plastic method, finally electroplating the copper copy, using a cyanide solution of silver.

(3268) H. C. J. asks (1) if there is any chemical that paper can be saturated with—and not be discolored—so that an electric current will burn it black as soon as it touches it. A. We know of no chemical that could be used on paper in the manner suggested without producing some discoloration. Iodide of starch is probably the nearest approach to it. 2. Please tell me if there is any kind of ink which will fade in a short while, and also an ink which will appear on paper after being exposed to the light. A. Weak purple aniline ink will fade in a short time if exposed to light. An ink formed of a weak solution of nitrate of silver will turn brown on exposure to light.

(3269) C. S. W. S. writes: The speed of electricity was a subject for discussion lately, but the exact rate could not be arrived at. According to a recent article it should require only one-half second to transmit a signal through the Atlantic cable, even less for 3,000 miles. Can any rate be given? A. No exact rate can be given. The electrostatic conditions regulate the practical velocity of transmission of an electric signal. Electric impulses theoretically may travel with the velocity of light. The article referred to relates to the following. Experiments now in progress at McGill College, Montreal, under the auspices of the British and Canadian governments, to ascertain the longitude of Montreal by direct observations from Greenwich, have led to the accomplishment of a remarkable telegraphic feat. The first thing to determine was the length of time it took a telegraphic signal to cross the Atlantic. An automatic contrivance, whereby the land line could work into the cable, was provided, and a duplex circuit was arranged, so that the signal sent from Montreal would go over the land lines to Canso (Nova Scotia), thence over the cable to Waterville (Ireland), and return to Montreal again. Attached to the sending and receiving apparatus was a chronograph, which measured the time. Out of a couple of hundred signals sent, it was found that the average time taken to cross the Atlantic and back again, a distance of 8,000 miles, occupied a trifle over one second, the exact time being one second and five one-hundredths.

(3270) S. W. R. asks: 1. Please give me formula for making carbon plates for batteries. A. You will find a simple process of making carbons on page 307, vol. 60, SCIENTIFIC AMERICAN, also in "Experimental Science." 2. Is there a cement by which carbon plates can be joined together and retain the connection? A. Carbon plates may be cemented together by using a mixture of very finely pulverized carbon and flour paste, afterward carbonizing in the usual way. The joint may be strengthened by saturating it with sugar sirup and recarbonizing. 3. Where can I procure carbon plates? A. From manufacturers and dealers who advertise in our columns.

(3271) J. F. B. writes: 1. Please describe a cheap dry battery with an E. M. F. of about 1·50 volts that would do for closed circuit work. Would a dry battery made as follows do for a 6 candle power incandescent electric light?—for the positive, a copper plate 2×3 inches; upon that are two blotters, between which is sprinkled powdered blue stone; on that is placed a 2×3 inch zinc plate. A teaspoonful of water is poured over the whole. If so, how many would it take? A. The battery you describe would soon become inactive. The Trouve battery is constructed something upon the same principle. It yields a small current, but will maintain it for a very long time. This battery is formed by separating a zinc and a copper plate by many thicknesses of blotting paper, enough to make the distance between the plates say 1½ or 2 inches. The blotting paper is divided into two equal portions; one part is saturated with a saturated solution of sulphate of copper, the other portion is saturated with a solution of sulphate of zinc. The part saturated with sulphate of copper is placed in contact with the copper plate, and that saturated with the sulphate of zinc is placed in contact with the zinc plate. An element of this kind inclosed in an air tight jar remains in working order for several years. Gassner's dry battery is described on page 306, vol. 61, SCIENTIFIC AMERICAN. It has an E. M. F. of about 1·5 volts. 2. What is the E. M. F. of a bichromate battery 2 inches in diameter and 2 inches deep with 2 carbon rods ¼ inch in diameter and 1 zinc rod ⅜ inch in diameter? A. The E. M. F. of all bichromate batteries is about 2 volts, without regard to the size of the carbon or zinc plates.

(3272) G. V. writes: I have made a motor like the one described in 641, and in "Experimental Science," and I have used 18 bell wire, but the motor would not go. Could you tell me in SCIENTIFIC AMERICAN the reason why, and if bell wire is the cause? I have put 8 pint glass jar bichromate cells on it, and would you please tell me how many cells of that kind I would need? A. The insulation on the bell wire is too thick to permit of winding on the required length. Use double cotton-covered magnet wire. Your battery cells are rather small. Connect them 4 in parallel, and use 8 such groups in series, or use 8 large cells with plates 6×8 or 8×10 inches.

(3273) W. R. asks: What makes the two halves of a Gramme ring armature in multiple arc when the wire is in series? Is it caused by the brushes or by the induction of the field magnets? How could it be arranged in series? A. The current flows from the neutral point in each half toward the brushes. In a motor the current entering the ring from the brushes flows in opposite directions. There is no way of arranging the two halves in series.

