## 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 This is for our information and not for publication.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.

**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.

(5624) G. A. M. asks (1) for a compound with which to coat wood and metals so that they will resist the action of the acids such as are used in batteries. A. Paraffine wax or thin sheet gutta percha. 2. Would it be practical to make a Gramme ring motor as few as four coils, and would it have any advantages over one with a Siemens armature? A. You can do this; but it is not advisable, and would not be better than a Siemens drum armature. 3. Is there any salt of mercury which can be put into the battery solution to keep the zincs amalgamated? A. Mercury nitrate. 4. Is there any simple way of finding the number of revolutions of a small motor or engine? A. Attach a sharp-pointed pencil near the axis of rotation. Move a piece of paper mounted on a board in front of the pencil. Keep it moving steadily for five or ten seconds. Then count the turns in the spiral. Some one may time you while you move the board.

(5625) E. R. W. asks: 1. Please tell me exactly how the resistance of commercial German silver wire compares with that of pure copper. A. German silver varies in resistance according to its composition. If you use the factor 12 or 13, you will not go far wrong. 2. What is the rule to find the number of ampere turns required to get a given lifting power from a given magnet core, allowing for distance of the coils from core? A. There is no general rule. It all depends on the shape, material, and dimensions of the magnet core. The calculations must take leakage of lines of force into account. We refer you to Sloane's "Arithmetic of Electricity," $1; Thompson's "Electro-magnet," $1; Thompson's "Electro-magnetic Machinery," $6. These we can supply by mail. 3. If I have a storage battery with ten 6½ × 4½ inch plates, each plate punched full of ¼ inch holes, which are filled with red lead, how fast can I discharge it without injury; that is, how many amperes can I pass through it. About how many ampere hours would it have? A. Allow six amperes per square foot of positive plate; about six amperes for the battery. It should have sixty ampere hours. 4. What would be its internal resistance, the plates being separated about three-sixteenths inch? A. Almost negligible; perhaps one one-hundredth ohm. 5. In "Experimental Science," page 527, it says: "The Weston dynamo is also perfectly adapted to incandescent lighting. With a constant speed the regulation of the current is automatic." Just before this it describes the way in which shunt-wound dynamos regulate themselves in arc lighting where the lamps are connected up in series. Now, in arc lighting, as I understand it, as the resistance is lowered by turning out some lamps, the voltage falls; and in incandescent lighting, when the resistance is lowered by turning on some lamps, the voltage remains the same and the amperage increases. Why does in the one case the voltage change and the amperage remain the same as the resistance of the external circuit falls? And in the other does the amperage change and the voltage remain the same, the resistance of the field magnets being the same, since the dynamo in both cases is self-regulating, according to "Experimental Science"? A. Supplying lamps in parallel, a shunt-wound dynamo will regulate itself tolerably well, if the armature resistance is low. It is especially adapted for series lighting. It is more sensitive to irregularities of speed than is a series-wound dynamo. The action of shunt-wound dynamos is best studied from their characteristic curves. Examples are given in Thompson's "Dynamo-Electric Machinery." 6. If a dynamo had its field magnets always of the same strength (being excited from some different source), and was run at a perfectly uniform speed, would a change of the resistance of the external circuit change the voltage? A. The voltage would be constant. 7. Suppose we charge a storage battery thus: The whole resistance of circuit is 15 ohms. At its end is a storage cell with terminals M and H. By Ohm's law ($\frac{1}{15} = \frac{1}{5}$) ⅕ ampere would pass; but since C R = E. M. F., the potential between M and H is ⅔ volt ($\frac{1}{5} \cdot 2 = \frac{2}{5}$); but ⅕ of a volt is not enough to overcome the voltage of the storage cell. Hence it would not charge. Please show me where the mistake is in the above conclusion. There must be one somewhere. A. In treating an electric circuit with opposed voltages, you subtract the less voltage from the greater and take the remainder as the net or actual voltage. The rule you cite applies only to actual resistance of a circuit through which a current is passing. Counter-electromotive force cannot be treated as if it were resistance.

