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 This is for our information and not for publication.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.

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.

(10121) S. S. asks: Please tell me whether there is any such thing as an absolute vacuum, and if so, how is it produced? A. It is claimed that an absolute vacuum has been made by chemical means. The gas remaining after exhaustion had been carried as far as possible by means of pumps, was absorbed by chemicals and the space was then empty of gas, a vacuum. Another method has been described. Fill a hard glass tube closed at one end with soft glass. This on solidifying presents the appearance of a glass rod, solid throughout. When this is connected to an air pump and heated so that the soft glass melts, the melted glass will drop from the top of the tube, just as the mercury does in the barometer and Torricellian experiment. Upon cooling the soft glass solidifies again, leaving a complete vacuum in the upper part of the tube.

(10122) C. W. N. asks: 1. Approximately how large a spark coil is needed in wireless telegraphy to transmit through a distance of one mile, and how large for a distance of five miles? A. A coil giving a spark one inch long will transmit one mile over water. Over land the spark length varies with the character of the surface. A coil giving a ten-inch spark will answer for a variety of distances and circumstances. 2. In winding a large spark coil in which the greatest amount of wire is placed on the middle part of the coil, I have learned that it is customary to leave a space between the core and the wire at the ends. Is there any disadvantage in winding so that the wire lies directly on the main insulating tube? A. The space is left because of the greater tendency of the spark to jump from the secondary into the primary as the ends of the coil are approached. See Hare's "Construction of Large Induction Coils," price $2.50 by mail. 3. Is there any better insulator than paraffine for use in the construction of coils? A. Paraffine or a heavy oil is employed. 4. What is the best material to use in separating the sections of the secondary? A. Hard rubber disks. 5. Are there any means by which the voltage of the secondary wire of a coil may be determined? A. Widely different estimates are to be found of the voltage necessary to force a spark through various lengths of dry air. There is no rule giving a certain result for lengths beyond a few centimeters.

(10123) J. G. M. asks if cast iron balls and cones can be cast so as to wear, and if they cannot, kindly state what other material can be used besides steel. A. Cast-iron balls and cones are not suitable for bearings for vehicles or machines. Nothing is better than truly finished steel balls and bearings, hardened.

(10124) D. L. O. asks whether or not it was ever the general practice to build locomotives with inside cranks in this country. Kindly give the date at which inside cranks were most generally used, and state roughly the extent to which the practice of building this type of locomotive was carried. A. Locomotives with inside cranks were the prevailing type with American builders commencing about 1831, and their building continued until about 1845. They were in use mostly for switching engines as late as 1860 and possibly later. The outside crank type was also built and in use during the early period of locomotive service in the United States, and began to displace the center crank type for passenger service about 1842.

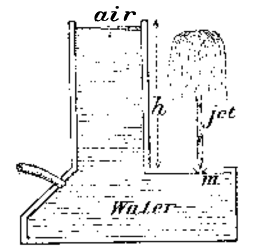
(10125) C. B. H. asks: 1. I have a good knowledge of the rudiments of electrical engineering and am desirous of completing the study as far as possible without the aid of an instructor. Will you kindly inform me what books you would recommend, also the prices and the order in which they should be taken up? A. Starting from a thorough knowledge of elementary electricity, embracing all that is contained in a book of the scope of Thompson's "Elements of Electricity," price $1.40 by mail, you should then proceed to the study of the dynamo, lighting systems, distribution systems, power systems, etc., in the direction of practical work. At the same time a study of currents, theoretically, should be carried on. Thorough work should be done upon the mathematics of the alternating current and the machines used in its distribution. You would do well to begin with Hawkins and Wallis' "Dynamo," and take next Crocker's "Electric Lighting," two vols., price $3 each. Steinmetz's "Alternating Currents," price $2.50, is the standard book on the theory of this subject. Kapp's "Transformers," $4, might follow this. For the electric railway there are many valuable books. Crosby and Bell, price $2.50; Dawson, $12.50; Bell, $3, may be named. The work thus laid out as a beginning only ought not to be carried on "by the book" alone. It ought to be taken in a laboratory where the article which is the subject of study at the time can be before the student and be handled, tested and investigated. Even a night course at one of the excellent institutions offering such courses in New York city would be far better than a book course taken without an instructor. 2. I should also like to know the method employed in figuring charges for light and power and how the wattmeter is read. If different manufacturers' instruments require a different formula—preferably those in use by the Edison Company in this city. A. The rotary wattmeter is a dial instrument and is read like the gas meter. A constant for the instrument must be used in computing the value from the reading, and each sort of instrument would of course have its own constant.

