

Inks, and consist of nigrosine, soluble, dissolved in sufficient water; a little sugar or glycerine can be added to make it a copying compound, but we doubt if good copying ink can be used with such a pen long.

(9) E. H. B. asks a good and cheap way to prepare a soft pine floor to be used for a skating rink; want something to fill cracks with, that will stay. A. We know of nothing better than the wood itself. The floor plank should be dry and well driven together. No cement that we know of will make a solid filling suitable for roller skating. We advise the use of maple for the floor; white pine is too soft.

(10) H. S. asks how to use the tin foil which comes round tobacco, for soft soldering? A. Add 50 per cent of tin. 2. How is Vienna lime used to polish steel? A. Wet the Vienna lime to a paste. Apply to buff, and finish dry.

(11) M. D. L. M. desires a receipt for clearing and purifying sorghum molasses that is old and glutinous with dregs settled at the bottom. A. First blow the molasses up with steam, then neutralize with lime, and inject sulphurous oxide, which will bleach the mixture, and finally run through the bag filters and boil down.

(12) W. H. A. asks: Is there a process for reworking or improving stale or inferior butter? A. Butter that is rancid may be restored, or in all cases greatly improved, by melting it in a water bath with some freshly burned and coarsely powdered animal charcoal (which has been thoroughly freed from dust by sifting), and straining it through clean flannel. A better and less troublesome method is to well wash the butter first with some good new milk, and next with cold spring water. Butyric acid, on the presence of which rancidity depends, is freely soluble in fresh milk.

(13) C. H. K.—We are not acquainted with the compound mentioned, but presume that it is similar to the menthol cures recently placed on the market. These are prepared as follows: Neuralgia cures are usually composed of menthol or a mixture of menthol, thyme, and eucalyptol to about equal parts of paraffine or spermaceti. When applied a burning sensation similar to that of menthol is first produced, generally followed by relief.

(14) H. D. J. asks (1) a formula for making a paint or cement, acid proof, for lining wood bath vats for plating. A. The following is from one of our back numbers: Melt together 1 part pitch, 1 part resin, and 1 part plaster of Paris (perfectly dry). A good asphalt varnish, if allowed to dry properly and completely, will also stand. 2. What is henequin, mentioned in SCIENTIFIC AMERICAN of December 6? A. Its botanical name is Agave sisalana, or, as it is more commonly called, Sisal or grass hemp.

(15) J. H. R.—Dust on belts is sometimes a source of trouble, but we can give no better advice than to try and keep a belt as nearly as possible in the condition in which a good manufacturer would furnish it, by occasional treatment with a little castor oil. Most of the slipping of belts comes from their being overloaded, or not properly laced up after the "stretch" has been taken out of the leather.

(16) M. S. asks (1) if there are any means by which I can construct a sand blast for the manufacture of small glass signs, and if so, how shall I go to work to make it? Can I mould small glass letters in a plaster Paris mould? A. You will find the sand blast described in SCIENTIFIC AMERICAN of January 29, 1881. Articles in glass are generally cast in metallic moulds, or else in wooden forms, and we do not think that plaster would be suitable. 2. I saw in a back number of the SCIENTIFIC AMERICAN a formula for an etching ink for glass. Where can I get it prepared? A. A description of the etching ink is given on page 211 of SCIENTIFIC AMERICAN, for April 5, 1884. It can be prepared by any competent pharmacist.

(17) E. N. N. writes: On page 299, in answer to No. 27, you say that a bar placed square is as 673 to 568 to a bar of same size placed diagonally. I am very desirous to know whether this is the case. Take, for instance, a buggy axle 1 inch, and place it square; will it require more strain in usage to bend that, than though placed diagonally? I see some of the express companies' wagons have the axles diagonally, and was about to have some spring wagons so made, when I chanced to see the answer above referred to. A. The answer is correct. The diagonal arrangement of axle is derived from the idea that the principal strain is neither horizontal nor vertical, but compounded of both, as you will see by analyzing the direction of the thrust when a wheel strikes an obstruction. You will find it as nearly as possible in the direction of the lines of the square when placed in the diagonal position.

(18) F. M. B. writes: I wish a receipt for making hard water soap, which will equal or surpass any used in this country, where alkali water prevails. Tallow is the grease I wish to use. A. It will be found exceedingly difficult to prepare a soap, such as you desire from tallow; coconut oil is generally used. The following, however, is a reliable recipe, being the formula for Dawson's Patent Composite Soap: Strong potash lye, 75 pounds; tallow, 75 pounds; coconut oil, 25 pounds. Boil until the compound is saponified in the usual manner, and perhaps may prove satisfactory.

