Inquiry No. 4195.—For blue prints of one horse power stationary engines.

Inquiry No. 4196.—For a large gasoline stove for heating a one horse power boiler.

Inquiry No. 4197.—For makers of collapsible metal tubes for holding polish, etc.

Inquiry No. 4198.—For a rotary fan run by clock work.

Inquiry No. 4199.—For parties engaged in difficult chilled casting work.

Inquiry No. 4200.—For makers of machinery for making potato starch.

Inquiry No. 4201.—For makers of self-cleaning curry combs.

Inquiry No. 4202.—For advertising novelties suitable to advertise medicines.

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 This is for our information and not for publication.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.

(9018) M. E. B. asks: I understand that the difference between the static and other electric currents is its high voltage and extreme low amperage. Now, what is average voltage and amperage of an electric static current from a common static machine of 16 plates running at moderate speed? A. The voltage of the discharge of a static machine depends upon the distance between the discharging rods. A spark of one inch in air under ordinary conditions requires perhaps 28,000 volts. The matter is treated in Thompson's "Elementary Lessons," quite fully. 2. Could a current similar to the static in voltage and amperage be procured from batteries (or lighting street current) and coils? A. Any induction coil gives the same kind of secondary discharge as a static machine. 3. If cells to be used, how many would you need, say of the Laclede national No. 7 to generate such a current? A. A coil giving a one-inch spark should be run with two or three cells of battery; one giving an eight-inch spark with six to eight cells of potassium bicarbonate battery. 4. Describe making the coil or series of coils to produce the static current effect, procured from batteries, and from city lighting current of about 110 voltage. A. A coil giving a six-inch spark is described in SUPPLEMENT No. 1124, price ten cents. 5. Is there such a machine made (in the market) to give static current effect from batteries or city current? A. Induction coils are for sale by all dealers in electric apparatus. 6. Give name of book, brief and comprehensive, for making coils in general for medical batteries, etc. A. Norrie's "Induction Coils" is a good and recent book on coil making.

(9019) C. M. asks: What is the best way, for practical use, to cut down a current of 220 volts to the strength of a Mesco dry battery? A. The Mesco dry cell has a voltage of about 1.5. The current depends upon the resistance of the external circuit, but on short circuit would scarcely exceed 1.5 to 3 amperes. To cut the current of a 220-volt circuit down to 1.5 amperes will require about 150 ohms. No. 24 iron wire is large enough for this, and you will need about 1,000 feet. 2. Does it matter what the amperage is? A. We have shown you above that the amperes must be taken into account in your calculations just as much as the volts. 3. What would be the cost of material? A. We are not able to tell you the cost of such an arrangement. That varies much in different localities. 4. If a 16 c. p. light costs $1 per 100 hours, what would this current cost per 100 hours? A. A 16 c. p. light on 220 volts consumes about ¼ ampere. If this costs $1 for 100 hours, 1.5 amperes will cost $6 for the same time. 5. What would two 110-volt lamps connected in series cost at rate mentioned above? A. If the two 110-volt lamps are 16 c. p., they take ½ ampere, and the two in series will cost twice as much as one 16 candle lamp on 220 volts. You will also have twice as much light.

(9020) P. T. P. writes: I have one of your SUPPLEMENTS giving directions for the making of an induction coil for sparking purposes. I have as a condenser about 30 square feet of tinfoil, alternated with sheets of paraffin paper. I use one sheet of paraffin between the tinfoil. The paper is some I made myself; paper about like what I am writing upon, soaked in paraffin. There is a great noise like sparking or buzzing in the condenser when in operation. Does this indicate that the condenser leaks? That the insulating sheets are not what they ought to be? Your SUPPLEMENT directed paper coated with shellac varnish to be used, but I substituted paraffin. Does the difficulty lie here? Would the placing of two sheets overcome the difficulty? A. Paraffin is a suitable material for coating the sheets of paper for a condenser of an induction coil. The paper must be without pores or visible holes. Before coating each sheet must be examined by holding between the eye and a strong light to detect these holes. One sheet of good firm paper is enough to use between two sheets of tinfoil. As we do not know what coil you have built, nor how you built it, we are not able to say what your difficulty may be. Norrie's "Induction Coils," price $1, gives careful instructions for making a coil and the proper size of condenser for each length of spark. One of the most frequent causes of failure in coil making is in getting the condenser too large or too small for the coil. It should be very carefully adjusted to the current to be used. It is possible that the margin of the paper beyond the foil is too small, around which a discharge may take place.

