison circuit. If placed in the circuit without using rheostat, the fuse would melt. The resistance of the machine should be increased many times to adapt it to the Edison circuit. 2. Can I charge storage battery from our system above mentioned, 110 volts? How many cells, and what size would I have to use, in order to obtain a proper supply for motor? A. You can charge a storage battery with the Edison current, but resistance will be required to prevent an excess of current from passing through the cells. About two cells will be required for the motor. 3. What is the voltage of motor? A. 6 to 10. 4. Suppose one foot of No. 18 copper wire will carry 44 amperes, will 10 feet carry 440? A. No. 5. I am a subscriber to both SCIENTIFIC AMERICAN and SUPPLEMENT. What is my best way to get them bound?

Would I have to pay a duty on the price of the bound book if I sent them to you? A. We think you could make arrangements with the customs officers so that you would be obliged to pay duty only on the binding. Possibly you can find a book bindery in your vicinity.

(4088) D. B. T. says: Pressure, volume and temperature are the three elements entering into all heat motors. I should be pleased to have a few questions answered concerning these elements and their variations and the natural laws governing them. Suppose we have a quantity of air in a cylinder whose piston moves air tight, and without friction. Say one cubic foot at a temperature of 490° F., and a pressure of 120 lb. per square inch above the atmosphere. If we allow this air to expand (performing work) four volumes, that is to 4 cubic feet, what will be its pressure and temperature? Next, suppose we now force the piston back to its original position, what will be the temperature, and pressure? Supposing in each case there be no loss of heat by absorption or radiation. Can any one of the elements, volume, pressure, and temperature, be varied while the other two remain constant? A. In the movement of the piston as described, the temperature, volume, and pressure are all changed in terms of the absolute temperature and absolute pressure. No one can be changed without a corresponding change in both the other elements, although not always in the same direction; decreasing the volume increases the pressure and temperature and the reverse. With a volume fixed by the piston, change of temperature changes the pressure only, while with a free piston the volume is also changed. The details of these changes are complex, and require more study than comes within the scope of Notes and Queries. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 279, for a valuable table of the conditions of pressure, temperature and volume of compressed air for each pound of pressure up to 100 pounds. Also No. 799 for a valuable illustrated lecture on compressed air and its properties; 10 cents each mailed.

(4089) E. A. K. writes: 1. I have ten 6 by 8 glass jars and ten 3 by 8 porous cups. Now, can you tell me how I can make ten batteries or cells, using the above and sheet zinc and electric light carbons for elements? I want to construct them so as to get the most possible current. A. Paraffine the ends (only) of the carbon rods by heating them and rubbing on paraffine, allowing it to soak in. Arrange two or three rows of the rods in a mould, and cast lead around the paraffined ends. Connect the wire with the lead by means of a screw or solder. Probably you will find it both cheaper and better to use carbon plates. The sheet zinc should be from 1/8 to 1/4 inch thick, and well amalgamated. 2. How many hours would such a battery run? A. With constant use it would probably run four days with fair usage. 3. How much current does the sewing machine motor require which is described in "Experimental Science"? A. 10 or 12 amperes. 4. Would the above batteries run it? A. Yes; connected 2 series of 5 each in parallel.

(4090) W. F. W. writes: 1. I notice that Remsen's late Chemistry and other recent works of that kind give the following reaction when hydrogen is evolved: $Zn + H_2SO_4 = ZnSO_4 + 2H$. And in all other equations showing two atoms of free hydrogen, they appear as 2H instead of H_2 as the earlier chemists give. Prof. Remsen does not believe the hydrogen atom and molecule to be identical, for he gives the hydrogen molecule as H_2 in another place. Unless the first is an allotropical modification, I cannot see why it should be given 2H. Please explain. A. In writing formulas as a rule no attempt is made to indicate molecules of elements. Thus in the formulas you quote 2H is no more incorrect than Zn. The hydrogen molecule must be at least H_2 , possibly much more, and the zinc molecule must be Zn_2 and possibly much more. 2. Is the space above the mercury in a thermometer a vacuum? If not, does it contain air or mercury vapor? A. It contains a trace of vapor of mercury.

