

(16) J. H. C. asks how the direct and first shadow of an object can be diminished in size. A. Only by lenses.

(17) D. D. O. asks what kind of varnish is used in the nitric acid process of etching designs on blades of razors, etc., and also how it is done. A. Asphaltum varnish or beeswax will answer your purpose. The varnish is put on with a brush and allowed to dry; the beeswax is applied by warming the steel and allowing it to melt on the surface.

(18) J. W.—Steam boxes are not generally painted; oil paints are soon decomposed. Would recommend you to try coal tar, such as is used for anchors and chains.

(19) G. S.—The ingredients used in putting together emery wheels vary with different manufacturers, and they keep the exact particulars to themselves. You might try this: A solution of pure gum in naphtha mixed with finely ground sulphur; thoroughly mix with emery, place in a mould, and subject to great pressure; then vulcanize by heating to nearly 300° Fah. See article on carbon points in SCIENTIFIC AMERICAN SUPPLEMENT, No. 98.

(20) R. H. K.—The French method of polishing is by using a piece of fine pumice stone and water; pass regularly over the work with the grain until the rising of the grain is down, then with powdered tripoli and boiled linseed oil polish the work to a bright face. This will give a very superior polish, but it requires considerable time.

(21) J. H. asks the best kind of round belt where a flat belt cannot be used; is there anything besides a wire or chain? A. It depends altogether on the use proposed and the size needed. Twisted leather and raw hide are good in some places, while for various purposes ropes might do. There is, however, a sort of triangular shaped built-up leather belt which may be made to convey a good deal of power.

(22) R. F. T. writes: Where is a common playing marble manufactory located, and what is its address? A. Marbles are all imported from Germany. There is no special house or houses that manufacture them. They are made in small quantities by the peasants, and sold to some commission house in the neighboring city.

(23) E. P. A. asks if jeweler's oil is made from jaw bone of porpoise. If it is refined, or as procured from the bone. What is it worth. A. Yes; it sells at 15 cents for a small bottle. We believe however that in reality most of the oil so sold is obtained from the blackfish. Some 6 quarts of a very limpid oil sometimes called melon oil is obtained from that portion of the head which reaches from the snout hole to the end of the nose and from the top of the head to the upper jaw. This oil is said to have an unusually low congealing point, and to have no corrosive effect on metallic surfaces, and is specially prepared by a few firms in the U. S. as a superior lubricator for delicate mechanisms.

(24) M. L. asks what product or preparation is used for separating wool from dry sheepskins. It does not injure the skin at all. A. Sodium sulphide has of late been a good deal used for this purpose, but various other preparations of lime and lime with arsenic are used.

(25) A. P.—There are several so-called kid revivifiers, whose composition is only known to those who make them. Probably olive oil, egg yolk, and alum would make a good base to work from; we fancy most of the revivifiers actually lessen the life of the kid, but the above could not be injurious. Shoe and boot dubbings are principally mixtures of oil and tallow, and may be colored to suit. The best waterproof boot polishes are simply made waterproof by carrying so much oil as to fill the pores of the leather, and thus repel water. Any preparation for cleaning brown tops should be adapted to the leather, which may be of sheep, goat, or calf. Sod oil is mixed both with degrass and tallow or other oils for currying purposes.

(26) W. M. M. writes: Will you please give me (1) directions for silvering looking glasses that are spotted. A. Clean the bare portion by rubbing it gently with fine cotton, taking care to remove any traces of dust and grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton; it hardens almost immediately, and the glass presents the same appearance as a new one. 2. Also, how I can waterproof blue sample boxes so as to enable me to wash same when they become dirty. A. It will be necessary to waterproof the paper before the box is made. The operation consists in dissolving 8 ounces of alum and 3¼ ounces of Castile soap in 4 pints of water, and 2 ounces of gum arabic and 4 ounces of glue separately in 4 pints of water; mix the solutions, heat slightly, dip in the single sheets, which hang up to dry. You might try coating the boxes with this mixture.

(27) J. M.—The known boiler explosions in the United States, for 1883, were 184, causing 263 deaths and 413 persons injured; of these 40 per cent were in saw mills, showing careless management in such establishments as a class. The above is somewhat larger than the average of previous years.