(19) R. W. asks: What will remove coal tar from the surface of hot water heater pipes, in a greenhouse? The fumes from the tar destroy the plants. What treatment would you recommend under the circumstances? A. There is no safer way to remove the coal tar than to scrape it off the pipes with steel scrapers. You may wash it off with benzine or naphtha, but you will have to let the heat down, as the evaporation of the benzine or naphtha will give more trouble than the coal tar. The coal tar ought to dry in a short time, and thus relieve you of the trouble.

(20) S. E. F. asks for a receipt for waxing soap wrappers after they are printed. A. Ordinary waxed paper is prepared by placing cartridge or other paper on a hot iron, and rubbing it with beeswax or by brushing in a solution of wax in turpentine. On a large scale, it is prepared by opening a quire of paper flat upon a table, and rapidly ironing it with a very hot iron

against which is held a piece of wax, which melting runs down upon the paper and is absorbed by it. Any excess on the topmost layer readily penetrates to the lower ones.

(21) H. J. writes: 1. I have made dynamo-half larger and similar to that in SUPPLEMENT No. 161, fields wound with No. 12, armature with No. 16. It does not work satisfactorily; will only heat about one inch of No. 36 iron wire to a bright red. Is built according to plan in every particular, except the space between poles of field magnets is only 1/2 inch instead of 1 1/2 inches; as in plan. Is this the defect? It is about the only one I can find; have wound armature with Nos. 12 and 20 with no better success; speed 1,495 revolutions per minute, runs noiseless with open circuit, but rumbles when closed on short circuit; slot in commutator 1/2 inch out of square. Insulation good between magnet cores and wire, as tested by telephone and battery. Can you help me discover the difficulty? A. Your difficulty probably arises from having the poles of your field magnets too near together. 2. About how many 10 candle power lamps (incandescence) ought it to run? A. It might run two such lamps, provided the speed of the armature was sufficiently high. 3. What kind of steel is used for permanent magnets, and how tempered, especially telephone magnets? A. Chrome steel is considered the best. The magnets are hardened only at the ends, and drawn to a light straw color. 4. Can I make a louder speaking receiver than Bell's form, something to be heard across an ordinary room? A. We know of no telephone receiver that can be heard at any great distance, excepting Edison's Electro Mechanical Telephone; if you succeed in making a telephone that can be heard distinctly across the room, you will have produced something far in advance of anything we have at present.

(22) H. A. F. asks: 1. What is the microphone used for? A. Many of the telephone transmitters now in use are simply microphones. 2. On what principle is it constructed? A. A microphone consists mainly of two pieces of carbon or other semi-conductor placed loosely in contact with each other and vibrated by a diaphragm to which one of them is attached. See SUPPLEMENT, Nos. 163, 400, 347. 3. Is it of any great value as a scientific discovery? A. Yes. 4. Do you think there is much room for improvement on the telephone? Would you think it worth while to try? A. Certainly telephones better than those now in use are required, and any marked improvement would be sure to pay.

(23) E. M. H. asks for the method of finishing picture mouldings. Of what is the first or (as I suppose) plaster of Paris coat composed and how applied, and of what is the composition of the gilt and dark finish? A. The composition for mouldings is prepared as follows: Mix 14 pounds of glue, 7 pounds resin, 1/2 pound pitch, 2 1/2 pints linseed oil, 5 pints of water, more or less according to the quantity required. Boil the whole together, well stirring until dissolved, add as much whiting as will render it of a hard consistency, then press it into a mould, which has been previously oiled with sweet oil. No more should be mixed than can be used before it becomes sensibly hard. Gold size is then put on, several coats being considered necessary, then the gold leaf itself, which is burnished in course of time, and finally covered with finishing size.

(24) H. L. K. asks a receipt for making photo dry plates, emulsion process. A. You will find this information given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 205. 2. Also a book or manual on fancy dyeing, consisting of, namely, silks, satin, etc., giving receipts for manufacturing the dyes, and their substance. A. There are many books on this subject. One of the best is: The American Practical Dyer's Companion, by F. G. Bird, price \$10.00; the Dyer and Color Maker's Companion, 12mo, \$1.25, is a much smaller book.

