chloride soldering fluid is made by dissolving the zinc in muriatic acid to saturation, and diluting the solution with an equal quantity of water.

(3370) S. E. W. asks if the current will decompose the ferrocyanide of potassium on the telegraph paper after it has dried. Have you any books on printing telegraph machines? A. Dry chemical paper is not affected by the current. You will have to add something to your ferrocyanide solution to keep the paper moist. Carbonate of ammonium is a suitable substance for this purpose. Prescott's "Electricity and Electric Telegraph" is a good work for your use. We can mail it to you for $6.

(3371) J. C. T. says: In Avery's "Elements of Natural Philosophy," page 441, I read: 1. "When melted cast iron is poured into a mould, it expands in solidifying and presses into every part of the mould. The traces on the casting are, therefore, as clear cut as they were in the mould." Is that statement correct? A. The statement is not correct. Iron shrinks in solidifying. The sharp impression from the mould is made by the fluidity of the metal, and the pressure produced on the mould, surface by the weight of the iron and the static pressure produced by the height of the gate. Thus a gate that is 10 inches high from the bottom of the mould, and kept full while pouring, gives a pressure of 2½ pounds per square inch at the bottom. It is this and the fine finish of the pattern that brings out the sharp detail in the casting. 2. In using the solar microscope what can be done to prevent the concentrated sunlight from burning the object? A. For a solar microscope, a water cell should be placed just before the condensing lens. Its thickness should be one-third the diameter of the condensing lens, made of two pieces of French plate glass set in a wooden frame with wax.

(3372) W. J. A. writes: 1. In making a resistance box for the eight-light dynamo how many ohms resistance is required to displace a 50 volt 16 candle power lamp? A. You will need about 50 ohms resistance. 2. What size wire (German silver) and how much is necessary? A. Use No. 26; you will require a little over ¾ pounds. 3. How can I make an automatic resistance controller? A. We shall have to refer you for this information to some of the works on electric lighting apparatus. The description of an automatic rheostat would occupy too much of our space.

(3373) E. A. C. writes: I have two handsome plaster images which have become badly broken. Can you tell me through your query column if I can repair them, and how it can be done? A. Wet the edges to be joined with water, coat them with a thick mucilage made of gum tragacanth, and place the edges together, allowing them to dry thoroughly. If any of the material of the image is lost, the deficiency may be supplied by applying a patch of plaster of Paris. The plaster should be mixed with water to form a thick batter and the edges to which the batter is applied should be wet.

(3374) H. R. asks for a sirup for making pop corn balls. A. Use simple sirup, which is made as follows: Take of white sugar 14 pounds (com.), water 1 gallon. Dissolve with the aid of a gentle heat, strain, and when cold add the whites of two eggs, previously rubbed with a portion of the sirup, and mix thoroughly by agitation. (The egg albumen is added to produce froth.)—From the "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3375) A. J. T. asks for pastes for razors. A. *a.* Paste for razors.—(Pradier.) Best putty powder 1½ ounce, jeweler's rouge 1½ ounce, scales of iron ¾ ounces, levigated Turkey stone 4½ ounces, beef suet 2¼ ounces. *b.* Put equal parts of dried sulphate of iron and salt in a closed vessel, and apply a gradually increased heat; pulverize, elutriate, mix with lard or tallow.—"Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3376) A. B. asks: 1. How can I test well water for injurious matter, animal or vegetable? A. Chemical and bacterial analysis is the best way of doing this, and even such analyses are not of absolutely certain interpretation. One simple method for a home test is to drop some sugar into the sample and leave it undisturbed. If it remains clear it is assumed to be of good quality, otherwise not. 2. What books can I get on that subject? A. We can supply you with Wanklyn's "Water Analysis," price $2; "Examination of Water for Sanitary and Technical Purposes," by Leffmann & Beam, $1.50 by mail post paid.

(3377) W. P. B. asks for a cochineal solution. A. Dissolve 1 gramme of cochineal in 75 cubic centimeters of 20 per cent alcohol. Alkalies will cause it to redden, and acids will bleach it.—From the "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3378) W. H. asks if there is any way of treating cotton or cloth to make them dry quickly, after being wet? A. We can only recommend treatment with paraffin, melting it into the pores with a hot iron. This will tend to shed water. It will for that reason prevent wetting, and so accelerate drying.