(28) T. E. L. asks the various methods of engraving, etc., names on door plates. A. The ancient and honorable way of engraving door plates is to draw the forms of the letters upon the plate with a steel point or even a pencil, and dig out the letters with a graver according to your fancy or design. A way of etching the letters with acid has been in practice. With

a complicated design some very pretty work is done in this way. The next is machine engraving, one kind being done by a routing machine carrying an automatic tracer traversing a pattern. Of these engraving machines there are several in the market under various patents and otherwise, some as mere tracers, others as liners, while some claim universal work.

(29) E. J. N.—Boilers cannot burn that are kept clean and with water at full height. Oil is the most pernicious element that can be fed to a boiler; it gathers the sediment and forms oil cake, which settles upon the fire sheets, causing the iron to become overheated or burned. This is a most dangerous practice. A little soda added occasionally to the feed water will prevent oxidation from acid waters.

(30) J. H. H.—There is no cheap material known suitable for conveying vinegar. Rubber hose and pipes of oak are probably the cheapest that are good. Porcelain or glass tubing is the best, and if properly protected is the cheapest for durability.—Powdered borax scattered in the runways of roaches and ants is the best known remedy. Steaming is practiced in some places where a small jet can be used with high pressure, so as to blow the steam into their hiding places.

(31) L. W. writes: I have several pairs of fine elk horns, but being exposed to sun are considerably bleached. How can I restore the brown color, or can you name a stain that will produce a brown color? A. Soak the horns for 12 hours in a solution of manganese sulphate, then wash with sodium carbonate and on allowing to dry the color will change into the brown shade desired.

(32) E. C. asks how to make the glossy marking ink used for marking show cards. A. Marking ink generally consists of lampblack mixed thoroughly with sufficient turpentine to make it thin enough to flow from the brush. The addition of sugar, glycerine, or gum arabic will impart a gloss to the ink.

(33) J. C. asks what they stain oak with in the car shops in Altoona, Pa.; it is a dark silver color. A. An oak stain can be produced by mixing powdered ochre, Venetian red, and umber in size, in proportions to suit; or a richer stain may be made with raw sienna, burnt sienna, and Vandyke. A light yellow stain of raw sienna alone is very effective. To darken oak, strong coffee is sometimes used. To make it very dark, iron filings with a little sulphuric acid and water, put on with a sponge and allowed to dry between each application, is good.

(34) H. G. H. asks what solution of chemicals can be applied to wood to render it fireproof, or remove danger of fire from stove pipe in close proximity to it. A. Coat the wood with zinc chloride or soda silicate. Another paint used is a saturated aqueous solution of 3 pounds alum and 1 pound copperas, with which the wood is twice painted; after drying, a solution of copperas in which powdered clay is suspended is brushed over the alum layer.

(35) J. S. W. asks: What is a carbon reducing agent or material for molten metals? A. According to Greenwood, reduction is the process of separating the metal from its ore or its chemical combination. The substance effecting this separation or reduction is called the reducing agent. In the metallurgy of iron we have to reduce the iron oxide (which is the ore) to metallic iron. This is principally accomplished by the indirect action of the carbon contained in the fuel. So that the iron oxide is reduced to iron by the carbon taking up the oxygen from the ore, forming carbon dioxide, thus: $2Fe_2O_3 + 3C = 4Fe + 3CO_2$. A carbon reducing material therefore is such a material (generally fuel, as coal, wood, etc.) that gives up its carbon to unite with substance with which the metal is combined, as crude ore, generally oxygen, as, in the case given, iron oxide or hematite.

(36) J. A. T. asks the necessary qualifications in order to pass an examination as mechanical engineer. A. A good draughtsman and experience in the construction of machinery are the principal points. A knowledge of the practical application of geometry and mathematics, with a fair knowledge of the history of mechanical science, are mediums of success.

(37) F. W. D. asks how to make a stain to apply on the bottoms of boots and shoes that will give them a hard and clean bright polish. A. The polish is different from the stain, and comes, after proper sammying of the leather, with the use of rub stock or hammer, and perhaps a little use of gum. Good stains are now furnished by the aniline dealers for either oak or hemlock or any immediate finish, and probably as cheaply as you could make one, but hemlock leather "acid" tanned will not usually take a permanent stain, the acid working through. Nearly every prominent manufacturer has some information he keeps secret in regard to staining bottoms, but we judge aniline colors will give the simplest way of reaching any desired stain.

(38) E. L. H. asks: Is there any method of removing tattoo marks from the human skin without leaving a scar? A. It is extremely improbable that tattoo remarks can be removed from the skin. A writer in the *Chemical News* has stated that if the tattooing is performed with some carbonaceous matter, the marks can be made to disappear by being first well rubbed with a salve of pure acetic acid and lard, then with a solution of potash, and finally with hydrochloric acid. Pricking with milk has also been partially effective in some cases.