(10126) J. C. H. asks: Will you please inform me whether there is any book treating on electric resistance and its principles? If so, can you furnish it, and at what price? I am aware that this is treated of in various works but I want the most complete treatise I can find. A. There is no separate treatise upon electric resistance. It is fully treated as to theory in such a textbook as Thompson's "Elementary Lessons," price $1.40 by mail. The various data of metals, methods of measurement, etc., are given fully in Foster's "Electrical Engineers' Pocket Book," just issued at $5.

(10127) C. G. W. says: Will you kindly inform me through your Notes and Queries column how I can artificially color a meerschaum pipe? A. Ordinarily the pipe is boiled for coloring in a preparation of wax which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerschaum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather. Fill the pipe and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking, put fresh tobacco on the top and smoke to the same level. When once burnt the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschaum is prepared. The coloring is produced by action of the smoke upon the oils and wax which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

(10128) F. B. C. asks for rules for calculating speed of pulleys. A. The diameter of the driver being given, to find the R. P. M. of the driven: Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven. Ex.—24 inches diameter of driver × 150, number of revolutions, = 3,600÷12 inches diameter of driven=300. The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time. Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter. Ex.—Diameter of driver (as before) 24 inches × revolutions 150 = 3,600. Number of revolutions of driven required = 300. Then 3,600÷300=12 inches. The rules following are but changes of the same, and will be readily understood from the foregoing examples. To ascertain the size of the driver: Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make and divide the product by the required revolutions of the driver; the quotient will be the size of the driver. To ascertain the size of pulleys for given speed. Rule.—Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of main shaft.

(10129) L. P. says: Will you give me a rule for finding the power a stream of water is capable of developing, when the size and drop of stream are known? A. The gross power of a fall of water is the product of the weight of water discharged in a unit of time into the total head, i. e., the difference of vertical elevation of the upper surface of the water at the points where the fall in question begins and ends. The term "head" used in connection with waterwheels is the difference in height from the surface of the water in the wheelpit to the surface in the penstock when the wheel is running. If Q=cubic feet of water discharged per second, D=weight of a cubic foot of water=62.36 pounds, A=total head in feet, then $D \times Q \times H$=gross power in foot pounds per second, and $D \times Q \times H \div 550$= gross horse-power. A waterwheel or motor of any kind cannot utilize the total head H due to losses at the entrance and discharge from



the wheel. There are also losses due to friction, etc., which place the average efficiency of waterwheels at about 75 per cent. Thus net horse-power $= 0.75 \times \frac{Q \times H \times D}{550}$. A head of water can be made use of in one or more of the following ways, namely: 1. By its weight, as in the water balance and overshot wheel. 2. By its pressure, as in turbines and in the hydraulic engines. 3. By its impulse, as in the Pelton waterwheel. 4. By a combination of the above. Referring to your question, we might say that it would be impossible to compute the horse-power of a stream of water when the size and head are known only. It would be necessary to measure the quantity of water which flows in a certain time. From this value Q could be determined in the formula, H could be measured, and the horse-power calculated. 2. A dynamo of what lighting capacity will a 3-horse-power gasoline engine run? A. A 3-horse-power gasoline engine would run a dynamo which could be operated on a lighting system carrying safely thirty 110-volt 16-candle-power Edison incandescent lamps on a parallel circuit.

(10130) W. S. asks: Is it possible to consume all the oxygen in a confined quantity of air, viz., in a sealed iron pipe? A. Yes; by placing copper scraps in the pipe and heating the air in the pipe. The oxygen combines with the copper, forming a solid substance, and leaving the nitrogen uncombined.