(4091) T. S. asks for a simple way of giving small articles of lead a coating with copper; the covering required to be only of the thickness of tissue paper. A. You will require a battery of one or two cells with a sulphate of copper bath.

(4092) W. M. B. says: Please inform me as to the cause of black specks appearing on silver prints. The bath which I use is very clear and the paper of good quality. Please state cause and how it may be overcome. A. The specks are caused by the bath being too acid. Neutralize the acid with a small amount of ammonia. Consult a professional photographer in your vicinity.

(4093) J. M. McL. asks: What progress is being made in the Nova Scotia ship railway? Also are they still at work on the tunnel they were cutting under the Hudson? Also give a constant elastic force of 8,000 lb. pressing on a radius of 7 in. What horse power will it produce? These are the figures approximately. I especially want to get the most convenient formula where just these data are known? A. Work on the Chignecto ship railway has been suspended, wanting funds. Ditto work on the Hudson River tunnel. Both expected to resume soon. A constant pressure, as stated, has no significance in horse power without motion. If the circumference of your radius moves under the constant stated pressure at 200 feet per minute, you will have $\frac{8,000 \text{ lb.} \times 200}{33,000} = 48\frac{4}{11}$ actual horse power.

(4094) T. M. says: In blowing out a boiler, does the water pass through the blow-off pipe with more or less force than there is in the boilers? With a 2 in. blow-off pipe 18 in. down from bottom of boiler, then connect with 2 in. feed pipe 10 ft. from check valve, 5 ft. from blow-off valve, 6 in. from blow-off turn, with elbow 2 ft. to sewer, what is the force or pressure at elbow, and at the sewer, 40 to 50 lb. pressure on boilers? A. The only additional pressure at the end of the blow-off pipe is due to the hydrostatic head of water or 0.43 of a pound for every foot height between the water level in the boiler and the end of the blow-off pipe. This is more than counteracted by the friction of the water in the pipe while blowing off, the open end and freedom of exit making the pressure in the pipe much less than the boiler pressure.

(4095) C. L. asks: Is there any solution placed upon the inside of a mould in which plaster of Paris may be cast to prevent it from adhering to the mould when cast? A. Use olive oil or soapuds.

(4096) D. B. T. writes: You have, no doubt, noticed watches oscillating while hanging on the file at jewelers'. Why do these watches oscillate? They seem to be an anomaly. Motion is usually communicated from a stationary base, but these watches seem to have their base of motion within themselves. Please explain their *modus operandi*. A. The slight change in the center of gravity, due to the motion of the escapement, tends to set the watch in vibration. One movement of the escapement does not produce any visible effect. The action is cumulative, like that of destroying a bridge by the march of soldiers. The first impulse produces little effect. The effect of the second is added to the first, that of the third to the second, and so on until the maximum is reached. It is essential that the watch be very delicately suspended.

(4097) T. H. asks: 1. Where Zwicker's "Engineer's Companion" is published. It treats of setting of valves of engines, etc. A. We can supply Zwicker's "Instructor for Machinists, Firemen, and Steam Engineers." Price \$1, by mail. 2. Which is the proper way to set a globe valve, and reason for so doing? My method is having the pressure against the seat, but have been told different. A. Always set a globe or angle valve to shut against the source of the steam. This always allows of packing the spindle when steam is on. 3. Is there any good book published on setting the valves of the Corliss engine? If so, where, and what price? A. We can supply "The Corliss Engine," by Henthorn and Thurber. Price, \$1 by mail. Also Halsey's "Slide Valve Gears," price \$1.50. 4. What is the cause of having a T. H. alternator spark? It seems as though fire was coming out of the armature (inside), and has a strong smell of burned rubber. Would the dampness of the room after being mopped cause it? A. You have a short circuit, we presume, somewhere. Investigation only could show where. The dampness of the room has nothing to do with it. You should have it attended to at once, as you are spoiling the insulation evidently.