(25) S. A. D. desires a colorless lacquer for yellow cedar and a good ebony stain. A. For a colorless lacquer: Dissolve 2 ounces gum sandarac and 1/2 ounce gum mastic in one pint alcohol. When dissolved add 5 drops glycerine. For the black: Take four ounces shellac, 2 ounces borax, and boil in half gallon water until dissolved, then add 1/2 ounce glycerine, and finally sufficient aniline black; soluble in water. This stain gives very satisfactory results if properly used.

(26) M. W. asks for receipt for darkening new mahogany to imitate old mahogany. A. To darken mahogany: Put 2 ounces of dragon's blood, bruised, into a quart of oil of turpentine; let the bottle stand in a warm place, shake frequently, and when dissolved, steep the work in the mixture.

(27) R. asks about how much kaolin is used in America, and how much is exported. How much does it bring per ton, and where can it be sold? What per cent of iron is required in ochre for paint? A. No exact information as to how much kaolin is used or the quantity exported is obtainable. Its value depends upon its quality, which varies widely. The iron ochers contain from 30 per cent of iron oxide upward. Their value depends largely upon their condition, whether soft and free from grit, etc.

(28) W. G. McC. asks how to make luminous ink with phosphorus, and how to use it—the very best process. Is there any way to make it the consistency of beeswax, so one could mark on paper, the mark showing only in the dark, and use it with safety in handling? A. Phosphorus itself can be used to mark on paper and then can be distinctly seen at night, but it is a dangerous substance to handle. We believe there have been no successful attempts at making either luminous ink or paint in this country, though the latter is made in England and handled by a large New York house.

(29) H. S. writes: October 25, 1884, in answer to query No. 22, you gave directions for making a reversed blue print, also black lines on white ground. I tried them both, and inclose samples of each, a fat failure. What is the trouble? A. If properly followed, the process will give good results. The samples sent show too long an exposure, and have apparently been prepared by the blue process itself.

(30) J. M. asks for some process by which lamp chimneys can be hardened. A. Glassware of all kinds is annealed by gradual heating and subsequent

slow cooling. The operation at the works sometimes takes quite a long while. For practical purposes an easy method consists in simply putting the chimneys into cold water, and slowly heating until the water boils and then allowing the water to cool again. This operation repeated several times will bring about the desired result.

(31) C. C. H. asks: What will remove claret wine stains from linen table cloths and napkins, also from body Brussels carpet? A. Apply a little table salt to the spot stained, and also moisten it with sherry. After washing, no trace of the stain will be left. The acid contained in the claret decomposes the salt, setting free chlorine (bleaching gas), which removes the vegetable coloring matter of the wine. See also table giving directions for removal of various stains in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(32) H. D. J. writes: Can water and sweet oil or castor oil be thoroughly amalgamated without showing their separate parts and qualities? What is the smallest amount of water that will thoroughly dissolve 1 ounce potassa permanganate crystallized? This solution being made, how can it be mixed with oil without showing the resistance of the water to combine itself with wax? A. Neither castor oil nor olive oil is soluble in water. Sometimes a small proportion of water can be mixed with the oils, but not satisfactorily. One part of potassium permanganate is soluble in 16 parts of water at 15° C. The oils would decompose the potassium permanganate, and therefore we do not see how a satisfactory mixture can be prepared.

(33) P. W. J. writes: I want to make a telescope. 1. What is the best lens—a double or plano-convex eye glass? A. For full information on the construction of a telescope, see article on this subject in SUPPLEMENT, No. 252. Use an achromatic object glass, which consists of a double convex crown glass lens and a plano or concavo convex flint glass lens. 2. What is the meaning of 1 inch diameter, 2 inches focus lens? A. The diameter of the lens would indicate its breadth, and the focus of the lens as generally understood is the principal focus, or the point at which the image is produced. 3. What size object glass will the above require, and what will be its power? Also what length tube will it require? A. It is probable that a 2 1/2 inch object glass will meet your wants.

(34) E. C. asks how to make extract of lemon and extract vanilla such as is used in cooking. A. Extract of lemon is prepared by exposing four ounces of the exterior rind of lemons in the air until partially dry; then bruise in a Wedgwood mortar; add to it two quarts deodorized alcohol of 95°, and agitate until the color is extracted; then add six ounces recent oil of lemon. If it does not become clear immediately, let it stand for a day or two, agitating occasionally. Then filter. For the vanilla, cut one ounce vanilla into small pieces and triturate with two ounces sugar to a coarse powder; put it into a percolator, pour on it diluted alcohol until one pint has run through, then mix with one pint spirit.