(10131) M. J. M. asks: 1. I have a folding camera 4 x 5, with lens 1 5-16 inches in diameter. Can I use it for a 5 x 7 camera? A. To cover a 5 x 7 plate a lens with a focal length of about 8 inches is used. 2. How can I remedy a ground glass which has become blurred and spotted by water and breathing on it? A. Wash it with soap and water, and afterward do not handle it. 3. Is there any paste made that can be used on squeegeed prints that has but little water or moisture in it, for it will spoil the print? A. There are many formulas in the photographic books for pastes or mountants made of gelatine. These do not penetrate the paper very much. 4. Can you give me the formula for flash-light powder? A. Flash-light powder is finely powdered magnesium. You should buy it from photographic dealers. 5. Will you please tell me what is the matter with my intensifying solution. I made it as per directions, but after it had stood several days it became crystallized at the bottom and shaking would not dissolve it. A. The water is saturated with the substances employed in the formula. Filter the solution. It is not injured by the crystals. 6. I have a lot of trouble with my exposure. I cannot always time it just right. Which would be the best for me to do—to get an exposure meter or an exposure book in which I would have to register every exposure? A. Nothing but experience and a careful study of the light can enable you to expose properly. You cannot become a photographer by the use of a meter or a book. It is, however, well to record the conditions of our exposures, so that we may study them and improve by our experience. Keep an exposure book by all means. 7. I wish to become proficient in the art of photography. What book or books would you advise me to procure to advance in that direction? A. We recommend and can supply you with the following books relating to photography: "The Amateur Photographer," by Wallace, price $1; "A Manual of Photography," by Brothers, price $6, post free. 8. Is there any way to burnish my prints and keep the card from curling without a burnisher? A. We do not know of any way of burnishing without a burnisher. Most amateurs use paper which has no gloss, such as velox, platinotype, bromide, etc. 9. Is it necessary to have a license to sell pictures? A. Some cities may require a license for selling anything. We do not think a license is required to sell a photograph any more than to sell a penny whistle you may have made. 10. Can you give me the address of some firm that has good lenses? A. See our advertising columns for addresses.

(10132) C. M. writes: 1. I want to use a call bell in kitchen, battery to be in second story, from which run two wires. I want one push button in one room, one in second room, one in parlor, one in room down stairs, also one in dining room—five push buttons; how could I connect all buttons to work properly with only one bell? A. Carry one wire from one post of the battery to the bell, and from the other side of the bell a wire which shall branch through each push button to the other side of the battery. There will then be a complete and separate circuit through battery, bell and a push button. 2. I have one lamp, 8 candle power, 26 volts; could I light it with 14 cells improved standard Fuller battery? If so, how about the amperes it will use with 26 volts? A. You can light the lamp with 26 volts and 1 ampere of current. 3. How old is Mr. Edison? Also, who was the first that invented the electric light? I mean both the arc and incandescent lamp? A. Mr. Edison was born February 11, 1847. The first man who ever saw a spark from artificially excited electricity is said to have been Otto von Guericke in 1660. This was the first electric light. Sir Humphry Davy is credited with first producing an electric arc light in 1801. He had a battery of 3,000 plates, each four inches square, and used charcoal points made of wood, which he immersed in a mercury bath to increase the conductivity. With this he melted many refractory substances such as lime, platinum, sapphire, and diamond. The incandescent lamp was invented and perfected by Edison.

(10133) H. E. G. asks: 1. What causes the humming sound heard at the receiver of a 'phone during a long-distance connection (New York to Philadelphia)? A. The running of the dynamo at central by which the system is worked. 2. Would not an alternating current (high tension) circuit parallel to 'phone wire have a tendency to cause such effect? A. Yes. The transposing of the line wires on the poles destroys the induction effect from currents upon parallel lines. 3. What is the object of transposing telegraph circuits? Are they affected by induction? A. The effect of transposing a line wire is as given above, in answer to question 2. 4. Why did such a long time elapse between the discovery of electro-magnetic induction (1831) and the invention of the dynamo (1867)? A. The world was not ready for it. 5. Are single-phase alternating current circuits ever operated on the three-wire system of distribution? A. We do not know whether this has ever been tried.