(4098) W. E. T. asks: 1. What effect would dipping or saturating oak posts in lime water or a strong brine have on them in the way of preserving them from rotting after being put in the ground? A. The cheapest process for preserving posts, and probably the best, is to soak the ends in a nearly saturated solution of sulphate of iron (1 1/4 lb. of the crystal sulphate to 1 gallon of water) for 24 hours. 2. Which would be the best, lime water or brine? A. The most convenient arrangement for this work is to use a tight hoghead with one head out, set it on end and pour the solution in about 6 inches deep; then fill the hoghead with the posts. Repeat the operation each day, until the required number of posts are treated. The setting can commence at once. Oak timber treated in this manner is known to have lasted 30 years in damp mines, where 2 years is its life without treatment. 3. What strength of each solution, and how long should the posts stand in the solution to insure the best results? A. If the posts are pointed, the solution should be made deeper than 6 inches, so that when the hoghead is filled with posts the solution will rise to 2 feet in depth. 4. Do you know of a cheap way to preserve oak posts from rotting? I have charred them and dipped in coal tar, but it is too expensive.

(4099) E. F. H. asks: Is a vacuum power? What is its chief advantage when used in connection with the steam engine? A. A vacuum is power when applied against atmospheric pressure. It adds about 13 lb. per square inch to the work of the piston, and in proportion to the mean engine pressure on the steam side is the measure of economy.

(4100) E. W. asks: 1. How long will a Bunsen cell, 1 pint, last, run steady on a motor for 13 hours at a time for 6 days out of every week? A. If the motor has a high resistance, the cell might operate for a week with the renewal of the electropin fluid at the end of the third day. If the resistance is small, the cell might fail in ten hours, or it might run forty hours, all depending on the amount of current used. 2. Will a 1-16 h. p. motor run a canoe? A. It might at a very slow speed. You cannot expect much from a motor of less than 1/8 to 1/4 h. p. 3. What is the voltage of a 1 pint Bunsen? A. Two volts. 4. I have an Edison lamp, 4 candle power. How many 1/2 pint Bunsen cells will be required to run it? A. Three to four.

(4101) T. B. P., Jr., asks: 1. I have just made a spark coil. My method was as follows: The inside of a bamboo rod, 7-16 inch in diameter, I filled with No. 18 soft iron wire. The rod is 8 1/2 inches long. On this I wound five layers of double covered No. 16 copper wire. The terminals of the wire I connected with binding screws on the end pieces. On putting the coil in circuit with a ratchet burner and four cells of Leclanche, it was found that there was scarcely spark enough to light the gas; so the spark coil was removed, and in its place an iron bolt, 5 1/2 inches long, wound with 16 layers of same wire, was substituted. This arrangement produced a spark fully twice the size of the other. What is the matter with the first spark coil? I had always understood that a core of iron wires was preferable to a simple bolt. A. In the first instance your wire was too far from the iron core. 2. Would it be possible to converse by means of two telephone receivers if the binding posts were connected each to each, or would it be necessary to introduce a cell or more of battery? Please let me know if communication between two rooms in the same house could be had in that way. Also if the steam pipes would answer as one conductor? A. The receivers can be used in the manner proposed. The sound will be weaker than when a transmitter is used. 3. How many cells of open circuit battery are required to successfully operate an automatic gas lighting burner? A. Four or six.

(4102) J. G. K. asks: 1. The height of a column of water to equal one pound pressure per square inch at sea level. A. 2.3063 feet. 2. The height of a column of mercury to equal one pound pressure per square inch at sea level? A. 2.0408 inches. 3. The mean pressure of the atmosphere at sea level, and

the height of column of water it will support. I find different authorities do not agree on this subject, and would like to get, in your opinion, the nearest correct. A. The pressure of the atmosphere when the barometer is at 30 in. is 14.7 lb. per square inch. The height of a column of water at 14.7 lb. pressure and 30 in. of the barometer is 33.947 ft. 4. What would be the cubical volume of a tetrahedron or four-sided body with all sides equilateral triangles, whose edges are 2 in. long, and the formula for working it arithmetically? A. For the volume of a tetrahedron multiply the linear edge of one side by 0.11785 for the volume or contents. The formula is a mathematical one. You will find a table of all the conditions for computing the elements of polygons in Haswell's "Pocket Book," \$4 mailed.

