

half an hour, that the heat thus generated may harden the coating of the collodion, or place in a current of air. The preparation can easily be removed with alcohol or sul huric ether, but is not affected by water. Experience as shown that the best results are obtained by not using too much aniline. Make the color light rather than deep, and apply two or three coats. These preparations may be used for coloring incandescent lamp bulbs. From the SCIENTIFIC AMERICAN Cyclopaedia of Receipts, Notes and Queries.

(5991) F. E. B. writes: 1. In making telephone instruments, would 1/2 an ounce of silk-covered No. 36 do to wind the spool? A. Yes. 2. What size spool should I make to hold that amount? A. Make the diameter of the small part of the spool as small as possible. The space between the flanges of the spools should be about 1/2 inch, and the flanges should be 1/2 inch wide. 3. Should 1/2 round 6 inches long bar magnets be magnetized the whole length or just the end? A. Magnetize the bars as much as possible. The magnetism would show principally at the ends. 4. How can I harden them? They are tool steel. A. Harden only at the ends by heating to a cherry red and plunging in cool water. Draw the temper to a dark straw color. 5. Will 6 small tumbler bichromate batteries sufficiently magnetize them? A. Yes. 6. How many layers of what size wire should I use? A. 10 or 12 layers of No. 18.

(5992) R. P. J. asks: 1. In telephone systems is earth used to complete the circuit or is a return wire necessary? Why? A. In quiet places free from induction, the earth may be used, but where there is induction from adjacent lines, a return wire is desirable, as the induction currents are equal and opposite in the two wires, and therefore neutralize each other. 2. Is there any satisfactory method of placing more than one subscriber on a single line leading from central, without making it possible for all subscribers on that line to overhear conversation carried on by any one on same line? A. There are complicated cut-out devices which will permit of calling up any person on a line without calling up others. You will find descriptions of these in works on the telephone.

(5993) H. K. G. says: What can I put on drawing paper to make it transparent, so I can use it for tracing paper? A. Dissolve a given quantity of castor oil in 1, 2, or 3 volumes of absolute alcohol, according to the thickness of the paper, and apply it by means of a sponge. The alcohol evaporates in a few minutes and the tracing paper is dry and ready for immediate use. The drawing or tracing can be made either with lead pencil or Indian ink, and the oil removed from the paper by immersing it in absolute alcohol, thus restoring its original opacity. The alcohol employed in removing the oil is preserved for diluting the oil used in preparing the next sheet.

(5994) C. F. N. writes: 1. How many ounces of bichromate of potash will saturate a half gallon of water? How many fluid ounces of sulphuric acid should be added? If the plates are 5x6 and close together in a half gallon jar, how much resistance will the battery have? A. The quantity depends on the temperature. For battery add 1 1/2 parts by weight of potassium bichromate in fine powder, 10 parts of water, and add slowly with constant stirring 4 1/2 parts by weight of oil of vitriol. Use after cooling. The battery will have about one-tenth ohm resistance. 2. What horse power (approximately) will simple electric motor develop with 8 cells plunge battery, plates 5x7? How many amperes of current should be sent through it to obtain best results with greatest power? What is the power? A. Possibly one-fifth horse power at 6 or 7 amperes. 3. Could it be run as a dynamo with wrought iron fields? Are they better than cast iron? A. It would not work well as a dynamo. 4. Would a solid copper commutator be better than one described? What diameter should it be? A. A regular copper bar commutator would be better than the one described. There is no special diameter—the smaller the better, if properly constructed.

(5995) G. I. B. T., Peoria, Ill., asks what the weight of a water tower and contents are. The tower is twenty feet across and one hundred and twenty feet tall. The first five sections are of 3/4 inch steel, the second five sections are of 5/8 inch steel, the third five sections are of 1/2 inch steel, and the last nine sections are of 3/8 inch steel, and filled with water within ten feet of top. A. The steel tower weighs 258 tons, including the bottom, if also of 3/4 inch plate; 110 feet of water height weighs 1083 tons; together 1340 net tons, or 4 1/2 tons per square foot of its base.