(3379) J. A. L. asks for the materials used for invisible writing which becomes distinct when heated. A. Numerous receipts are given for this. Simple lemon or onion juice answers very well. Dilute solution of cobaltic chloride or dilute sulphuric acid works well. The latter gives on heating an ineradicable mark.

(3380) T. McC. asks for a liquid gloss for harness. A. Glue 4 ounces, gum arabic 2 ounces, vinegar 1½ pints, black ink ½ pint, isinglass 2 ounces. Soften the glue by standing in 1 pint of the vinegar, dissolve the isinglass in the ink, dissolve the isinglass in a little warm water. Add the rest of the vinegar to the glue solution, then warm it until solution is obtained, add the gum and ink and next the isinglass. When all is warm and thoroughly mixed, remove from fire.

(3381) C. W. N. writes: Please state whether, in your opinion, lightning rods on a building are a benefit or detriment, with reason why. A. Properly constructed lightning rods are undoubtedly a protection. Such a rod not only receives the discharge and conducts it to the ground, but it also tends to prevent a disruptive discharge by diffusing the earth's charge into the air.

(3382) F. W. writes: Can you tell me of some kind of metal that will melt at a very low degree of temperature, so that it can be placed in the circuit of a telegraph line to guard the instrument from any heavy discharge which may take place through the wire from lightning or from crossing electric light wires? A. Fusible metal is made of lead 31, tin 19, bismuth 50 parts. A wire of common soft solder will probably answer your purpose.

(3383) D. K. P. writes: It is not generally supposed, I believe, that oil and rubber will mix, but I understand it can be mixed. Will you inform me how it can be done. A. By heating together, virgin rubber and linseed and some other oils will mix more or less perfectly. Dippel's oil, obtained by distillation of bones, is one of the first solvents for rubber ever suggested. We recommend "Rubber Hand Stamps and the Manipulation of India Rubber," $1 by mail.

(3384) W. G. S. asks: 1. How can I get copper oxide in a finely divided state, attached or made into a plate, for making a copper zinc storage battery, using alkaline solution electrolyte? A. You can procure black oxide of copper from any dealer in chemicals in this city. 2. How can this plate be thoroughly oxidized? A. The copper is oxidized before it is placed in the battery. 3. Would asbestos cloth do for the bag in which to place the copper plate? A. We think asbestos cloth will answer. 4 What fabric would be likely to stand the solution that would not be too porous? A. See answer above. 5. Can you give me a rule for winding a small motor, to get the best results, from two volts, and to take about one ampere when working? A. Wind you motor so as to give it a total resistance of 2 ohms. If it is a shunt machine, the field magnet should have about fourteen times the resistance of the armature. 6. With a given amount of pressure current and wire, would there be any gain in making an armature with teeth projecting between the windings? About what per cent, if any, could be gained by getting the armature close to the fields? A. This construction would give improved results. We cannot give the percentage of gain. 7. If weight is not a consideration in a small motor, what could be gained by using permanent magnets for the fields? If nothing could be gained, why, since it seems that there would be a gain with limited pressure, giving the armature all the current? A. The advantages of regulation would be lost by using permanent magnets. There is practically no economy in using permanent magnets.

(3385) G. P. writes: 1. In referring to George M. Hopkins motor in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, page 10240, April 14, 1888, what size of wire can I use on the field magnet, when the armature is of No. 22, and what kind of a battery must I use? A. This will depend upon the length of wire upon the armature, and upon when whether the motor is used as a shunt or as a series machine. Probably No. 26 would be about right for a shunt machine. Use 8 cells of large Bunsen battery or of plunging battery in series. 2. Can I make a bar commutator for the above motor, and what is the easiest way to make one? A. For the construction of a bar commutator consult SUPPLEMENT, No. 641. 3. Referring to Edison's dynamo and motor, of July 25, 1891, what is the use of the vulcanized fiber collars at each end of the field magnet winding? A. The fiber collars are for receiving the canvas cover.