(3274) G. H. G. asks: 1. What is the best method of making oxygen gas? A. Probably for small amounts from the ignition of a mixture of chlorate of potassium and binoxide of manganese. Many other methods have been proposed and tried. On the large scale Brin's process, described in our SUPPLEMENT No. 623, seems to have met with success in England.

(3275) C. T. asks: Can real ebony be glued to mahogany or other hard woods with a certainty of preserving a fast joint? A. Use the finest white glue or gelatine dissolved in acetic acid or strong vinegar. The surfaces of the wood must be roughened.

(3276) B. S. W. asks whether the accompanying specimen of lime rock is of a water or volcanic formation. A. The sample sent is carbonate of calcium or calcite, and is unquestionably a deposit from watery solution. Volcanic or thermal action may have had an agency in effecting its deposition.

(3277) A. W. asks (1) how the dry developer put up in powder form is made. A. Use any formula for a developer. Powder the substances and place them in paper cartridges in the proper proportions; separate the different ingredients by wads of cotton. 2. Is common powder used in the manufacture of the so-called cannon fire crackers? A. Meal powder is used in fire crackers.

(3278) C. H. G. asks: What is the speed of light? Also what is the speed of electricity? A. The speed of light and electric waves are about the same, that is, 186,000 miles per second. The speed of electric signaling through a wire depends on many factors and varies greatly for different lines.

(3279) W. W. says: I have four conical wall tents which are good except for small spark holes. Can you tell me of a cement or glue that will stick on small patches of canvas, and will resist the rain? A. You can cover the holes with patches of canvas cemented by means of leaf gutta percha such as the tailors use. A hot pressing iron is employed to melt the gutta percha.

(3280) N. N.—For table of freezing mixtures see SUPPLEMENT, No. 551, page 8806.

(3281) J. R. G. says: Please give directions for making cement walks, also asphalt walks. Will the cement for sidewalks be suitable for cellars? A. For cement walks use one part best Rosendale cement and two parts clean sharp sand. Make a stiff mortar, mix thoroughly, spread three inches thick. Excellent for cellars. Ashpalt requires heat.

(3282) H. H. H. asks: How many degrees Fah. melt platinum? A. 3080° Fah. It can be melted by the oxyhydrogen blowpipe on charcoal or in a lime crucible.

(3283) L. B. M. asks: 1. How much ascensional power does one cubic yard of hydrogen gas have? A. Pure hydrogen can lift 500 grains per cubic foot or one and nine-tenths lb. per cubic yard. 2. Does the form of the receptacle affect the lifting power? A. No.

(3284) E. M. H. asks: 1. In using the oxyhydrogen light for stereopticon purposes, the gases being compressed in cylinders at a pressure of 225 pounds to the square inch, is there any danger of an explosion occurring from the admixture of the two gases, or from other cause, in the use of light, and if so, how could such an explosion occur? A. If the gases are pure when compressed, and if the cylinders are strong enough to withstand the pressure, and if oxygen cylinder contain no hydrocarbon, and the hydrogen cylinder is free from oxygen or air, there will be no danger of an explosion so long as the pressure in both cylinders is greater than the pressure in the burner. If however one cylinder becomes nearly exhausted while the other has considerabe pressure, and if the burner from any cause becomes stopped, so that gas may escape from the cylinder having the greater pressure to one having the least, there will be danger of an explosion on relighting the burner. 2. Is there any book published on the magic lantern that is reliable, that will be of assistance to any one in using the magic lantern, and if so, what is the name of it, and where can I purchase same? My reason for asking the question in regard to the oxyhydrogen light is that I would like to be satisfied one way or another in regard to it, and appeal to you as the best authority. A. "Experimental Science," price $4 by mail, contains a long chapter on "Optical Projection," which is very complete. We can also recommend Wright's "Optical Projection," price $2 by mail, and Dolbear's "Art of Projecting," price $2.

(3285) C. C. asks: 1. Supposing a current from a battery would exert an attractive force of five pounds on a single electro-magnet, how much attractive force would be exerted on each of six electro-magnets whose coils are wound seriatim with the same wire, the wire to be continuous from first to second, and so on, and then returned to battery? A. It is a question of ampere turns. If you get the same number of ampere turns, and the conditions are otherwise the same, the results will be alike in both cases. 2. How does the current in an electric motor act on the field magnet and armature to produce the force that revolves the armature? Is it attraction or repulsion, or both acting alternately? A. In a drum or ring armature motor the poles are constantly being displaced in one direction, while the material of the armature is being drawn forward by the field magnet in the opposite direction. It is attraction mainly that is concerned in the rotation of the armature. 3. What cheap book explains all these matters and gives an insight into the elementary and practical principles of electricity and magnetic forces? A. We know of no very cheap book that would be of use to you; we can, however, recommend "Experimental Science," price by mail, $4.