(9021) H. R. asks: 1. What is the "elastic limit," or limit of elasticity, of a body? A. The elastic limit of a body is the amount of deformation which a body will endure and still return to its size and shape when the deforming force is removed. When a permanent change of shape is produced by force, the limit of elasticity is exceeded and the body is weakened. The factor of the elasticity of a body is called its modulus of elasticity. 2. Is it not a fact that a cannon-ball will sink to the bottom of the deepest ocean? A. A cannon ball will sink to the bottom of the deepest ocean. 3. Will a non-magnetic body have any effect on the action of a magnet? A. A non-magnetic body has no effect whatever upon the action of a magnet.

(9022) T. A. K. asks how to anneal selenium so as to make it sensitive to light. Also, what form of selenium is best to begin with? I have some selenium in a precipitated or powdered form. Is this the best form to use? I wish to coat a metallic (copper) surface with a thin coat or film of sensitized selenium. Is it better to sensitize it before or after it is applied? What is the best shape to put it in to apply it, and how is the best way to apply it? Can it be dissolved and applied while in solution and then made sensitive to light afterward? If so, what is the best chemical to dissolve it in? As stated above, the whole idea is to coat a copper or nickel surface with a very thin coat of sensitive selenium, and what I want is the best way of doing it. If the powdered or precipitated kind is not the best, where can I find the proper kind? A. The face of the plate is thinly covered with the selenium, which must then be melted on and allowed to cool slowly, so as to assume the crystalline form. In the "selenium cell" the coating of selenium is applied to a strip of mica or other substance of high insulating power. Selenium will dissolve in selenium chloride, and will separate from this solution in the metallic form. However, the selenium cell is always made by melting in the selenium, and we can find no accounts as to whether a coating obtained by using a solution in selenium chloride will be sufficiently adherent or sufficiently sensitive. Your powdered selenium, if pure, should be all right.

(9023) A. C. asks: 1. What are the causes of color blindness? Can it be cured? If so, how? If not, why? A. Color blindness is the inability to see a difference between colors which to the normal eye appear quite distinct. It is a defect in the eye, born with it, and usually incurable. True color blindness is not removable by education. The same mistakes in matching colors are repeated constantly by a person after they have been pointed out to him. The only remedy for his mistakes is to avoid all occupations having to do with colors. 2. What is a good way to learn colors? A. One ignorant of the names of colors should learn them by having them pointed out to him. This has nothing to do with color blindness. The test for color blindness is simply in selecting tints which look alike. No names are used.

(9024) B. P. L. S. asks: 1. Is the secondary coil of an induction coil wound in an opposite direction to the primary coil? A. It makes no difference which way the two coils are wound in reference to each other. All large coils are furnished with a reversing switch in the primary circuit, and if the poles are not as desired, the switch is thrown and the current in the primary is reversed. 2. Could a brass tube be used to cover the core of an induction coil to regulate the amount of current? If not, what kind of metal or substance can be used? A. A brass tube cannot be used as a regulator for a coil. It cannot cut off magnetism. An iron tube might be used to screen the primary from the secondary.