(5626) J. P. G. writes: 1. In SUPPLEMENT, No. 641, on page 10240, in second column, you give No. 18 wire for armature, and on next page, last column, No. 16 for same. Which size is proper? A. It should read "No. 18" for armature coils. 2. Is wire to be single or double wound? A. Single wound is more compact. You may use either. 3. Could motor be connected to some power and give satisfaction, same as run with battery power? A. Yes; as a motor. It is not adapted for use as a dynamo. 4. How many revolutions is the armature required to make? A. As a motor, this regulates itself by the power, say 1,000 to 2,000 per minute. 5. How many 16 candle power incandescent lamps would the above motor run? A. None.

(5627) C. S. asks how to make a dry cell. A. See our SUPPLEMENT, Nos. 157 and 767; also the SCIENTIFIC AMERICAN, vol. 61, No. 20, and vol. 67, No. 2.

(5628) E. F. asks: 1. What must be the essential difference between an arc lamp designed to burn on a constant potential circuit and one designed to burn on a constant current circuit? A. The constant potential lamp must have a resistance coil in series to steady it. The constant current lamp must have an automatic cut-out, so that if one lamp goes out it will not open the circuit. 2. With what is aluminum combined in its natural state, and how may I obtain some of the ore? A. With oxygen generally, in all clays, and earthy minerals in general; with fluorine in cryolite. 3. Has ammoniacal alum ever been obtained by the direct combination of ammonia, sulphuric acid, and aluminum? A. No; except possibly as a chemical experiment. 4. If it has, please tell how. If not, would the combination be of any value? A. Dissolve the aluminum in hydrochloric acid; evaporate with sulphuric acid until all hydrochloric acid is expelled; add requisite amount of acid, if necessary, and of ammonia, and crystallize. There would be no object in carrying out such a process.

(5629) W. S. D. writes: The recent application of electricity to canal boats is regarded as a great invention. Now, it has always been stated that steam could never be used as a motive power on canals for the reason that the banks were undermined and ruined by the wash of the swiftly moving boat. Could you, through your paper, kindly explain to me and several others why the wash of an electric canal boat, moving at the rate of eight miles an hour, would be any less ruinous to the banks of the canal than the wash of a steam canal boat moving at the same rate of speed? Both boats, of course, to have screw propellers. A. The mode of propulsion does not affect the wash on the banks of a canal. Stern and bow wheel propulsion was tried on the Erie Canal as early as 1833, and was then declared inadmissible on account of the wash. The Baxter system of screw propulsion began about 1870, in which speed was sacrificed to save the banks, four miles per hour being about the average, while six to seven miles could be made by the same boats between New York and Albany. B. T. Babbitt built an experimental boat to overcome the difficulty by jet propulsion, taking in the water at the bow and discharging at the stern. It did not meet expectations, and the scheme was abandoned. No matter what kind of power is used, the speed of the boats, if made for carrying the greatest bulk, must conform to the hydraulic condition of the canal. Depth and width are the all-important exponents of speedy transit on our internal waters. We have seen the light draught, sharp-lined packets of the olden time drawn at the speed of a full trot with nine horses, or at seven miles per hour, with the waves curling over the tow path, but destructive to the canal. If ever an average speed of eight miles is accomplished on our canals on a commercial basis of profit, it will be when the canals are 10 feet deep and 150 feet wide.

(5630) W. J. R. asks: How is it that stumps of trees are found in the bogs of Ireland as far as twenty feet from the surface, which look as if they had been broken off? I have never found anyone that could give me any explanation as to how they came to be so situated. A. The tree stumps found beneath the surface of bogs and swamps grew there in prehistoric times, before the water was raised above their roots. Geological changes in the level of the land have caused the water to rise or the land to settle and cover the lower part of the trees. The part above the water decaying, left the stumps under water, which preserved them until the vegetable growth converted the pond or swamp into a peat bog. There are many such examples in Europe and America. Sound cedar timber is now mined from ten to twenty feet below the surface in the swamps of Southern New Jersey.