(10134) J. H. L. asks: I have a long-distance telephone in my office. A portion of the day the office is locked and I am engaged in another room about one hundred feet distant, where I cannot hear the bell ring. How can I arrange to hear the signal in the latter room without having a second long-distance 'phone installed? Can I fix up a separate two-battery call telephone that will transmit the sound from one room to the other, thus notifying me that the bell is ringing? A. You can have a second bell put in so that the call shall ring in both places all the time. Or you can switch out the second bell when you do not wish it to ring. Many physicians have such an arrangement for night calls, placing the extension bell in their sleeping room.

(10135) J. T. H. asks: 1. If you rub with flannel a stick of sealing-wax held in the hand, it becomes electrified. If similarly you rub a rod of brass it does not become electrified. Explain the differences. A. The wax is an insulator, the brass is a conductor, and its electricity flows off as fast as it is generated. Insulate the brass and it can then be charged. 2. Is it possible to obtain a magnet with a single pole? A. No. 3. Can you magnetize a steel ball, 3 inches in diameter, and where is the equator? A. Yes. If symmetrically magnetized, the equator will be at the largest place between the two poles and equidistant from them.

(10136) W. F. R. writes: Is it not a fact that wireless telegraphy was known and practiced (experimentally) as much as fifteen to twenty-five years ago? I remember reading (I think in SCIENTIFIC AMERICAN) of some one who succeeded in sending a message a distance of eleven miles between mountain peaks in Virginia. A. Wireless telegraphy has been known much more than twenty-five years. Between 1840 and 1850, Prof. Joseph Henry made this record in a published paper: "A single spark from the prime conductor of a machine of about an inch long, thrown onto the end of a circuit of wire in an upper room, produced an induction sufficiently powerful to magnetize needles in a parallel circuit of iron placed in a cellar beneath, at a perpendicular distance of 30 feet, with two floors and ceilings, each 14 inches thick, intervening." This was not the sending of a message, but the man who did this was not far from sending messages in the same way. He also placed a coil 5½ feet in diameter against a door and at a distance of 7 feet from another coil of 4 feet diameter. Shocks were felt in the tongue from the terminals of the second coil when the circuit of a battery of eight cells was broken in the first coil. This was sending signals with the tongue as a receiver. In 1885 Mr. L. J. Phelps installed a system of telegraphing to trains on the railway between Mott Haven and New Rochelle, N. Y. The message was sent along a wire between the rails and received in the baggage car of the moving train, wherever it happened to be along the line. This was soon replaced by the Edison system, and this was employed by the Lehigh Valley Railroad in running its trains. A man who was connected with this system has recently stated in print that he had received messages by it at a distance of 10 miles from the line, using a wire fence to receive with. In subsequent experiments the same writer states: "A large induction coil similar to that used by Marconi was used, and 10 to 20-mile messages were of common occurrence."

(10137) A. B. asks: 1. Why are magneto calls used on telephones instead of the common make and break bells? A. The magneto machine generates a current well adapted to ringing the bell. No battery is required. It is less liable to get out of order than if a battery were employed to ring the bell. 2. Is the armature of a magneto bell a permanent magnet? If not, please state what causes it to vibrate. A. The bell has a polarized armature. This is a permanent magnet, which moves the instant the current varies the magnetism around it. It works more easily than a bell with a battery could do. All such matters are fully explained in Webb's "Telephone Handbook," price $1 by mail.

(10138) H. L. H. asks: How much No. 36 wire will it take for the secondary of a coil giving a one-inch spark, and how much and what size wire for the primary coil to be used for wireless telegraphy? A. It is a very good coil which gives an inch of spark for a pound of secondary. For primary coils from 12 to 16 wire may be used.