(5996) C. & T. ask: 1. Are growing flowers and plants in bedroom injurious to health of occupants? A. There is danger of their being so. It depends on the plants. 2. Do coal ashes possess any value as a fertilizer? If not, are same injurious to soil? A. Little or none, except a mechanical value in clay, as loosening and lightening the soil. 3. How are roses propagated? A. They may be propagated by cuttings. We can supply Parson's "On the Rose, a Treatise on the Propagation, Culture and History of the Rose," price \$1 mailed.

(5997) C. N., Ontario, asks information regarding best appliance to use for elevating water in draining some low land. I wish to elevate over am from ditch, average lift about 20 inches, amount of water to be handled about 3 acres, covered to depth of say 10 inches, time for disposing of it, say 3 to 5 days. Would suction pump elevator buckets driven by chains and sprocket wheels, or cylinder with rotatory spiral, be preferable? Please give plan of construction of what you deem best. What amount of power would be required to drive it? Would a gasoline engine answer the purpose? Does a gasoline engine require attention after starting, or would it operate for several hours without attention? A. Assuming that you may have to lift 120,000 cubic feet of water 2 feet for clearance over the am, you will need to lift 90 cubic feet per minute for 8 days of 24 hours each, or 5 days of 15 hours each day. This is equal to 2,750 foot pounds per minute. Allowing 50 per cent for friction and loss, will require 1/2 of a horsepower. In the application of a gasoline or petroleum engine for this work a much larger power will be required by the commercial rating of such engines. A bucket breast wheel 5 feet diameter, 8 inches wide, with 15 buckets, shrouded on the sides, running in a one-fifth circle trough

at a speed of 12 to 15 revolutions per minute. Shaft extended with a sprocket wheel and chain from the engine shaft. Engine making 100 revolutions per minute. The gasoline and petroleum engines will work many hours without attention.

(5998) A. L., L'Epiphanie, P. Q., asks: Is it possible to boil water, bubbling as much as water in a kettle on a very hot stove, in an open vessel holding about 4 gallons, with steam at 50 pounds pressure? I do not want steam being mixed with said water. If there is any possibility to do so, please inform me how to do it. A. Yes; you can boil the kettle over with steam at less than 50 pounds pressure. Use a flat bottom kettle 14 inches diameter and any convenient height to hold the 4 gallons, say 8 or 10 inches. Make a flat spiral coil of 1/2 inch copper pipe, using 14 feet of pipe, each coil separated so as to allow of water circulation between the pipes; turn the ends up to clear the kettle and connect one end with the steam and the other end to waste, with a valve to keep back the pressure and drip away the water of condensation.

(5999) E. M. G.—Dr. L. O. Howard, Acting Entomologist, Dept. of Agriculture, says: The insect you sent is the common bag worm (Thyridopteryx ephemeriformis). It is in the egg state at present, the eggs being laid inside the cocoon from which the female moth may easily be destroyed by spraying with Paris green or London purple in the proportion of one-fourth pound to 50 gallons of water.

(6000) W. E. L. says: Please inform me of the best material to use to prevent the nitric acid from eating fine lines away in photo zinc etching for the greatest depth in quick work. A. Dust with powdered dragon's blood and heat until the etching ink and dragon's blood fuse. For full directions see Schraubstadter's "Photo-Engraving, with Copy for Photo-engraving," which we mail for \$3.25.

(6001) J. D. W.—The average rise and fall of the tide at New York is 4 1/2 feet. Liverpool, 20 feet 31 inches. London, 31 feet 10 inches.

