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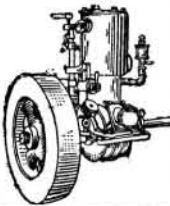
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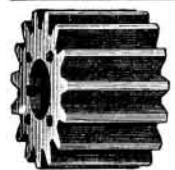
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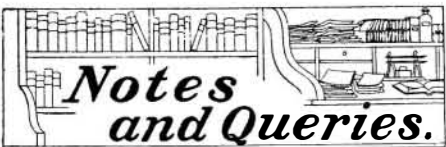
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Notes and Queries.

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 This is for our information and not for publication.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.

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(8693) F. H. asks: 1. I have a yoke and cores for an electromagnet. Yoke, 8 by 1 1/2 by 1 3/4 inches; cores, 6 by 1 inch. I have at my disposal six large bichromates. What number of B. W. G. should I use, and how many pounds of the same to obtain the best effects in connection with my battery? A. Use No. 14 magnet wire, and wind to a depth of one inch on the spools. You will find in the new edition of Hopkins' Experimental Science, price \$5, full directions for such a magnet. 2. Also if such a magnet could be used for diamagnetic experiments? A. Yes; with pole pieces properly shaped to bring the flux to the point where the diamagnetic substance is suspended. These, too, are illustrated in Hopkins. 3. Please give me the best proportions of water, bichromate of potash and sulphuric acid for bichromate cells (water and acid in cubic centimeters and bichromate in grammes). I have several recipes, but they all differ with regard to proportions of bichromate and acid. A. There are many formulas for the bichromate solution. We cannot say which one is the best. Practice now is to use chromic acid directly in place of bichromate of potash. Indeed, bichromate of soda is to be preferred to the potash salt, since it is more easily dissolved and the solution does not throw down crystals as bichromate of potash does. The idea is to have a saturated solution of the salt and add sulphuric acid to a proportion of about one in ten to one in twelve. If the acid is more than one in ten it will act too strongly on the zincs and the cell will overheat, the liquid "boiling" as it is called.

(8694) W. M. H. asks: 1. May the direction in which the armature of a dynamo or motor revolves be governed at the will of the operator by change of current or other means. A. A dynamo may be run in either direction by placing the brushes so that they lead in the proper direction. A motor is reversed by changing the direction of the current in either the field or the armature, but not in both. 2. What means is employed to change the direction in which a trolley car runs? A. By throwing the reversing switch to change the current as above.

(8695) G. H. D. asks: 1. Does kilowatt mean 1,000 watts? A. A kilowatt is one thousand watts. 2. How many electrical horse power does 90 kilowatts equal? A. Ninety kilowatts are 90,000 watts; 746 watts are one electrical horse power. Divide 90,000 by 746 and the quotient is the number of horse power there are in 90 kw. 3. What does the term cycle mean when electrically speaking? A. Cycle is the series of values of the E. M. F. in an alternating current. 4. What is the full meaning of phase? Of mono-phase? Of multi-phase? Of two-phase? Of poly-phase? A. Phase is the fractional part of a period which has elapsed since a vibrating body last passed through the extreme point of its path in the positive direction. Mono means single, multi means many, and poly means many, though both multi and poly are used for any number of phases more than one. The terms in common use are single phase, di-phase or two-phase, and three-phase. The alternating current starts from zero as its middle point, rises to its highest value, falls as far below zero as it rose above and returns to zero. This it does in one cycle, and this is repeated many times a second, and is single phase. Now if a second E. M. F. starts after the first is one-quarter way along and follows the same variations, the two existing in the same circuit, the current is diphasic. If there are three variations in the current, one-third of a cycle apart, the current is three-phase. 5. What is meant by frequency? A. Frequency is the number of cycles per second. 6. What voltage will kill a person? A. A direct current of 500 volts pressure, we suppose, has proved fatal to a human being. Less than this would be required if the current were alternating. 7. I know of a dynamo, of 1,100 volts, 81 amperes, and 90 kilowatts. How can I calculate the number of 16 c. p. lamps it will burn? A. A dynamo will light from eight to twelve 16 c. p. lamps per horse power, or you may allow 55 watts per lamp. 8. I know of a telephone (on a metallic cir-

(Continued on page 213)

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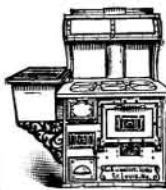
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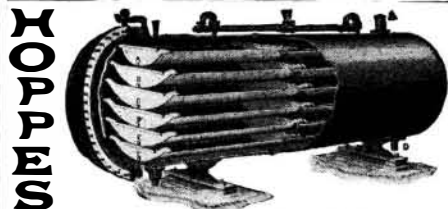