(10139) J. R. F. asks: 1. What amount of weight can be lifted with a pound of metal charged with lodestone as heavily as it can be charged? A. There is a great difference in the weight lifted by permanent magnets. You will do well if you lift a pound with a magnet weighing as much as a pound. Nor can you magnetize a bar magnet well with lodestone. It should be magnetized with an electric current, if you would produce a strong magnet. 2. Does the metal charged lose its power to lift in time by using it? A. No; a magnet is not injured by working. If left with a keeper on its poles and handled with care, no loss of strength need take place. 3. Can cast iron be charged as well as any other metal? A. Steel is the only metal of which a permanent magnet can be made. The best tool steel should be used.

(10140) K. S. A. asks: Is there any method known by which a picture or outline can be thrown on a screen in daylight, on the principle of the magic lantern, without making the room dark? For instance, could the outline be thrown on as a shadow? A. A lantern slide can be thrown upon a screen in a room by daylight if an electric arc lamp is used for an illuminant. It will not be as distinct as if the room were darkened, but still it can be distinctly seen.

(10141) W. E. F. asks: What would be the apparatus necessary to charge a storage battery from a trolley wire of an electric railway, and what size battery for 5 horse-power motor to run say 10 hours; and about what would the outfit cost, and how long would it take to charge it? A. You will require half as many storage cells to run your motor as the volts taken by the motor, since each cell will give 2 volts. To obtain the number of amperes you will need, divide 746 by the voltage of the motor. This gives the amperes for one horse-power hour. Multiply this by 5 and by 10, and you will have the ampere hours required for 5 horse-power for 10 hours.

(10142) L. E. A. K. asks: 1. Is the current that leaves a telephone in talking the battery or an induced current? A. An induced current. The induction coil is to be seen in the box of the transmitter in many forms of apparatus. 2. Are telephone generators alternating or direct current? A. The magneto generator by which the call bell is rung is an alternating current machine. 3. Can a direct current be transformed from a higher to lower or lower to higher without going through a rotary transformer? A. Yes; by an induction coil it is transformed to a pulsatory current in one direction.

(10143) C. C. McC. asks: Do you publish a work on the construction of voltmeters and ammeters that would enable one to construct one for use on an isolated plant? A. SUPPLEMENT No. 1215, price ten cents, will give information for the construction of a voltmeter and ammeter which may answer your purpose.

(10144) S. C. asks: 1. A party of us visited an electric plant. The electrician attached to the end of the poles of the dynamo two large pieces of iron, then inserted them into a saline solution, saying he would boil water, but I thought what he called boiled was only the decomposition of the water to H_2+O. Am I correct? A. Both decomposition and heating of water takes place, and the water is soon heated to boiling. 2. The electrician said if the two pieces of iron at the end of the poles were to touch one another, it would blow up the dynamo. In that case what would cause it to blow up? A. If the plates were brought to touch each other, the resistance would be brought so low that an enormous flow of current would take place (Ohm's law), and this would heat the dynamo so that the wire would soon melt, unless there were a fuse which would blow and cut off the current. It would not be an explosion in any ordinary sense of the term, but a burn-out.

(10145) S. B. S. asks: 1. Will a 4-ohm telegraph work on a line one mile in length? A. Yes, if all else is in good shape. 2. If so, how many gravity batteries will be required to work the instruments if No. 12 galvanized iron wire is used with ground circuit? A. The number depends upon the joints and insulation. We should put 4 to 6 cells and try it. Then add others if necessary. 3. How many gravity batteries will be required to work two 4-ohm telegraphs on a line 265 feet in length, where No. 18 uninsulated wire is used with ground circuit? A. Probably two will do the work.

(10146) D. H. asks: 1. Is there any way that a number of open-circuit sal-ammoniac cells (say twelve) can be connected together so as to produce a continuous current for an incandescent light? Is there any apparatus made for such cells to make them produce a more continuous current? A. No. It is impossible to use a sal-ammoniac cell on a closed circuit for any length of time. 2. Will dry cells recuperate as quickly and as well as wet open-circuit cells? A. No.

(10147) M. B. T. asks if putting the antennæ of a wireless telegraph system in an iron or other pipe will prevent the emission of the Hertzian waves? A. Anything which disturbes the free outflow of the waves from the vertical wires will disturb the transmission.

