(3395) A. D. B. asks (1) how to make Trouve's battery, thimble size. A. A Trouve battery may be made by providing a plate of zinc, a plate of copper, and a series of sheets of blotting paper of the same size. Have enough sheets of blotting paper to make a pile ¾ of an inch thick. Separate the pile into two halves, soak one pile in a saturated solution of sulphate of zinc, soak the other pile in a saturated solution of copper, put the two piles together, place the zinc plate against the sulphate of zinc side and the copper against the sulphate of copper side. Inclose the whole in a suitable casing and connect a wire with each of the plates, and you have a Trouve battery which will yield a small current for a long time. 2. How to make very smallest battery that will generate current sufficiently strong to be felt if electrodes are applied to tongue or temple, and how long will it run without recharging, I mean a dry or moist battery? A. Probably a chloride of silver battery is capable of being made in as small sizes as any. Consult SUPPLEMENT, No. 157, for information on the chloride of silver battery. The current from any battery is not very perceptible to the touch unless used in connection with an induction coil. A very slight current, however, can be detected by the tongue. 3 What material makes good terminal electrodes? I mean, by terminal, the end of the wires. A. Platinum or carbon would make good terminal electrodes for the ends of the wires. 4. Will the three pieces of electric light carbons 4 inches long, wrapped with one layer of felt and inclosed in amalgamated zinc tubes, contain enough moisture when saturated with solution to generate a current? If so, for about how long without dipping them in solution, and how shall I fix carbons? Would it be necessary to inclose the tubes in anything? A. The battery you describe, if charged with a solution of chloride of ammonium, would work for a few minutes. 5. What makes best battery solution to dip an absorbent material in to use in a dry or moist battery? A. See description of Trouve battery above.

(3396) G. W. V. writes: 1. I have made an electric motor like the one described in 641, and I have wound the magnet and armature with No. 18 bell wire, and would you let me know if that would hinder it from going, because I did not use bell wire? A. The insulation on bell wire is very heavy, and occupies so much room on an armature or field magnet as to prevent winding enough wire in the allotted space. Besides this difficulty, it removes the wires too far from the cores of the field magnet and armature. 2. Would you let me know the difference between bell wire and magnet wire? A. Bell wire or office wire is provided with a single or double covering of cotton braided upon the wire and occupying about four or five times the space needed for covering which is sufficient for magnet wire. Magnet wire is provided with a single or double covering of cotton or silk, which is quite thin. 3. Would you let me know how to make carbon plates and mould zinc plates? A. For information on making carbon plates consult SCIENTIFIC AMERICAN, vol. 60, page 307, or "Experimental Science." You can cast your zincs in a metal mould, or in a sand mould if you have a suitable pattern. 4. Would you let me know how many half pint cells it would take to run the motor I referred to? I used eight. A. Half pint cells are rather small for running the motor referred to. It would require a large number connected up in parallel to equal one cell of large battery. It would be better for you to construct larger cells, such as you will find described in SUPPLEMENT, No. 792. 5. Let me know how to make a paint or compound that would be suitable to paint the inside of a wooden cell for a bichromate battery. A. A wooden battery cell may be rendered acid-proof by soaking it in paraffine, filling in the corners well with melted paraffine. Another method of protecting a wooden cell is to coat it with coal tar pitch. Wooden cells are not very desirable, as they are sure to fail after a time.

(3397) J. S. L. asks how to fasten rubber rolls on clothes wringers. A. Clean shaft thoroughly between the shoulders or the washers where the rubber goes on. 2. Give the shaft a coat of copal varnish between the shoulders and let it dry. 3. Give shaft a coat of varnish and wind shaft tightly as possible with five ply jute twine at once, while varnish is green, and let it dry for about six hours. 4. Give shaft over the twine a coat of rubber cement (see receipt below) and let it dry for about six hours. 5. Repeat 4. 6. Remove washer on the short end of shaft, also the cog-wheel if the shaft has cogs on both ends. 7. See that the rubber rolls are always longer than the space between the washers where the rubber goes on, as they shrink or take up a little in putting on the shaft. 8. Clean out the hole or inside of roll with benzine, using a small brush or swab. 9. Put the thimble or pointer on the end of shaft from which the washer has been removed, and give shaft over the twine and thimble another coat of cement and stand upright in a vise. 10. Give the inside or hole of roll a coat of cement with a rod or stick. 11. Pull or force the roll on the shaft as quickly as possible with a jerk, then rivet the washer on with a cold chisel. 12. Let roll stand and dry for two or three days before using same. Cement for use should be just thin enough to run freely. If it gets too thick, thin it with benzine. For rubber cement dissolve pure unvulcanized rubber in pure spirits of turpentine. From "The Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3398) W. S. asks: 1. What gas has the greatest lifting and lasting power and how long will it retain its virtue? A. Hydrogen gas has the greatest lifting power, if it may be so expressed, of any gas. There is no question of its "lasting power." Any gas of lower specific gravity than air will last forever. Leakage and diffusion through the pores of the balloon causes the gas to escape and apparently "lose power." Hydrogen escapes thus faster than any other gas. No limit of time can be assigned, as all depends on the envelope or material of the balloon. 2. Would it be possible to inclose it so that it would not waste? A. This has never yet been successfully accomplished. If the metal could be worked thin enough, a copper balloon, which has actually been suggested, would retain hydrogen.

