(9) F. C. E. asks how to make a mould from which he can get one or two dozen castings in tin or its soft alloys. A. You may make a mould of iron or brass for casting tin or soft alloys. Plaster of Paris moulds will allow of a few castings, but are brittle and not reliable. If the mould can be cut easily, it can be made of soapstone.

(10) W. V. L. asks: Is it true that gold is one of the constituent parts of silver? A. Both gold and silver are elements, and theoretically are free from all admixture. In commerce they are generally alloyed with some harder elements, In mining, gold ore often yields a good proportion of silver.

(11) J. M. L. G. asks: 1. What is about the cost of the least complicated and plainest (and therefore the cheapest) lathes in the market? Also planer of the same description. Both to be durable and strong, for working iron. A. The price of lathes and planers varies so widely that it is impossible to name a price without knowing the size. A new or second hand lathe for iron work may be anywhere from $50 to $500. Planers about the same. Address makers and dealers who advertise in our columns for their lists of new and second hand machinery, stating about the size you want. 2. Is it injurious to slightly oil or grease boilers at night when quitting work? A. There is no harm in oiling the outside of your boiler. 3. Do the safety plugs (in the crown sheet) ever melt out when properly filled with metal, when well covered with water? A. Safety plugs have been known to melt by too hard firing with a thin sheet of water over them. Otherwise they are generally reliable.

(12) A. E. L.— Oberlin College, Ohio, Cornell University, Ithaca, N. Y., are institutions where part of the dues are taken in labor. We do not know of any institutions that provide for students wholly earning both board and tuition, but with the $300 you have saved, some knowledge of the machinist's trade, and plenty of pluck, we do not doubt you can get about as thorough a course as you may resolve upon.

(13) M. I.—Lignite may be readily pressed in bricks for burning, by the addition of a little tar or fluid pitch or asphalt. Crude oil does not dry readily, and might not be found practicable. Presses for this work are made in Pennsylvania.

(14) G. E. B. asks: Of what value would a knowledge of the process of hardening copper be to any one at the present time? A. Such a process would be very valuable if it can be done after the copper has been worked to shape or combined with other metals, as the linings of pump cylinders, hydraulic rams, and pistons, and for a thousand uses in running machinery. The hard alloys of copper are well known.

(15) F. W. asks the simplest way to tell how much a block and fall will safely carry. Also, how many men it would take to lift a certain weight with a 2 and 3 sheave block, and the difference with 3 and 4 sheaves and blocks; also, if ropes are measured round or through, and if there is a book on ropes and knots. A. With a pair of blocks of 2 and 3 sheaves respectively, you will have a leverage of 5 to 1, less the friction. With a pair of blocks of 3 and 4 sheaves respectively, the leverage will be 7 to 1, less the friction. New ropes will bear from 1,500 to 2,000 pounds as a safe load per square inch of section. A rope of 1 inch diameter will have ¾ of an inch section, and may be used for from 1,200 to 1,500 pounds load. Ropes are sold by their size in circumference. Thus a 3 inch rope is 0·95 inch diameter. A 2½ inch rope will be a little over ¾ inch diameter, etc. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 396, Rope Strains.

(16) T. H. G. writes: I have a mahogany table which has been varnished and has ink spots on it. 1. By what means can I get the varnish and ink off, in order to rub on an oil finish? A. The ink spots can be washed off with water and the varnish with alcohol. 2. What is best to polish carved brass? A. Polish with rotten stone and oil. alcohol, or spirits of turpentine. 3. What will remove water stains from polished marble? A. Mix quicklime with strong lye, so as to form a mixture having the consistency of cream, and apply it immediately with a brush. If this composition be allowed to remain for a day or two, and be then washed off with soap and water, the marble will appear as though it were new.

(17) F. A. C. desires a receipt for a harness cleaner and oiler. A. Take 2 ounces mutton suet, 6 ounces beeswax, 6 ounces powdered sugar candy, 2 ounces soft soap, and 1 ounce indigo or lampblack. Dissolve the soap in ¼ pint of water. then add the other ingredients, melt and mix together, add a gill of turpentine, lay it on the harness with a sponge and polish off with a brush.