(10148) E. H. S. asks: 1. I should like to know something about the mathematics of an induction coil; how to calculate its probable output and what vital points tend to increase or diminish its efficiency. A. You will find in our SUPPLEMENT No. 1124, price ten cents, the description of a coil which gives a 6-inch spark. This will do X-ray work upon the thinner portions of the human body. For the thickest parts, a coil is employed which will give a spark of 14 inches or more. Such a coil is described in Hare's "Large Induction Coils," price $2.50 by mail. 2. Something about the Wehnelt electrolytic interrupter. A. We can send you five numbers of the SUPPLEMENT containing illustrated articles upon the Wehnelt interrupter, at ten cents each. SUPPLEMENT, pages 19602, 19811, 20871, 20982, 21500. 3. How to build an induction coil suitable for X-ray work, etc.? A. Faraday's laws of the induced current cover the action of a coil. The correct designing of a coil is the result of experience extending over many years, as well as the application of law to the case.

(10149) A. E. W. writes: 1. I would like to know if there is any advantage in using plate rather than ordinary glass regardless of difference in price? The plate will run oppositely 1-16 inch apart (20 inch D.), while some window-glass may run seldom less than ¾ inch apart. A. It is an advantage to bring the plates of any static machine as near to each other as possible. If they will not run nearer than ¾ inch apart, the machine will not be very efficient. 2. The plate is usually about 3-16 inch thick. Does this thickness of glass take away from the efficiency of the machine? A. It is not advisable to use glass of a greater thickness than will stand the strain of the running. 3. Could you also tell me as to how I can obtain drawings or descriptions of the arrangement of conductors or carriers for a two-plate Wimshurst? A. A good design of a Wimshurst machine can be found in Bottone's "Electrical Instrument Making," price 50 cents, by mail.

(10150) J. F. McG. asks: 1. What is the temperature of a 30-candle-power incandescent electric light? A. The temperature of incandescence is not directly connected with the candle power of a lamp. Ganot gives the temperature as 2,350 deg. Foster's Pocket-book gives it at about 2,500 deg. 2. What is rare earth and where can it be obtained? A. Certain minerals have been known among chemists as earths. The rarer ones are zirconia, glucinia, yttria and thoria. They are oxides of elements of similar names. 3. What candle-power would a 220-volt lamp give? A. It may be of any candle-power, depending upon the resistance of its filament.

(10151) R. B. asks: 1. Will a watch become magnetized by a motor? A. Yes; if there is much external magnetism in the space around the motor. 2. How can you tell if it is? A. By its irregular motion, or failure to keep time as well as it has been doing, often even stopping entirely. 3. How can it be demagnetized thoroughly? A. The quickest way is to take it to a jeweler, who is nowadays quite accustomed to this disease of watches. We can send you two valuable articles on the subject for 20 cents.

(10152) D. S. asks: Will you please answer through the columns of your valuable paper, if a small motor or dynamo, say 1-16 to 1-8 horse-power, can be designed the same as larger machine of 1 horse-power or over, that is in regard to the magnetic flux in the different parts? A. All dynamos are designed by the same rules.

(10153) F. M. C. asks: 1. In winding the primary and secondary coils for a medical battery (faradic current) should both be wound right or left hand, looking from the same end of the coil, or should one be wound right hand and the other left hand? A. We do not see how it can make any difference in which direction the turns of a coil are wound. The electrical induction will find that out for itself. 2. In using a galvanic battery, for medical purposes, of say ten carbon and ten zinc plates arranged zinc to carbon through the entire number, is it absolutely necessary to have each element, that is, a carbon and zinc plate, in a separate cup or cell with the fluid, or will the battery work as well, and the current last as long, if *one* large cup is used containing *all* the elements and fluid? A. If all the plates are in one cell, you will have one cell with the electromotive force of one cell, but with the amperes due to the large surface of your single plate. The same state of the current results if you connect all the positive plates together, and all the negative plates together from a larger number of smaller sized cells. This is *connecting in multiple.* If, on the other hand, you join the zinc of one cell to the carbon of the next in series, you will have an electromotive force equal to that of one cell multiplied by the whole number of cells, and a less number of amperes because of the greater resistance of the arrangement. This is a battery *connected for intensity.*