(39) L. E. B. W. asks if water and glycerine mixed will answer for a hot water apparatus for house warming. A. Water mixed with from one to five per cent glycerine will be safe and proper for hot water circulation only for heating purposes. For generating steam you might be troubled with foaming and the formation of scale cake.

(40) J. W. S. writes: Is not the variation in brightness of the star Algol caused by the peculiar shape of that body? Is it not a disk, or more properly speaking lens shape, revolving so as to present first the edge and then the face toward the earth, and having a

period of 5 days 17 hours and 36 minutes? A. The revolution of a disk upon its plane as an axis is a most unnatural phenomenon among planetary or stellar motions. The common opinion among those who have investigated the observed conditions of this variable star is that a planet of about two-thirds the diameter of the primary, and at a distance of about twice its diameter, is revolving about the primary in a plane coincident with our solar system, making a revolution in 68 hours 48' 8" minutes.

(41) P. B. S.—Neptune and Uranus cannot be seen with the naked eye. You will not recognize them except as the faintest stars in a 2 inch telescope. Stars have no measurable diameters. Poor telescopes may give them a false diameter. The distance between Zeta and Delta Orion is about 3° 49'. The hourly ascension is reckoned from the visual equinox, and is turned into degrees by multiplying the hours and minutes by 15, divide the minute sum by 60, adding the degrees to the hour sum.

(42) J. P. C. asks for a device for polishing the edges of No. 28 iron suitable for taking solder; polished about an inch wide on the edge of sheets, to be done cheaply and rapidly. A. You may take the scale off, or polish sheet iron edges suitable for soldering, by passing a revolving emery wheel along the edges—the emery wheel to be mounted upon a swinging frame; or by dipping the edges of the iron in a shallow bath of hydrochloric acid 1 part, water 3 parts, for a half to 1 hour, or until the scale is removed; wash the sheet in warm soda and water to free it from acid, and tin the edge required to be used for soldering with a copper and soldering fluid. If there are a great many sheets to be done, and machinery not easily obtained, the cheapest way is to make a shallow sheet lead trough; make a frame to hold the sheets vertical, all large enough to set up 20 or more sheets at once, when the whole operation may be made continuous.

(43) H. S. writes: I noticed in the SCIENTIFIC AMERICAN of September 27, that citric acid was used in the preservation of meat, etc. But it stated also that the soluble citric acid could not be used, etc. Please state what kind of citric acid is used and in what manner and proportion, etc. A. Citric acid is a disinfectant both when in solution or as a solid, but combinations of the anhydrous acid with other elements than hydrogen are soluble, and cannot be used. For instance, such as sodium citrate, or iron citrate, etc., cannot be used. The proportion of acid used depends largely upon the substance with which it is used. The manner of employment is by mixing the solution of acid with the substance.

(44) P. T. H. asks: 1. Suppose a boat 36 feet long, 8 feet beam, 20 inches draught, what horse power of engine would be required to drive it six miles against the tide or a river current of two miles an hour? A. We think an engine 8 inches cylinder by 8 inches stroke would suit. 2. Is a long stroke or short stroke engine better for such boats? A. Short stroke preferable. 3. Would I gain much (on the coast), using such a boat mainly for pleasure, but sometimes for towing, by having masts and sails fore and aft the engine to be used on occasion? A. No. 4. Is one large or are two small propellers preferable, and what size in either instance, and about weight and cost of propellers? A. Two propellers better for towing, one for speed only; if one propeller, 3 feet 2 inches to 3 feet 4 inches diameter; if two, 34 inches to 36 inches diameter. 5. Is there any United States law which forbids a man to use a small steam launch or yacht, and to carry with him whoever goes of his own will, provided he does not carry freight or passengers for money? It is said that a license after inspection by a government official, iron bearing the government stamp, licensed engineers, pilots, or at sea navigators, etc., are required for boats driven by steam. What is the law? A. There is such a law; such licensed officers are required.