(18) C. H. B.—The coarse emeries are sifted. You may buy sieves of brass for grades down to No. 80 or 90. After that, wash by placing the emery in a basin, pail, or tub, according to the quantity you wish to wash, with a small pipe attached to a hose from a water supply, and a faucet to regulate the flow; stir the emery at the bottom of the pail with the hose nozzle, allowing the water and fine emery to run over the side of the pail into a pan larger than the pail, and, if necessary, continue the overflow into two or three pans. The different pans will catch different grades of emery. Your own judgment and a little tact must be used in regulating the flow of water.

(19) L. S. P.—Height of Washington monument, 555 feet. The depth that a body sinks in sea water depends upon its density. Sea water weighs 64·312 pounds to a cubic foot, while fresh water weighs 62½ pounds to a cubic foot. From this a comparison of the floating capacities may be estimated. All bodies heavier than water go to the bottom at once, even to the greatest depths. The greatest depth yet reached is about 23,000 feet. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 398, for illustration of deep sea sounding apparatus. 6,000 to 10,000 pounds per square inch is the greatest hydraulic pressure we have heard of being used; 4,000 to 6,000 pounds per square inch in common use.

(20) C. B. writes: 1. I have an iron wash sink with a common trap and ¾ inch waste pipe leading to a cesspool in yard. When water is thrown in the sink, it does not run off readily; a pint would take two or three minutes, but, by lifting up the trap (strainer), the water bubbles up two or three times and then runs down all right. What is the trouble? A. The sink pipe is air bound, and the bubbling is caused by air escaping. The pipe should be ventilated between the trap and sink; vent should be outdoors. 2. What is sweet oil made of? A. Sweet oil is the oil of the olive, which grows in Spain, Italy, etc. 3. What is celluloid? A. The manufacture of celluloid, parkesine, and zylonite are described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 227. 4. Does the word "Redditch" on needle labels stand for the maker's name? A. Redditch is a trade mark. You may obtain prices through the jobbing trade in your city.—The sample you ask about is called pebble cloth, made by passing it through embossed calenders. Mastic varnish is proper for it.

(21) W. B. H. writes: Have you a recipe composed of linseed oil and resin, mixed, to make muslin semi-transparent and waterproof? A. Dissolve together white resin pulverized 8 ounces, bleached linseed oil 6 ounces, white beeswax 1½ ounces; add the turpentine while hot. Apply to both sides of the cloth while it is stretched tight. 2. How are the yellow oil proof coats made? A. The yellow jackets referred to are made by treating the cloth with a solution made by dissolving 1 ounce beeswax in 1 pint best linseed oil over the fire, applying it, when cold, with a piece of rag, rubbing it well in and then drying.

(22) S. G. W. writes: Sam Jones, the noted revivalist, is trying to make people believe that 13 worlds have been lost sight of by the astronomers, and it is a sure sign that one world or planet will soon be destroyed. Give your opinion. A. We do not think it follows that the stars referred to have been destroyed because they have been lost sight of. Astronomy cites many instances of stars appearing in the heavens attaining a high magnitude and then suddenly disappearing again. In some cases these phenomena have been observed to be periodic. We do not see that the destruction of the earth follows by analogy.

(23) J. J. W. asks: 1. The ingredients for a good water stain to imitate walnut? A. Burnt umber 2 parts, rose pink 1 part, glue 1 part, water sufficient; heat all together and dissolve completely; apply to the work first with a sponge, then go over it with a brush, and varnish over with shellac. 2. A good jet black water stain. A. Pour 2 quarts boiling water over 1 ounce of powdered extract of logwood, and when the solution is effected 1 drachm of yellow chromate of potash is added and the whole well stirred. When rubbed on wood, it produces a pure black. 3. A good size for gilding with gold leaf, one to be ready for gilding in an hour. A. Good drying oil 1 pound, pure gum anime powdered 4 ounces. Bring the oil almost to the boiling point in a covered metal pot, add your gum gradually and cautiously to the oil, stirring all the time to dissolve completely. Boil to a tarry consistency and strain, while warm, through silk, into a warm bottle with a wide mouth. Keep it well corked; use as required, thinning with turpentine. 4. The compositition of the so-called oil finish? A. Boiled linseed oil 1 pint, yellow wax 4 ounces; melt and color with alkanet root.