(6002) A. G. P. asks: 1. How many caustic potash batteries of the large size described in "Experimental Science" will it take to run motor #41, and would they be a good kind of battery to charge storage batteries with, and how many will it take to charge 3 storage batteries like those described in "Experimental Science"? A. Ten or fifteen would run the motor. It would take twelve to charge 3 storage cells. 2. What is the voltage and amperage of battery described in SCIENTIFIC AMERICAN, April 11, 1893, page 230, with tin cell 6 inches by 5 inches? A. We have no exact figures. Allow 0.6 volt and 1/4 ohm internal resistance. 3. Is it a constant battery, and is there any action in the cell when the circuit is open? A. It is constant and unattacked on open circuit. 4. Should the zinc be amalgamated? A. No. 5. How long will it last in constant use? A. It depends on the current taken from it.

(6003) F. H. writes: I want to build a small electric motor of the Froment type, in which armature placed round the circumference of a wheel are successively attracted by an electro-magnet. During the day I want to use the motor. I have a battery (Fuller-Leclanche type) of 6 cells for an incandescent lamp. I think an electro-magnet of high resistance would prevent the battery from being exhausted so soon on the motor; if not, kindly give me the necessary instruction for this kind of motor. A. A high resistance motor would save the battery, but might tend to reduce the power. For electric motor construction we refer you to our SUPPLEMENT, Nos. 641, 759, 761, 767, 783, 844, 865, and to "Electric Motor Construction for Amateurs," by Parkhurst, price \$1; Botone's "Electro Motors," price 75 cents mailed. Your battery and motor should be adapted for each other.

(6004) G. C. W. asks: 1. Can an alternating current of electricity be taken from a sectional commutator? A. Yes; but at a disadvantage. 2. Can a continuous current be taken from a commutator, composed of rings on the armature shaft? A. Yes; under proper conditions, not as dynamos are ordinarily wound. 3. Why in a dynamo is one wire from each of two segments connected with one bar of the commutator? A. As a matter of mechanical convenience and to avoid sparking and to secure electrical balance. 4. Please explain a shunt-wound dynamo. A. The ends of the field wires are connected to the brushes, thus bringing the field and outer circuit in parallel.

(6005) C. C. S. asks: 1. Can small dynamo, say 75 light 16 candlepower, direct current, which refuses to start with no visible reason why it should not, be made to start by momentarily short-circuiting across brushes while at full speed, and why? A. If series wound, this will tend to send a heavy current through the field coils, and thus start the machine. 2. Is it good practice to connect 16 candle power lamps, 10 in series, direct from mains of 1,000 volt alternator circuit, and why? A. This is done for street lighting; it is bad practice in house lighting, as it involves a dangerous potential. 3. Have telephone transmitters been made which operate by the vibrations opening and closing a circuit around induction coil? A. The operation described is not adapted for telephoning, the variations are so sudden. 4. How is Edison carbon telephone made? A. See our SUPPLEMENT, No. 127. 5. Can spoofs for electro-magnets be made of tin tube with brass or copper heads and be as effective as made of paper or rubber? A. Yes.

(6006) H. D. W. asks: Can sulphate of magnesium (MgSO4) be decomposed into magnesia (MgO) and sulphuric acid (H2SO4) by passing superheated steam over the anhydrous MgSO4? How complete is the reaction and what conditions are most favorable to it? A. At a high enough heat the decomposition spoken of might be produced.

(6007) F. D. H. writes: How may I refill the tube of a barometer from which a part of the mercury was lost by the instrument falling? The tube is turned up at lower end, and has stopcock between bend and cistern. A. You will probably have to boil or heat strongly the mercury. The operation is a difficult one and should only be undertaken by an expert, as there is great danger of breaking the tube.

TO INVENTORS. An experience of forty-four years, and the preparation of more than one hundred thousand applications for patents, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices and particulars. We are provided with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 24, 1894, AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Table listing inventions and their patent numbers. Includes items like Alarm, Animal trap, Arm for crabs, Armature for dynamo, etc.

Table listing inventions and their patent numbers. Includes items like Fireplace heater, Fire pumps or engines, Fish traps, Flooring boards, etc.