(9025) D. G. E. asks: 1. How much and what size wire would it require for a 20-ohm telegraph instrument? A. Almost any size wire from 24 to 30 can be employed for a 20-ohm sounder. It is a matter of convenience simply. 2. How many square feet in a pound of tinfoil? A. The number of square feet in a pound of tinfoil varies with the thickness of the tinfoil. 3. What book is there giving size, resistance, and weight of copper wire? A. A copper wire table will be found in Swoope's "Lessons in Practical Electricity." 4. What is the name of a maker of C. P. battery zinc? A. There is no book on zinc casting. Chemically pure zinc is not used for batteries. Its price is prohibitory. Zinc amalgamated with mercury is just as good. 5. How may a 2-inch hole be made in the center of a glass plate? A. To make a hole through a glass plate, break the tip from a three-cornered or round file. Dissolve some camphor in turpentine. Dip the end of the file in the liquid, and by a twisting motion grind a hole into the glass plate, which must rest upon a level surface. Care should be exercised when the hole is about to break through the glass. After an opening is made through the glass, the hole is worked to its proper size by a round or half-round file. Always keep the file wet with the fluid. Experience is better than any amount of written instruction on this subject. 6. What is the exact diameter of a single cotton-insulated No. 36 copper wire, or how many wires to the inch? A. No. 36 wire is five thousandths of an inch in diameter. This does not include the insulation. This may be thicker or thinner, according to circumstances. 7. If a good ground is made in the return circuit of a telegraph line, is the resistance of the earth greater or less than a No. 12 iron wire? A. The resistance of the earth in the return circuit is taken to be zero. 8. Have you a book on making batteries for amateurs? A. Bottone's "Galvanic Batteries" is the most recent work on this subject.

(9026) J. S. asks: If a bullet were shot from a .30 or .40 army rifle straight up in the air, when it dropped to the earth would it have the same force it had when it left the gun barrel, and would it penetrate the same amount of pine as it would if it were shot direct at it? A. A projectile shot vertically up into the air from any kind of gun does not have the same velocity when in its fall it strikes the ground as when it left the muzzle of the gun on its ascent. The resistance of the air retards it on its upward flight, and hence it does not attain the full height due to its initial velocity. On its fall the retardation of the air prevents it from attaining the full velocity of fall from the point where it ceased to rise. It therefore does not rise to its full distance, nor in falling from its lower position does it attain its full velocity due to that altitude. Both causes act to produce a less velocity when it reaches the earth.

(9027) A. S. asks: 1. Has the so-called double strength sal-ammoniac battery that has a carbon cylinder filled with granulated carbon and a zinc cylinder around that, charged with 8 ounces sal-ammoniac to the cell, any advantage over the ordinary pencil zinc batteries for a telephone? A. The ordinary Le Clanché cell with a pencil zinc answers perfectly for a telephone, and there seems to be no need to use any stronger one. 2. I want to put a magnet on my telephone line similar to the relay on the telegraph lines. Could it be wound with No. 20 wire? A. You can put an electro-magnet on a telephone line, and it can be wound with No. 20 wire. 3. Would it interfere with the talking qualities of the line? A. It would lengthen the line by so much and would make it so much more difficult to transmit through the line. 4. How many cells of the above-mentioned double-strength sal-ammoniac batteries would it take to work said magnets, if I had say twenty on a line forty miles long? A. Probably twenty cells would prove strong enough to work through twenty magnets. If they were not, more could be added. No one can tell how many will be needed, since that depends on the magnets, the connections, and the leakage, due to moisture and other causes on the line. 5. Could I use a telephone over the same line, say with only two cells in each 'phone? Would there be any more resistance in those magnets wound with No. 20 wire than there is resistance on the line wire? A. You can telephone through the magnets if you use power enough. You will find that out by trying. 6. What size wire is the ordinary telephone extension bell magnets wound with? A. We have not at hand the size of the wire in the extension bell. There is no reason why it should not be about the same as in the polarized calling bell attached to the magneto, since it is rung by the magneto. 7. Which requires the greatest current to work it—a horseshoe magnet, with its two poles working together, or the ordinary extension bell magnets, the wire being the same size? A. The extension bell with polarized magnet is more sensitive than the ordinary bell with electro-magnets simply. 8. How many turns of say No. 20 wire should I put on each end of the horseshoe magnet to make it lift a lever weighing say one drachm, when the current is passing, and let it fall as soon as the current stops? A. We should suppose that you could use ordinary relays of low resistance for your magnets far more cheaply than to make the magnets by hand. These will lift a drachm with a small current, and would be exactly alike, if ordered to be made alike.