(24) H. N. S. asks: Which is the faster—a toboggan or a sled (steel shod); assuming that the total weight is the same in each case, the incline of the coast the same, and each on a coast best adapted to it? Also, the reasons governing your reply. A. We should say the steel shod sled. Although the frictional resistance is independent of the area of contact (so much larger in the toboggan than in a sled) or the velocity of rubbing, and the intensity of pressure is the same, yet the rubbing surfaces of the toboggan present more asperities to interlock with those of the ice or snow than do the steel runners of a sled. Bodies having rough surfaces, those made of compressible material, and those of irregular surface and form exhibit greater friction, as these features are exaggerated.

(25) N. N.—Art work is so various in its specialties that we cannot venture on specific names without knowing what you should know, viz., what your taste leans to in art study. When a young man arrives at the age suggesting a feeling of responsibility, he should at once consult with his friends or those that know his habits, opportunities, and proclivities, as to the probability of his success in any trade or art that presents itself to his grasp. We believe that you have an excellent library in your town in which are to be found books on the trades and arts. Join it and read.

(26) C. R. asks whether successive coats of glue, applied hot to wood or articles of a woody nature, would permeate the material, giving it toughness and rigidity, or would said glue remain as a mere coating, not permeating? If the glue would not materially permeate, what would you suggest as a fluid that would permeate and produce rigidity and, at the same time, have a preserving quality? It is desired that the article should be very cheap and the process very simple. A. Glue will not penetrate wood sufficiently to affect its stiffness or rigidity. Boiling the articles in thin glue for a few minutes will allow the glue to penetrate slightly further than the mere brushing of the hot glue upon the surface. Whatever can be forced through the grain endwise, that would dry easily and of a glutinous nature, would stiffen the work. These processes are tedious and expensive.

(27) J. M. D. asks: Is there any virtue in the "divining rod," so called, as a means of determining the locality of hidden streams of water? A. None whatever. The bobbing of the stick is due to a muscular pressure by the holder.

(28) T. E. writes: I have a marine boiler in use on a steamboat that gives plenty of steam, but the motion of the engine (12 inches in diameter, 5 feet stroke) raises the water in said boiler at least 4 inches. There is a steam drum on top of boiler about 18 inches diam. and 24 inches high. Would an additional steam drum connected horizontally to top of drum now on boiler, with a three inch pipe, prevent the raising of water when the engine is in motion? If so, how large a drum would be necessary? Would this additional drum save fuel? My steam pipe is 3 inches. A. The additional steam drum will not help you. It will only add to the work of the boiler by condensing the steam. If your steam pipe and drum is naked, it should be felted. The raising of the water is, no doubt, a surging of the surface into waves by the action of the engine, which shows in the water gauge. This may be partially prevented or broken up by making another connection near the end of the boiler, between the boiler and the steam pipe, with a 2 inch or 2½ inch pipe. This will partially relieve the water under the dome from the reciprocating action of the engine. Felting the exposed parts of the boiler is also necessary to economy.

(29) L. H. R. writes: In a hydraulic ram for making lead pipe the water ram is eaten with grooves running vertically with the ram. This caused the water to leak so badly, I had a new ram cast. I now notice small grooves beginning in the same manner, which, in less than a year's time, will compel me to get another new ram, unless the evil is remedied. What is the cause? What is the remedy or preventive? The water used is from the Kansas River, and is not filtered; but if the cause was from sand or any gritty substance, it surely would ruin the leather packings before it would eat away the ram. A. The ram pistons in the lead pipe presses in New York and vicinity have a life of only about one year, wearing in grooves as you describe. The present practice is to cover the pistons with copper, which wears two to three years. Old pistons are also covered and recovered. If you have the old piston, you can have it covered. Gritty substances, as fine sand, iron rust, the hardening of the leather by absorption of iron, together with the great pressure, is the assigned cause of the cutting.