(3399) I. S. A. writes: 1. My cistern sprang a leak and I put about a peck of bran in to stop it. Now the water has spoiled, it smells bad and is harder than before. What is the matter, and can it be purified and how? A. Pump it out, clean it, and stop the leaks with cement. The bran we presume has fermented and occasioned the trouble. 2. Can glass be cast perfect enough to make an air-tight joint without any grinding after casting? A. No.

(3400) Amateur Stone Cutter asks for a method of polishing Vermont marble. I have a small monument cut out of it, rubbed down ready for polishing, and I can't go any further, as I don't know what is used for polishing or how to use it. Also, in rubbing down face to a fine surface it shows an open seam 3 inches or 4 inches long. Would like to know if there is any preparation used by polishers to fill small cracks before polishing, and what it is? A. After rubbing the marble down with fine sand, use pumice stone, either powdered and applied with a felt rubber or in its natural state in the form of a lump with a plane surface. After smoothing with pumice stone, polish with putty powder and water. The cracks may be filled with Portland cement mixed with marble dust, or with a cement formed of oxychloride of zinc. This cement is made by mixing oxide of zinc with a strong solution of chloride of zinc. It is applied in the same manner as putty. You can tint the cement by adding to it while mixing it any of the dry pigments used in painting.

(3401) J. A. P. asks: What size wire should a telephone magneto armature be wound with to run on a 110 volt circuit filled with 4 magnets instead of 2; also what number will it be? A. A magneto machine cannot be used as a motor without providing a commutator to change the direction of the current. For information on this point consult SUPPLEMENT, No. 161. The armature should be wound with No. 30 wire, a sufficient quantity being used to secure a resistance of about 220 ohms. It will have about one-fourteenth of a horse power.

(3402) W. B. Y. asks: Will you please tell me how to make gold and silver alloy, that which is most fusible, and will make the brightest and smoothest castings? A. Silver melts at about 1800° and gold at about 2300°. You can make any mixture to suit the color desired, or you can add a little copper to make a cheaper alloy of a deep gold color. Any of these alloys melt at about 2000°. For details of the alloying of gold and silver with other metals, see the "Practical Gold Worker," $1.25, or "The Silversmith's Handbook," $1.25.

(3403) L. H. P. asks: 1. What kind of acid or chemical is used to write a name on a steel knife blade, and not be defaced by time or use of blade? A. Use nitric acid and water equal parts to etch your knife blade. 2. Is there a good treatise on dairy work, and what is its price? A. We can mail "Handbook on Milch Cows," for $1, and Stewart's "Dairyman's Manual," $1 mailed.

(3404) G. L. asks: Will you please tell me the best way to get rid of worms? We have a beautiful lawn for tennis, but the worms make it almost impossible for us to keep it in good shape. I was advised to try lime, and to put it on when the worms are out at night. We have tried it, and I am sorry to say not very successfully, as it does not kill them unless they get a great dose. It occurred to me that you may be able to tell me what will do it and not kill the grass. A. Reply by Prof. C. V. Riley.—Your ascribing the injury to worms which you say are out at night would seem to indicate that the depredators are the common earth worms or angle worms. Grass lands, however, are frequently injured by the larvæ of May beetles, though these do not ordinarily leave the soil. One remedy for angle worms and also for white grubs is to thoroughly wet the ground with the kerosene emulsion, the formula for the preparation of which has been published in the SCIENTIFIC AMERICAN. A few years ago very successful experiments were conducted with this emulsion on the lawns of the Capitol grounds, and an account of the results is given in the periodical bulletin of the Division of Entomology, *Insect Life*, vol. 1, No. 2. This report will give you the necessary details for the application of the emulsion. The larvæ of May beetles feed on the roots of grasses, and are very injurious to lawns. The earth worms, on the contrary, feed on the earth and the vegetable humus in the soil, and are constantly carrying the soil, through their excrements, from the lower layers to the surface, and as has been shown by Darwin, they are by this means of positive advantage to lawns under certain circumstances. When, however, they interfere with any special object, as in your case, they must be considered hurtful, but beyond the use of lime and kerosene emulsion, as here indicated, I do not know any way of getting rid of them. Heavy rolling will doubtless tend to neutralize their effects, and large numbers of them may be captured at night by means of lanterns, especially after a good rain. They come out of their burrows, under such circumstances, and may be killed in large numbers by any one who is at all quick and active.