(10154) W. H. G. asks: 1. Please give acid used in pole indicator and ground detector and state what size and kind of wire is used. A. Make a solution of alcohol, 10 cubic centimeters, phenolphthalein, 1 gramme. Add to this distilled water, 110 cubic centimeters. Make a second solution of sodium sulphate, 20 grammes, in 100 cubic centimeters of water. Soak blotting paper in the first solution, and drain off the superfluous liquid. Then soak the paper in the second solution and dry the paper. To test the poles of an open circuit, moisten a strip of the paper, and place the ends of the wires about two inches apart upon it. A red spot will appear around the end of the negative wire. 2. Is there any way in which a bipolar dynamo can be made to give a steady current and not an alternating current? I cannot run a Ruhmkorff coil because of this, and would like to know if there is any instrument or battery that I can connect in circuit to stop this alternation? A. A dynamo gives a direct or continuous current when its armature is provided with a commutator. The same machine gives an alternating current when its armature is fitted with rings connected to the windings. Either form of dynamo will work a Ruhmkorff coil equally well. If the alternating current is to be used, screw down the vibrator so that it will not vibrate. 3. Do I understand that in the system of wireless telegraphy explained in SCIENTIFIC AMERICAN of January 4, 1902, there is no Ruhmkorff coil used in the transmitting part, but just the batteries connected to the earth? A. Yes; but Hertzian waves are not used in this system. 4. What are inductance coils, and please give idea of how made? What is a choke coil, and how made? A. An inductance or a choking coil is a coil to reduce the current by its induction upon the current as it pases through it. A second current is set up in the inductance coil, which flows in the opposite direction to the main current and thus chokes it off, so to speak. 5. Please give number of SUPPLEMENT, if you have same, that has plans and working drawings for constructing small gasoline motor. A. See SUPPLEMENTS Nos. 715 and 716, for construction of gas engines, 23 figures, 10 cents by mail. Also a book on "Gas Engine Construction" by Parsell and Weed, $2.50 by mail.

(10155) L. P. L. writes: We have an angle iron tower 100 feet high on which is a 50,000-gallon tank. Miscreants annoy us by climbing to tank. Electric light and trolley lines are near; how best connect them to tower to give a good stiff shock, and what size wire should we use? A. You can connect your tank to the electric lines you mention, but you will render yourself liable for the injury or death of anyone who may be connected to the circuit through your act. A man does not render himself liable to be murdered by climbing a neighbor's tower. It is simply a trespass, which has not so severe a penalty in the law. There are other ways of meeting the case.

(10156) M. P. C. asks: 1. What metal is next in quality to platinum for contact pieces in a bell, induction coil and a telegraph key? A. There is no metal which can take the place of platinum for this use. There are several which have higher melting points, but they cost from five to ten times as much as platinum and the price prohibits their use. Most metals oxidize too easily to enable them to be used for contact points. 2. Does carbon or graphite make a good contact? A. No. They are too brittle, and would soon be broken in pieces. 3. How many pounds of wire should be wound on the armature and field magnet of the hand-power dynamos described in SUPPLEMENT No. 161? A. The winding calls for so many turns, not so many pounds. 4. Is this dynamo suitable for running a motor? A. Yes, a small one.

(10157) L. A. G. asks: We have a small motor wound for 25 to 30 volts, which we would like to utilize in running a small job press which we are at present running by foot. Would it be advisable to use a battery of the Grenet cells; or would the cost of maintaining them be too high? A. The voltage is only one element in determining the output of a battery, and in rating the power required to run a motor. To furnish the voltage for your motor will require 16 bichromate cells. The type described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 792, price ten cents, is best adapted to this purpose. The size of cell therein described will doubtless be large enough to run motor. One charge will last six hours. You can determine the cost from the price of bichromate of soda or potash and sulphuric acid at your place.

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