(5631) R. W. C. asks for a formula for computing the number of pounds pressure a boiler will stand, if you know the thickness of the iron and the size of the boiler. A. The bursting strength of a boiler is the thickness of the iron or steel in decimals of an inch, multiplied by its tensile strength, minus the per cent of loss of strength by the method of riveting. The product divided by one-half the internal diameter of the boiler. A single-riveted shell, with the best proportion of size and pitch of rivets, may be rated at 60 per cent of the value of the plate; a double-riveted shell at 70 per cent. For example, a double-riveted boiler, 48 inches diameter, five-sixteenths inch steel plate of assumed 60,000 pounds tensile strength, the figures will be $\frac{0{\cdot}31 \times 60{,}000 \times 0{\cdot}70}{24''} =$ 542 pounds, the ultimate strength of the boiler. The safe working pressure should be one-sixth, or 90 pounds.

(5632) C. W.—Catgut is made by scraping the entrails of sheep, twisting them while stretched, and holding them so until they are dry.

(5633) J. R. asks: 1. A test suitable to make before an audience to demonstrate the existence of opium in cigarettes. A. Try treatment with boiling alcohol and application of the ferric chloride test to the filtrate. This gives a dark blue color. 2. Is it probable that there would be enough arsenic to detect by Marsh's apparatus? A. It is doubtful. You can easily try it. Use chemically pure zinc and acid in making the test. 3. Is it injurious to health to sleep in a room with a coal fire burning in an open front stove? A. Not if the stove has a proper draught. 4. Is it true that the top portion of a buggy wheel turns faster than the lower portion? If so, why does it? A. See our SUPPLEMENT, No. 706.

(5634) W. C. asks: 1. What determines which is the positive pole in a thermo-electric pair? A. The relations are determined by trial. There is no universal rule, and the thermo-electric relations of metals are different at different temperatures. 2. What two metals give the greatest current? A. Bismuth and crystallized antimony at ordinary temperatures. 3. Does the E. M. F. depend upon the number of pairs in series, or upon the intensity of the heat applied? A. On both. 4. Is there any varnish not affected by boiling water? A. We can give no reliable formula.

(5635) D. W. R. writes: We have a dynamo (5 K. W.), 105 volts. Could I connect it so that I could weld iron or "burn" sheet lead? If so, how shall I proceed, or where can I obtain information regarding it? A. Your dynamo is of far too high resistance for incandescent welding. The usual way of operation is to employ an alternating current dynamo and to convert the current into one of higher intensity. We refer you for full information to our SUPPLEMENT, Nos. 891, 892, 763, 682, 785, 778, which we can supply at 10 cents each by mail. Our SUPPLEMENT, No. 840, describes the Bernardos system of using the arc. This would operate with your machine.

(5636) G. A. G. asks: 1. Can I draw electricity from a storage battery and use it for heating in welding and smelting iron and minerals, and how shall I proceed? A. A storage battery may be used for welding, but is not to be recommended. A proper dynamo, with converter if necessary, is better. It can be used for smelting by using electric light carbons for terminals leading into a mixture of the ore with coke dust; but it will be expensive. 2. Is the storage battery patented, and where offered for sale? A. There are patents affecting different features. Address Queen & Co., whose address you will find in our advertising columns. 3. What kind of dynamo shall I use for storing this electricity? A. Use a dynamo giving two and one-half volts potential for each cell that is to be stored. Charge at the rate specified by the manufacturer of the battery.

(5637) C. H. McD. writes: 1. I have four storage batteries running a 4 candle power lamp of 6 volts. At times the lamp grows dim and then brightens up again; what is the cause of the batteries acting so? A. It is impossible for us to tell where the trouble is. If the battery is a good one, it should give ample current. 2. Can you give me approximate amperage of these cells, each cell having four plates, 6 × 8, covered with red lead paste? A. About four amperes, if the cells are in good condition. We imagine they are not, from your trouble with the lamp. Perhaps they are not fully formed. 3. I have a No. 3 Knapp motor, taking from four to ten volts. What is required to change motor into a dynamo? A. No change is necessary, if the field magnet core is of cast iron. But a small motor is apt not to give much return as a dynamo.



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**December 19, 1893,**

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