(4103) D. L. asks: What materials give best results for insulating heat and cold in refrigerators. Which is preferable—charcoal or mineral wool? I am about to make a refrigerator, and I have very little experience along this line. I will also be very much obliged for any suggestion in regard to construction to attain the best result? A. In large refrigerators and cold storage rooms, the best practice is to line the space with paraffined building paper and fill in with dry sawdust. For house refrigerators pulverized and mineral wool are both used. The mineral wool if properly packed is the best non-conductor, but charcoal makes the sweetest refrigerator, as it absorbs any odors from dampness that may accidentally get into the insulating space. In large refrigerating rooms the insulating space should be 6 in. thick. In household refrigerators 2 1/2 to 3 1/2 in. space, according to size. The method of construction you will readily understand by examining the refrigerators in use.

(4104) J. P. asks: 1. I have a C. & C. one-eighth horse power electric motor to be run in connection with a plunge battery. The carbons and zinc were allowed to remain in the solution for some length of time, and have become covered with a thick coating, so that they are in one solid mass. How can I get the carbons and zinc clean again? A. Soak them in hot water for a few hours. 2. If I run the motor by a pulley from a water motor, how many lamps of 16 candle power would the motor light? A. The voltage of motor would probably be too low for anything but small lamps. 3. Could I connect the electric motor with the wires of Edison's system of incandescent lighting for houses, so as to run a lathe or sewing machine, and if so would I have to reduce the power in any way, and how? A. No. The motor must be differently wound for the Edison circuit.

(4105) J. H. G. asks for the cheapest and best method to extract the metal from the scum and skimmings from spelter, used to galvanize steel wire; it looks like dark yellowish ashes and is very heavy. A. It will not pay. The substance is principally oxide of zinc. Distillation with charcoal in a retort is the method of reduction.

(4106) N. B. R. writes: 1. I am building the dynamo described in SUPPLEMENT, No. 161. I have No. 16 B and S gauge single-wound cotton-covered copper wire for the field magnets. Is the insulation complete enough, or would it be better to paint each layer of wire with shellac before winding the next layer? A. The insulation will be sufficient if thin paper is placed between the layers. 2. Would No. 16 wire be as good as No. 14 for connecting the commutator springs with the binding posts? A. Yes.

(4107) R. L. W. asks for a good ink eraser. A. Try a saturated solution of oxalic acid in water. The red inks are made of various bases; for the color, as Brazil wood, cochineal, and aniline red. The aniline red may be removed by alcohol acidulated with nitric acid. Javelle water is good for many colored inks. —From the "Scientific American Encyclopedia of Receipts."

(4108) C. E. A. asks: Can you give me any plan for the cheap production of cyanide of ammonium? Have tried the passing of the ammonia gas over heated charcoal, which does not seem to give the desired result. A. Heat sal ammoniac (ammonium chloride) and dry potassium ferrocyanide together in a loosely closed flask or retort. The ammonium cyanide volatilizes and condenses in crystals. The work is very dangerous on account of the poisonous nature of the compounds.

(4109) A. W. B. asks: Is it practicable to have a dynamo (one to furnish eight 16 candle power incandescent lights) run by a windmill? If so, how large would the windmill have to be, and what size dynamo would be necessary? As the wind might not furnish power enough at all times, how many storage cells would be necessary to store enough electricity to run the lights four hours, etc.? A. It requires a full horse power to run the dynamo. You would need from 8 to 12 storage cells.

(4110) C. A. G. writes: 1. Take an electric current: A man could readily see that the deflections of a galvanometer were not in proportion to the current. So who made it, and how was the discovery made that the currents were proportional to the tangents? A. In the tangent galvanometer the needle is so far removed from the coil that the lines of force passing through it are virtually parallel. The earth's directive action on the needle varies with the sine of the angle it makes with the magnetic meridian, the action of the lines of force due to the current is proportional to the cosine of the angle. The intensity of the current producing a given deflection under both forces varies with the sine divided by the cosine or with the tangent of the angle. 2. Taking the law that the current is equal in all parts of the circuit (which I suppose means that it is equal in voltage and amperage), how can there be any difference of potential in any part of the circuit? A. Voltage is not an attribute but a cause of current; therefore your supposition is wrong. As it is the cause of current, any two points on a circuit in action include between them a fall of potential, as the cause of or force producing the current in such part. 3. Given a current: Now, on one galvanometer say it registers 5°, on another 8°, must there not be a standard method of conveying the current around the needle so as to make the deflections equal for equal currents, on different gal-