(3405) Serouky says: As I incessantly meet with the following difficulty in developing dry plates, will you oblige me, through the columns of your valuable paper, with the information as to the cause and remedy? In developing, the image is slow to make its appearance, indicating under exposure, then comes up gradually until it reaches a certain stage, when fog seems to take hold, and the image continues to develop slowly but uniformly, indicating over exposure, and the result is a flat negative. The trouble is not in the light, and I am convinced that it rests in the exposure or development. I have tried less exposure and the result is under-exposure with heavy contrast. Hence my opinion of its being in the development, and yet I follow strictly the formula coming with the plates. A. If you use the eikonogen developer made up:

Eikonogen	1 oz.
Sulphite of sodium	1 "
Water	30 "

and pour this on the plate without the addition of any carbonate of potash or carbonate of soda, as is usually specified in the plate formulas, and then get the foggy and flat negatives that you describe, the cause is probably due to a poor grade of emulsion on the plate, or to a leakage of weak light through the bellows of the camera. If the emulsion is defective, the rabbet edges of the plate which are not exposed in the camera will fog over just the same as the exposed portion. Old plates poorly packed in ordinary pasteboard boxes separated by strips of card board will fog, because of the deleterious chemicals in the separators. If the plate is under exposed, simply add a few drops of a carbonate of potash solution (1 ounce dissolved in 3 ounces of water) to the above solution and try a fresh box of plates. We have had plates act precisely as you describe and obtained passable but foggy negatives by leaving them in the developer for some time. The edges protected by the rabbets of the plate holder fogged over. We proved the fault to be a defective emulsion on the plate. Another box of the same manufacturer's plates worked under the above developer as beautifully as could be desired.

(3406) S. A. D. asks: 1. What is the ferro-prussiate paper used for in photography, and how is it used? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 584, for full particulars. 2. How long (about) must a Harvard dry plate be exposed on a medium bright day? A. One second exposure with *f*-32 stop in an 8 inch equiv. focus lens, on an ordinary open landscape should be sufficient. Much depends on the subject, the time of day, the lens, and the size of the diaphragm used. 3. How long after the exposure must the developer be applied? What is next done with them? A. After exposure, if the plates are removed from the holders and packed, film sides in contact with each other and surrounded with waxed paper, then placed in a box, they may be preserved for two years before developing. In general it is advisable to develop the exposures as soon as it is convenient to do so. After the plate is developed, the image is fixed by immersing it in a bath of hyposulphite of soda, one ounce to six ounces of water. Then it is washed for an hour and dried. From the negative in a printing frame the photographs are printed on and sensitized in the sun.

(3407) O. S. P. asks: 1. What makes black spots on photographic negatives? Red spots on the prints? A. Blackspots may be caused by particles of iron settling on the film when japanned iron developing trays are used, or to particles of foreign matter being embedded in the film. Red spots on prints are due to too weak a toning bath, or to insufficient toning, or to failure to move the prints around in the bath. 2. What is the best material for dusting and polishing camera lenses? A. Use an old clean cambric handkerchief to remove dust, brushing the lens lightly with it. 3. What will take photograph stains off the fingers? A. If the stains are caused by the pyro developer, they can be removed with a dilute solution of citric acid. 4. What causes reddish brown dust to appear on negatives when drying? A. The reddish brown dust is probably a precipitate of iron deposited on the film, provided the plate was developed with the ferrous oxalate or iron developer. It may be removed by immersing the plate in dilute solution of sulphuric acid and water.

(3408) W. F. asks: 1. How to compute the horse power of an engine? A. Multiply the square of the diameter of the cylinder by 0·7854, and this product by the mean pressure in the cylinder. The mean pressure, assuming the usual practice in small engines at five-eighths cut-off, will be 0·92 of the boiler pressure. Multiply the last product by the speed of the piston in feet per minute and divide by 33,000 for the horse power. 2. How much power would an engine have that has a 3×5 inch cylinder, with 50 pounds pressure per square inch on the piston head, and making 100 revolutions per minute? A. For your engine this would be $\frac{3^2 \times 0{\cdot}7854 \times 100 \times 0{\cdot}92 \times \frac{5\times 2}{12} \times 100}{3{,}3000} = 1{\cdot}6$ h. p.