(3386) W. McL. asks: 1. Why is a steamship funnel given aft rake? Has it any effect on the draught? A. The rake of the funnel is for symmetry with the masts, and also helps the draught. 2. What is the difference between plain wool and dyed wool? Does woolen underwear that is dyed red possess medicinal properties? A. We do not know of any special medicinal value in red flannel. 3. Will a piece of iron lodged in the corner of the eye work inward or remain stationary? A. Iron chips in the surface of the eyeball or skin are likely to remain there unless removed, becoming encysted. 4. If two safety valves are fitted on two separate pipes, one twice as large as the other, both valves same size and weight, and same pressure of steam in both pipes, which valve will blow off first, and give cause? A. The valves should all blow off at the same pressure, without regard to size of pipe.

(3387) J. B. B. says: Suppose a jet of steam be discharged from a tube, one inch in diameter, what force would the steam exert, coming in contact with a body to be moved? How large and of what strength would such a tube have to be constructed, to exert a force equal to one horse power? A. Steam issuing from an orifice at 100 pounds pressure has a velocity of 898 feet per second, and at 50 pounds pressure a velocity of 878 feet per second. As a 1 inch orifice is 0·78 inch area, the pressure would be less than 0·78 of the boiler pressure against a body in contact with the end of the pipe, but would rapidly decrease as the body moved away. Any ordinary iron pipe is strong enough, but should be larger than 1 inch from the nozzle to the boiler to prevent friction. At 50 pounds boiler pressure the total power of the jet would be possibly 25 horse power, from which 15 horse power may be realized. With the same pressure a jet nozzle of ¼ inch diameter would realize 1 horse power.

(3388) W. S. writes: I have a polishing head which I wish to use for sharpening and polishing surgical instruments, etc. I want to use emery, crocus, tripoli, and Vienna lime. With what should each be mixed to use on leather and felt covered wheels? How is Vienna lime used for polishing steel? A. Use the materials named with water for preliminary polishing, brighten with crocus and Vienna lime mixed with alcohol on cotton buff. The "Practical Gold Worker," and the "Silversmith's Manual," are the best books, $1.25 each mailed.

(3389) J. H. asks: What causes the hollow sound under foot while walking over the ground? There are several places in the immediate vicinity that are apparently as hollow as a drum for a space of ten feet square. A. A hollow sound is produced when the soil is made up of light material, such as dry leaves, especially the leaves of evergreen trees, or chips, shavings or sawdust. In some cases a horizontal seam in the rock near the surface will give the rock or the earth upon the rock a resonant character.

(3390) B. H. asks: 1. How can I make a condenser for a three horse power engine, the engine being in the cellar? I want to get rid of the steam, so as not to annoy my neighbors. I would like a very simple way to do it. A. For your condenser use a coil of iron pipe, say of 1 inch diameter and about 100 feet in length, arranged so that the air will circulate around it, and the water drip freely away. 2. I have a small lathe with one treadle, the balance wheel is 3 feet diameter, rim 3 inches wide by ¾ thick. I have attached the lathe to a grinding machine by belt; one man and a boy can run the machine at full speed for two minutes. Now what size steam engine will run this machine? A. You will need a nominally ¼ horse power engine, or a 2¼×3 inches cylinder. 3. Will one man and a boy develop ¼ horse power in the manner above? A. Yes. 4. I am making emery wheels by coating a wooden wheel with glue, then emery, and keep on until about ⅛ inch thick; is this emery wheel more or less liable to burst than a solid emery wheel? A. If your wooden frame is made of proper strength, it should be strong enough for the purpose, but not to be trusted at as high velocity as the best solid emery wheel, unless for small wheels of solid wood. 5. These emery wheels, when made of fine emery, glaze, and will not cut or polish glass; how can I make them so they will not glaze? A. Glass is not cut on solid emery wheels, unless they are made to run in water. For this purpose waterproof wheels are used. Glass should be cut with a lead wheel, fed with emery and water. Wheels that do not glaze must be made with a cementing material that will allow the emery to crumble from the wheel easily. Very light pressure should be used on emery wheels for all work. 6. How can I make a first class glue for belts? A. You will need nothing better than the best glue on sale, which should be of a light brown color and very tough when the pieces are bent in the hand. Put a few drops of glycerine in a pot of glue for gluing belts.

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