(3286) P. D. asks: 1. Has the phonograph been developed to a degree which warrants its extensive use in the displacement of stenographers? A. The phonograph can be used in lieu of a stenographer, and is so used by many. 2. Please give recipe for a good furniture polish. A. Try the following: 4 ounces of orange shellac dissolved in 2 pints of alcohol; add to this 2 pints of linseed oil and 1 pint of spirits of turpentine. Mix thoroughly and add 4 ounces of sulphuric ether and 4 ounces of ammonia water. Apply with a sponge or cloth.

(3287) W. C. R. asks: 1. In referring to George M. Hopkins' motor, No. 641, SCIENTIFIC AMERICAN SUPPLEMENT, what kind of wood is best suited for the armature and other parts? A. Hard, well seasoned maple is a good wood for this purpose. 2. What is that part on the armature that divides the hub from the collar? A. It is a space. 3. Concave face 2½ inches across, is that right, on top and bottom? A. Yes. 4. What kind of battery is best suite for the motor mentioned? If you have among your papers how to make such a battery, I would like to know the number, or more of same. A. Consult SUPPLEMENT, No. 792, also "Experimental Science."

(3288) W. W. T. asks how to prepare strawberry extract. A. Harrop's "Monograph on Flavoring Extracts," etc., $2 by mail, contains numerous formulæ of this character. A receipt for strawberry essence is the following: Glycerine 2 parts, nitric ether 1 part, ethyl acetate 5 parts, ethyl formate 1 part, ethyl butyrate 5 parts, methyl salicylate 1 part, amyl acetate 3 parts, amyl butyrate 2 parts. Other formulæ are given in the above work.

(3289) L. F. M. writes: 1. In winding the armature core for the motor in SUPPLEMENT, No. 641, what is done with the ends of the wire after it is wound? A. The ends of the wires are connected with the screws which take the place of commutator bars. You will find this feature described in the article referred to. 2. Can you give me a formula of substance or a liquid that when applied to the gum of the teeth it will cause the teeth to become loose? A. We know of no substance that would accomplish what you describe without, at the same time, doing great physical injury.

(3290) S. D. M. G. says: On page 49 of the issue of July 25 of the SCIENTIFIC AMERICAN, I noticed a platinotype printing process which is new to us and which I do not thoroughly understand. Will you please answer the following questions through your paper for the benefit of our camera club? 1. In what proportions should solutions A and B be used? A. Mix equal parts. 2. Will any paper, such as is used for blue prints, do, or does the process require a specially prepared paper? A. Use plain photographic paper, to be had of photo dealers. 3. Is any toning solution necessary? If so, what is the formula? A. No. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 711. 4. Is there any simple process by which blue prints may be turned brown or black? A. Make a solution of

Borax	2¼ oz.
Hot water	38 "

Add sulphuric acid in small quantities until blue litmus paper is turned slightly red. Then add a few drops of ammonia until red litmus paper turns blue. Then put into the solution 150 grains of red crude gum catechu, and allow it to dissolve, with occasional stirring. To tone a print, immerse it a minute or longer until the desired tone is obtained The solution will keep indefinitely. Gum catechu can be obtained from drug stores.

(3291) W. J. B. asks what kind of carbon to use for a bottle battery or cup for a dry battery, and give names of necessary address for a dry battery. A. Use plates prepared for the purpose and sold by dealers, or use carbon rods such as are employed in electric lighting. If the rods are coppered, the copper should be removed with nitric acid. You can use an ordinary porous cell. You will find Dr. Gassner's dry battery described on page 306, vol. 61, SCIENTIFIC AMERICAN, also in "Experimental Science."

(3292) J. H. H. asks: 1. What number of the SCIENTIFIC AMERICAN or SUPPLEMENT explains how to make an induction coil? A. See article on this subject in SUPPLEMENT, No. 160. 2. How can I make a good dry battery? A. For information on dry batteries see SCIENTIFIC AMERICAN, vol. 61, page 306. Dr. Gassner's dry battery.

(3293) E. E. T. asks: Can No. 27 double silk-covered copper wire be used instead of bare wire as given in directions about induction coil in chapter xx of "Experimental Science"? A. Silk-covered wire can be used, but it should be No. 36. 2. How is the current in above coil regulated, as it has no regulating tube? A. The secondary current is regulated by varying the primary current, either by plunging the elements of the battery more or less. This mode of regulation, however, is not very firm. In a spark coil firm regulation is seldom required.

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