(35) E. M. C. asks: Is there any way of softening the putty on old sash so as to get the glass out without breaking? A. Take 1 pound of American pearl ash, 3 pounds of quick stone lime; slake the lime in water, then add the pearl ash, and make the whole of the consistency of paint. Apply it to both sides of the glass, and let it remain for twelve hours, when the putty will be so softened that the glass may be taken out of the frame with the greatest facility.

(36) G. W. B.—I notice in your paper of December 13, that G. W. B. asks what will prevent shellac from turning dark after being mixed for some time. Tell him to keep his shellac in a glass or earthen vessel, and see that his brush is neither tin nor iron bound, and he will have no difficulty; it is contact with iron that turns the shellac dark.—E. W. L.

(37) R. N. writes: I have been requested to refer a disputed question to you. It is this: A tubular boiler 60 inches diameter by 14 feet long, set in brick, 60 3/4 inch tubes, stack 30 inches diameter, 48 feet high, ample grate surface, fuel common pine (not fat pine). Evaporates 3,607 pounds water in one hour. Temperature of water feed by injector 76°; injector run by steam from boiler. What horse power is the boiler? A. Your boiler is 60 horse power.

(38) S. L. asks if it is possible to construct a working model of a compound condensing screw engine (two cylinders, say 3/4x1 1/2 for small, 1 1/2x1 1/2 large), and says: "I am told that it will not work unless I can raise steam to 90 pounds, and there is difficulty in the expansion also." A. Your engine is entirely too small to gain any advantage from the compound form.

(39) A. V. R.—We are of the opinion that of two stoves exactly alike, the one with thin clear mica around the upper part will radiate more heat through the mica than would be radiated if the panels were filled with iron. Iron gives out the most heat by convection, or the circulation of air over the surface. It is also a stronger radiant than mica, but the mica has the advantage of being transparent to the direct radiation of a red hot fire.

(40) A. C. G. asks if there is anything that I can add to a solution of nitric acid that will stop its action on metals, the article added not to exceed one-quarter the weight of the acid, and to thoroughly mix with it. A. You can neutralize the effect of the acid by adding any of the alkalis; the carbonate of soda or commercial soda ash will probably be the least expensive. Dilution by water is likewise an excellent plan. Heat the solution until the nitric acid is driven off and then add water, will perhaps be found suitable.

(41) F. J. R.—For your safety valve multiply the area of the valve by the pressure that you wish to carry, divide this sum by the weight of the ball in pounds. The quotient will be the number of times that the distance of the ball should be from the fulcrum, in parts of the distance of the center of the pin from the fulcrum. To get the area, square the diameter and multiply by 0.7854. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 13, "How to Set a Slide Valve." We do not know what you mean by 6, 8, and 10, unless to make a square. Any other numbers will answer that have the

same proportion. Practice has found these the most convenient.

(42) L. R. writes: The arm below the elbow of a statue, solid as being of stucco, is broken. I tried to stick a loose small piece with plaster of Paris, but failed; it gets dry before I manage to adjust it. Would you suggest a remedy? A. We think you were right in using plaster of Paris. Mix finely powdered plaster of Paris into a cream with water, and apply it at once; will probably prove successful. Yellow resin 2 parts melted and stirred in with an equal amount of plaster of Paris is sometimes used. In the latter case the cement is to be applied hot, and the surfaces to be united must previously be heated.

(43) S. W. F. writes: What is the remedy to remove warts and moles from the face and not be injurious to the skin? A. Croton oil under the form of pomade or ointment, and tartaremetic under the form of plaster or paste, have been extensively employed for the removal of moles. For warts see SCIENTIFIC AMERICAN of October 3, 1883.

(44) D. S. C. asks what the difference is between whiting and Paris white, or sometimes it is called cliffstone, or what is the difference between it and common chalk, and why is it called Paris white? A. Whiting and Paris white are practically the same article in different degrees of fineness, both being simply chalk, ground, elutriated, balled, and dried. Cliffstone is a better and harder variety of chalk, and is the one generally used for the preparation of Paris white. The Paris white is considered the better article; it is more carefully washed and more slowly dried than the ordinary whiting.

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