(30) C. R. desires a simple size for making decalcomanie or transfer paper. A. Use gelatin size. 2. Could I bake in a japan oven so that the transferred printing could be drawn slightly, like a blacking box lid? A. If the picture is coated with a transparent japan varnish, it can be baked same as any other varnish. If the japan is quite thin, the metal may be drawn.

(31) H. L. writes: 1. I wish to melt a gold coin in a sand crucible, and want instructions how to proceed. A. Break into small pieces, mix with borax, and expose it in the crucible. 2. Is there danger of heating too hot? A. No. 3. Can I remedy its tendency to crack? A. Only by proper annealing. 4. I have seen gold coin as yellow as brass and some almost as red as copper. What is the cause of so much difference in color? A. The red color is due to its being alloyed with copper. The natural color is yellow, but it becomes red by the addition of copper. See "The Practical Gold Worker," by George Gee, which we can send for $1.75.

(32) J. G. H.—We could not recommend a steam pump to be used once a fortnight. It would never be in order for running. A small low pressure steam pump in the market will cost about $125. We consider gasoline a dangerous element in its liquid state, in the vicinity of fire. Its vapor, mixed with air, as used for lighting purposes, where the vaporization is carried on outside of the premises, will be safe if burned in jets in a stove.

(33) J. C.—A first class ice boat, sailing on first class ice, will sail from three to four times faster than the wind that drives the boat. For example, a wind having a velocity of fifteen miles an hour will drive the boat at the rate of from forty to sixty miles an hour.

(34) W. H. O. desires a formula for making white miners' oil, for burning in lamps. A. Take 50 to 60 per cent mineral, seal, or some other 300° oil and from 40 to 50 per cent of pure lard oil. A cheaper article is made by using 40 to 50 per cent cotton or rape seed oil.

(35) E. W. asks: What is a good, cheap substitute for beeswax to coat wooden patterns for use but a few times, something that can be applied with a brush, without heat? A. Shellac varnish. 2. What is a good flux for welding iron in a blacksmith's fire, and the desirable qualities of coal for same? A. Clear white sand or borax. Use best Cumberland coal, free from sulphur.

(36) J. C. writes: I am burning in my boiler slabs that are saturated with salt water, and find that the tubes of the boiler have to be cleaned out every few days on account of the salt, which is coated heavily upon them. Is there any danger of the salt eating into them or doing any injury? A. The burning of salt fuel under boilers may not materially affect the iron while the boiler is in use, but may make a coating or form a coat upon the surface of the tubes by the condensation of the evaporated salt that will be troublesome to clean off. When the boiler is not in use, the salt crust will absorb water and rust the tubes. A close examination of the rear end of the boiler and tubes will show whether the tubes are accumulating a crust that the tube brush does not remove. If so, better abandon the use of salt fuel. The dry salt does not affect the iron. The salt absorbs water when the boiler is cold, when rust takes place.

(37) J. S.—Cast or tool steel cannot be welded together with any certainty. Low grade steel that will harden, such as shear and double shear, can be welded together fairly with borax and sal ammoniac or borax alone, which are also good for welding steel to iron. Use about one-tenth sal ammoniac, pulverized with the borax and heated to evaporate the water, then pulverize again and weld with the powder.

(38) E. M. asks (1) what to add to hair oil that will give the hair a yellow color. I have very light hair, and would like to color it a darker shade. A. A bismuth hair dye is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 356, which is not considered injurious at all to the head. 2. Give me a remedy to purify the blood. A. We would refer you to a physician for a remedy of this character. 3. A good toilet soap. A. See "The Manufacture of Toilet Soaps," contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 518 and 519.

(39) P. M. A. asks: Would you please give some remedy whereby tattoo marks may be completely expunged? A. We know of no means by which they can be completely removed. Pricking in milk, in some cases, rather fades them.

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