3. Give the ingredients of a crucible for melting brass. A. For a crucible use finely pulverized plumbago well kneaded with 10 per cent of pipe clay or porcelain clay, and baked at a red heat after drying. 4. What is Stourbridge clay? A. Stourbridge clay is used also for crucibles. It comes from England. 5. How much heavier is common brass than common pine wood? A. Brass weighs 16 times the weight of the pine pattern. 6. About how many pounds of brass could I melt with a good sized fan run by hand? A. If you use a properly made furnace, you may melt 100 pounds. In a forge with loose brick chamber you may melt 5 to 10 pounds. 7. What should the diameter and weight of a fly wheel be for an engine with a 3 inch by 5 inch cylinder? A. Fly wheel 20 inches diameter, weight 40 pounds. 8. What would be the safe carrying pressure per pound on the piston head of a cylinder ½ inch thick? A. 100 pounds on cylinder of size mentioned. 9. What is granulated lead, and how is it made? A. Make granulated lead by pouring melted lead into water in a small stream. 10. How can I purify common lead? A. Purify lead by melting and pouring off from the ladle just before it sets.

(3409) Reader asks: Is there such a thing as an effective hair invigorator, and has there ever been any article on this subject published in the SCIENTIFIC AMERICAN or SUPPLEMENT?

A.

Quinine sulphate	20 gr.
Tincture of cantharides	2 fl. dr.
Fluid extract of jaborandi	2 " "
Alcohol	2 fl. oz.
Glycerine	2 " "
Bay rum	6 " "
Rose water	15 " "

The quinine is dissolved in the alcoholic liquids by warming slightly, then the other ingredients are added.

Astringent Hair Tonic.

Tannin	1 dr.
Tincture of myrrh	1 fl. oz.
Glycerine	5 " "

From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press. See also SUPPLEMENT, Nos 388, 436, and 396.

(3410) J. C. B. writes: Can you explain the working of a small toy sampan or boat sold here in Japan? The bottom of the sampan seems to be made of thin copper, and a reddish paste is sold with it, which is smeared over the stern of the boat, and when the little craft is put on water, it gayly sails away. The paste smells like a mixture of camphor and ammonia. Can you tell its probable composition and what reaction occurs when it unites with water? A. The principal agent in the above composition is undoubtedly the camphor, which acts by modifying the surface tension of the water, as in the familiar camphor motions. Its exact composition cannot be deduced from a mere description. It would be an interesting subject for experimenting.

(3411) J. J. C. asks: 1. How to prepare nitrous oxide gas. A. Nitrous oxide is prepared by heating ammonium nitrate in a suitable flask. 2. Will No. 16 German silver wire do for the resistance wire in a Wheatstone meter bridge? If so, what is the highest resistance it will accurately measure with a hundred ohm coil for the third resistance? A. No. 16 German silver wire will answer. You can probably measure resistances up to 500 ohms with a meter bridge, using wire of the size given. 3. What should the resistance of a motor be to be run by 16 cells with each an E. M. F. of 1·83 volts and an internal resistance of one-fifth ohm? A. The resistance of the motor should be the same as that of the battery. The power in watts is obtained by multiplying the E. M. F. in volts into the current in amperes. 4. Will German silver wire do as well for the 50 and 100 ohm coils in the tangent galvanometer described in "Experimental Science," as copper? A. It is best to use copper coils in a galvanometer, and if resistance is needed, to insert it in the circuit outside of the instrument.

(3412) C. A. M. writes: 1. Please give the chemistry of a blue print made from a citrate of iron, ammonium and prussiate of potash solution. A. The action of light reduces the ferric salt to a ferrous salt, which latter produces a blue color with ferri-cyanide of potassium. 2. Please give directions for making a photographic camera, or name some good books giving full directions. A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 625, 670, 507, for photographic cameras. 3. In the SCIENTIFIC AMERICAN of August 29, 1891, query 3313, it says, "Incessant vigilance and putz pomade are to be recommended as a preventive of rust on bicycles." As I understand it putz pomade is very bad for nickel. We had some nickel plated water cocks, and on using the pomade the nickel was soon worn off. A friend who works in a large nickel plating establishment has told me never to use putz pomade on silver or nickel plated goods. A. Putz pomade is recommended and sold by the bicycle trade. It should be used sparingly. Careful wiping is the principal point in the preservation of the plating. 4. Will wood alcohol dissolve shellac, and make a colorless film on applying to wood? A. Wood alcohol dissolves shellac, is nearly colorless as a wood varnish, but sinks into the pores of the wood. 5. On page 70, SCIENTIFIC AMERICAN of August 1, 1891, you say that mineral oils are better than sperm oil for lubricating. Please name a good mineral oil for a bicycle, its expense, where obtained, and whether it will need thinning down, and if so, with what? A. Cylinder oil or sewing machine oil, which can be had from sewing machine agents, is good, and requires no thinning.

(3413) F. E.—Bromide prints may be toned a sepia color, if, after development, and before fixing, they are slightly bleached with a solution of bichloride of mercury. After washing fix in a solution of hyposulphite of soda 1 ounce, water 6 ounces.

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September 15, 1891,

AND EACH BEARING THAT DATE.

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

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