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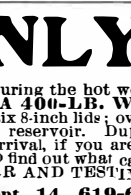
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cuit) which got out of order. While out of order I turned the crank, and received a shock; the 'phone was not grounded, and I was standing on a dry floor, and I had no possible ground. How can I wire a telephone to do this without a ground? A. We do not know how to wire a telephone so as to give a shock without a ground, in real work. It can be done as a joke or trick. 9. Can a condenser be connected to a large medical battery, and the battery be made to give a spark? A. A medical coil cannot usually be changed to a good coil for giving sparks. You can try yours by adding a condenser, and may be able to obtain a spark from it.

(8696) C. E. T. asks: 1. I am thinking of making a small direct-current dynamo, and would like to know the formula and meaning of the symbols for wrapping and determining the size of wire to be used in order to get a given voltage and current. A. Perhaps the simplest book for calculating the parts of a dynamo is given in "Practical Electricity," price \$2 by mail. There is, however, no easy road to designing dynamos and motors. The best way for the amateur to go about the building of a dynamo is to select the size of machine he requires and buy plans for it all worked out. Many such designs have been published in the SCIENTIFIC AMERICAN and other periodicals and in books. We have frequent occasion to recommend such to our correspondents. They can be had very cheap. 2. I would also like to know the name of a good reliable varnish or lacquer for using on articles of steel or iron so they will stand a good deal of handling and to be kept in a damp place so as they will not rust. A. A good lacquer for rough ironwork is made with 6 parts asphaltum dissolved in turpentine, 1 part shellac dissolved in wood alcohol; mix and thin with turpentine or wood alcohol. For bright steel or iron, a shellac and mastic varnish is much used; 10 parts shellac, 1 part mastic dissolved in wood alcohol. Color with any of the aniline dyes. Blue is much in use.

(8697) G. P. M. asks: What are the true primary colors? A. Primary colors are the colors into which white light is separated by the dispersion of a prism. Those named by Newton are red, orange, yellow, green, blue, indigo, and violet. Artists reduce these to three—red, yellow, and blue. Scientists generally consider red, green, and blue to represent the primary color sensations, and in one theory there are supposed to be three sets of nerves in the retina which can respond to these three colors. The idea of three primary colors is that from the combination of these three all hues may be produced which are to be found in white light.

(8698) E. A. writes: Please give me an explanation of the following phenomenon: During a rainstorm a click or brief ring of the telephone bell is frequently audible. It is evidently due to the lightning being coincident with it. But how does the lightning produce the effect? Also, why may a spark often be seen shooting from five to twenty feet from the 'phone? Is it harmful? Please answer the following questions: What chemicals are used in the makeup of a Mescro dry battery cell? Please explain the chemical action? Is the cell affected by heat or cold? Are the chemicals injurious to the body if handled? A. The clicking of electrical apparatus during thunderstorms is due to the action of the lightning flashes upon the lines. When they are struck there will frequently be a flash from the wires, even though the lightning arresters do their work properly. The lightning produces the effect because it is an electric discharge, the same as the usual current, only much more intense. It is not entirely safe to handle electrical apparatus during a thunderstorm, when the wires are strung upon poles, though the lightning arresters usually protect the instruments. We have not the formula for the composition of the Mescro dry cell. It probably contains the same materials as the Leclanche cell, since all dry cells are modifications of this form of cell. These cells are very little affected by heat and cold, cannot be frozen by winter temperature even on mountain tops, and the chemicals are not poisonous. The general chemical action is that the ammoniac chloride acts upon the zinc chloride. The hydrogen goes to the manganese dioxide and forms water with its oxygen. This is only general, since other substances may be used and other and more complicated reactions take place.

(8699) C. R. McM. writes: I desire to maintain a heat of about 105 degs. to 110 degs. in a box containing about 8 cubic feet of air. Can I do it by sending a current from a small battery through wires? How many cells and what kind? How much wire and what kind? A. We cannot advise the heating of air by electricity if expense is an object. It will cost many times as much as an oil lamp, and be as difficult of regulation as that. It can be done, however, by a coil of No. 14 or No. 16 iron wire with three or four cells of battery. The bichromate cell will give the heat quickest. The Edison-Lalande cell also may be used. It will work slower and last longer. A bichromate cell will need to be renewed every day. The length of wire should be perhaps fifty feet. We cannot give definite figures, since there are so many circumstances to affect the result. If you get too much heat reduce the battery, if too little add more cells.

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