(9028) J. F. P. asks: Can you tell me anything that will prevent the formation of chrome alum crystals in a battery using a bichromate of potash solution? A. There are three ways of avoiding the troublesome crystals in a bichromate battery. One is to use chromic acid in the cell. The second is to use a saturated solution of bichromate of sodium in place of the bichromate of potash. No crystals form. The third is to make the solution after the formula which follows: Take 1 part of potassium bichromate, 2½ parts of water, and 3½ parts of sulphuric acid, all by weight. Dissolve the bichromate in the water by boiling, and allow the solution to cool. Then pour the sulphuric acid into the solution slowly and with constant stirring. The mixture becomes very hot, and at a certain point changes its color in a marked manner. This is the moment when decomposition takes place and chromic acid is formed. When all the acid is stirred in, let the solution stand over night. A large crop of crystals will form. These are the alum crystals, and as they are of no use in the liquid, they may be separated by decanting the liquid or by filtering through asbestos. If these crystals are fully gotten rid of, no others will form as the battery is used. This method is due, we understand, to the veteran Prof. A. K. Eaton.

(9029) H. S. asks: 1. How much weight will a cubic foot of gas sustain in mid-air? A. A cubic foot of air at 30 inches of the barometer, and the freezing temperature, weighs 1.29 ounce. A cubic foot of coal gas varies in weight from 0.56 ounce to 0.73 ounce. The sustaining power is the difference of the weights of air and gas. This gives from 0.73 ounce to 0.87 ounce. The lifting power is slightly less than these numbers. 2. What will be the entire weight of the lightest 6 horse power force that can be had, suitable for an airship? A. The lightest 6 horse power motor will weigh about 250 pounds. 3. In ascending, will the attraction of gravity be greater than close to the earth? A. The attraction of gravity *decreases* as you rise above the earth. This decrease in the force of gravity is so small that it would not be noticeable for any distances to which a balloon ascends. For five miles it amounts to nearly a quarter of a pound in a hundred pounds. As scales for weights as large as 100 pounds rarely mark less than quarter pounds, it is evident that so small a change is not practically of any moment. The change in weight is calculated in the following manner: The mean diameter of the earth is 7,918 miles. The distance from the center to the surface is 3,959 miles. Five miles above the surface is 3,964 miles from the center. According to Newton's Law of Gravitation, the weight of a body five miles above the surface of the earth is to its weight at the surface of the earth as the squares of these distances taken inversely; that is,

$$\left(\frac{3959}{3964}\right)^2 \times \text{its surface weight.}$$

This somewhat large fraction reduced to a decimal gives 0.9975 nearly. Hence 100 pounds at the surface of the earth will weigh 99.75 pounds if carried to a height of five miles above the surface of the earth.

(9030) J. W. O. says: 1. A weekly paper tells about a new and wonderful explosive compound called thermite—a mixture of aluminium filings and oxide of chromium, which when touched off with a match, using flashlight powder for a primer, a heat of over 5,000 deg. is instantly produced, melting great bodies of iron or steel instantly. The paper says it is in use in Germany for welding steel rails, etc. Can you tell anything about it, and give the details? A. Thermite, properly speaking, is a mixture of aluminium powder and iron oxide. Barium peroxide is the primer most used. The heat generated is very intense; the aluminium is burned to the oxide at the expense of the oxygen combined with the iron, and the iron is reduced to the metal and melted. It is being largely used in Germany for the purpose mentioned, and thousands of miles of rails are said to have been welded together by this process. It offers also an effective means of repairing shafts, gearing, broken lugs, etc., being thus a very great saving, as it obviates the necessity of completely replacing the broken part. Its manufacture is patented, and is in the hands of a very strong company. The inventor of the process is Hans Goldschmidt. There are a whole class of mixtures made of aluminium powder with different metallic oxides; all these are also called thermite compounds, but the specific name of "thermite" is applied to the one above described. The other mixtures are useful for the preparation of metals and alloys that are otherwise difficult to prepare; such as metallic chromium, molybdenum, tungsten, titanium, manganese, etc. By mixing the oxides, alloys can be directly produced. The commercial possibilities of these are very great. 2. I read in a book called "The Wonders of the World" that one ounce of the fulminate of gold was enough to totally destroy the city of New York. Has this statement any truth for its basis? What are the facts in the case?