(45) W. F. McK. asks formula for pad for rubber stamp, called ever ready ink pad. A. The following is said to be a cushion that will give color permanently. It consists of a box filled with an elastic composition, saturated with a suitable color. The cushion fulfills its purpose for years without being renewed, always contains sufficient moisture, which is drawn from the atmosphere, and continues to act as a color stamp cushion so long as a remnant of the mass or composition remains in the box or receptacle. This cushion or pad is too soft to be self-supporting, but should be held in a low, flat pan, and have a permanent cloth cover. The composition consists preferably of 1 part gelatine, 1 part water, 6 parts glycerine, and 6 parts coloring matter. A suitable black color can be made from the following materials: 1 part gelatine glue, 3 parts lampblack, aniline black, or a suitable quantity of logwood extract, 10 parts of glycerine, 1 part absolute alcohol, 2 parts water, 1 part Venetian soap, one-fifth part salicylic acid. For red, blue, or violet, 1 part gelatine glue, 2 parts aniline oil, desired color, 1 part absolute alcohol, 10 parts glycerine, 1 part Venetian soap, and one-fifth part salicylic acid. The following are two additional receipts for this purpose: 1. Mix and dissolve 2 to 4 dr. aniline violet, 15 ounces alcohol, 15 ounces glycerine. The solution is poured on the cushion and rubbed in with a brush. 2. Aniline violet 90 grains, boiling rain water 1 ounce; to which is added a little glycerine and a small quantity of treacle. The quantities of the last two ingredients will vary with the season, but half a teaspoonful will be ample for the quantities of violet and water specified.

(46) J. G. E. asks for (1) the best and cheapest way of dissolving corrosive sublimate—alcohol or glycerine—so that it will readily combine with linseed oil, and also with water. A. Corrosive sublimate can be dissolved in either alcohol or preferably in glycerine, and then mixed with the linseed oil; 53-96 parts of the corrosive sublimate are soluble in water at 212° Fah. 2. Also how to clarify and deodorize fish oil. A. Filter the oil through charcoal, or if that is impossible take 1,000 parts of the oil, 25 parts purified charcoal, and 10 parts calcined magnesia. Mix them carefully in a Courcineux vessel of glass or tinned iron, let it stand during three days with occasional agitation, and then filter through paper or felt. 3. Would a weak (aque-

ous) solution of corrosive sublimate do as an insecticide for a compost heap? And of what strength? A. Instead of corrosive sublimate, we would recommend the use of iron sulphate (copperas), or else a spoonful each of salt and lead nitrate, dissolved separately, and mixed in a pail of water.

(47) A. W.—Composition for ornamenting picture frames is made as follows: Dissolve 1 pound of glue in 1 gallon of water; in another kettle boil together 2 pounds of resin, 1 gill of Venice turpentine, and 1 pint linseed oil; mix all together in one kettle, and continue to boil and stir them together until the water has evaporated from the other ingredients; then add finely pulverized whiting till the mass is brought to the consistence of soft putty. This composition is hard when cold, but when warmed can be moulded to any shape.

(48) J. L. G. asks if blood albumen is still largely employed as a mordant in calico printing. Also is it imported to any large extent, what it is worth per pound, also the title of any work on the subject? A. Blood albumen is still extensively used in calico printing although not so much as some years ago. Almost all of the albumen used is imported. It is manufactured to a slight extent in the West, at Chicago and other places where there is much slaughtering. Its price varies from 10 cents to 20 cents per pound, according to quantity. A. Klipstein, of 52 Cedar Street, and J. L. & D. S. Riker, of 45 Cedar Street, handle it. We know of no special book on the subject.

(49) A. M. P. asks for a receipt for ginger ale easily made. A. We take the following from our back files:

Brown sugar..... 2 pounds.
Boiling water..... 2 gallons.
Cream of tartar..... 1 ounce.
Bruised gingerroot..... 2 "
Infuse the ginger in boiling water, and your sugar and cream of tartar; when lukewarm, strain; then add half pint good yeast. Let it stand all night, then bottle; if you desire, you can add one lemon and the white of an egg to fine it.

(50) L. C. writes: 1. I have made a Devlin-port writing desk of quartered sycamore; have oiled it, and given it body of white shellac. Please tell me through your Notes and Queries how I can give it a good polish. A. The French method of polishing consists in passing regularly over the work with the grain, using a piece of fine pumice stone and water, until the rising of the grain is down; then with powdered tripoli and boiled linseed oil polish the work to a bright face. This will give a very superior polish, but it required considerable time. 2. Is there anything poisonous about a lizard if taken into the stomach, by being boiled in water or otherwise? A. The flesh of certain lizards is considered a great delicacy, and is highly prized as an article of food in portions of South America.

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