123

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R. can mold rubber by the process described on p. 363, vol. 30.—F. will find a description of harness oil on p. 234, vol. 30. Black ink is described on p. 203, vol. 29; it may be made copyable by the addition of a little refined sugar.—R. H. will find full directions for modeling in clay on p. 58, vol. 24.— W. F. should consult a physician.—T. F. W. will find directions for removing ink stains on p. 43, vol. 31.

(1) E. H. asks: 1. What was the name of the first steamship that crossed the Atlantic Ocean from West to east? A. The Savannah, in 1818. 2. What was the first steamship that crossed from east to west? A. The Savannah returned in the same year.

(2) J. P. L. asks: How can I tint tracing cloth so that the tinted places will not wrinkle? A. Common tracing cloth will wrinkle at the first touch of moisture; but there is an oiled or varnished cloth that can be tinted with water color.

(3) J. A. K. asks: How can I cement amber? A. Take 4 ozs. orange shellac and 3 ozs. strongest rectified alcohol. Digest in a warm place. When of the consistence of molasses, it is ready

(4) G. F. asks: If a man takes a pistol loaded with ball, and shoots straight up in the air, standing so that the bullet should happen to hit him, would it not kill him? A. We think not, as the resistance of the air would affect its velocity. We would not care to try the experiment, however.

(5) F. H. asks: Which is the hardest 14. 16, or 18 carat gold? A. 14 carat is the hardest of the three.

How long are the days on the equator? A. The days and nights at the equator, meaning by day, the time the sun is above the horizon, are equal.

(6) E. asks: 1. Can copper be tempered? If so, to what degree, and what is the process? A. It can be hardened by hammering or rolling, but the temper cannot be drawn as in the case of steel. 2. Did the ancients know of a process by which coppercould be tempered as hard as steel is now? A. The very hard ancient tools and weapons were made from an alloy of copper with other metals.

(7) N. N. asks: What action will frost have on east iron pipe 1/8 inch in thickness, about 20 inches under the street paving, with the water all out? A part of the pipe is flanged and bolted together: the other is common socket soil pipe with leaded joints. A. It would cause the pipe to contract somewhat in length; but if provision were made for this, it would give no trouble.

1. I am about to build some sprinkling tubs o 900 gallons capacity. Can you give me an idea of the best shape to make them, to get the widest spread of water? A. It makes little difference about the shape of the tub, as the spread of water is usually obtained by the use of a sprinkling pipe of suitable form. 2. Is fresh or salt water used for sprinkling the streets in New York city? A.Fresh water. 2. Is fresh water considered unhealthy? A. We do not consider it so. There are some persons, however, who do.

(8) E. H. asks: What is the radius of the sharpest curve that a train can safely turn? Is there any difference whether the train be long or short? Is there any difference whether it be an arc of 10° or the whole circle? A. We doubt whether any one can answer these questions, as there are many curves on railroads, to-day, that a few years ago were declared to be impossible. They are not desirable features, however, and most engineers make the curves as large as circumstances will permit.

(9) F. W. asks: How can I cut a design in iron, as on a watch case? A. The designs on watch cases are usually cut by a tool, either by hand or

How can I polish iron and brass? A. Use emery cloth for iron, after it has been filed or turned and polishing brick for brass

What power can I get out of an engine with a cylinder, 31/4 inches bore by 6 inches stroke, with 80 lbs. of steam? A. From 21/2 to 3 horse power.

(10) W. D. asks: What kind of cement is generally used between French millstone blocks when they are put together? A. A mixture of alum, the dust of the stones, and water, or mo-

(11) M. V. O. says: A question has arisen as to how the lead of the valve of a locomotive is affected by raising or lowering the link. One party contends that the lead is greatest when the revers ing lever is in full gear, either forward or back, and is least as the lever is hooked up nearer the center of the quadrant. Another party thinks that the lead is increased by hooking up. How is it? A. Both parties may be right, since the lead increases by hooking up if the forward eccentric works the top of the link, and diminishes if the contrary is

(12) W. S. W. arks: How can I set the valves of a locomotive? Can it be done without taking off the steam chest covers? A. It would require a treatise to answer your question. Consult Auchineloss on "Link and Valve Motions."

(13) R. C. asks: What are the ingredients and what their proportion for enameling iron pots. sauce pans, etc.? A. A paste is made by fusing together 100 parts by weight of calcined ground flints, and 50 parts calcined borax, grinding the product, mixing it with 20 parts potter's clay, and enough water to give it the proper consistence. The pot is lined with this paste, which is allowed to dry in a warm room. Then fuse together 125 parts white glass, 25 parts borax, 20 parts soda. Pulverize the compound; and make it into a paste with 4 lbs. of soda and a sufficient quantity of hot water. Coverthe lining of the pot with the paste, and heat it in a muffle until the glazing is fuzed.

(14) P. W. D. says: My friend says that the same power that will run a circular saw through a log with a feed of 16 inch to revolution. will start the saw when standing in the middle of the log, with the same feed choking the teeth of the saw. I say that it will not. Who is right? A. Judging from the general practice of sawyers, who back the carriage when a saw stops in the cut, we should say that you were right. The amount in the difference of the two cases could only be determined by experiment.

(15) L. G. asks: What chemical preparation will purify or improve strong and rancid butter? I noticed recently an account of experiments (by Sonstadt) with iodate of calcium, which kept butter for three weeks, and rancid butter was improved by it; also that stale herring, immersed in a weak solution, came out perfectly fresh, etc. I sent for some of the iodate and received iodide of calcium. Isthere any difference in the effect of the two salts? A. What you received is not the required salt, being a compound of calcium with iodine, whereas the salt employed for this purpose is a compound of calcium with iodic acid. The characteristic properties of the two are widely different.

(16) J. M. R. asks: 1, Would a shot gun barrel manufactured of decarbonized steel be apt to burst? A. We do not think it would be perfectly safe. 2. Is not decarbonized steel a fancy name for common iron? A. Probably.

(17) L. S. C. says: In a recent issue you state that a large circular saw requires more driving power than a small one, which is apparent, the number of revolutions per minute being the same with both saws: but will it require more power to drive a sixty inch saw, through a piece of timber than a thirty inch saw, time employed being the same and size of timber the same in both cases? I claim that the larger saw will require only half the number of revolutions to give the same speed to the teeth as the smaller, and that the same power will do the same work in the two cases. A. You appear to have the correct idea. As we rerevolutions per minute.

1. Does water expand in passing from the boiling to the freezing point? A. Yes. 2. Will a piece of ice exposed to an atmosphere of zero become as cold as the atmosphere, or as cold as any other object exposed in same atmosphere, or does it remain at same temperature as when changed from water to ice? A. Yes. 3. Does it expand in pass ing from 32° to zero? A. It will contract.

(18) E. E. K. asks: 1. Would a receptacle having an internal hydraulic pressure sufficient to show an external moisture cause the castiron re centacle to break? A. Not necessarily. It would depend upon the strength of the receptacle or casting. 2. If such moisture should appear, would the internal pressure be reduced? A. We think not. 3. Would a constant pressure producing such a moisture eventually fracture a casting A. Not necessarily.

(19) P. & W. ask: 1. How are burglar alarms applied to the doors and windows of a dwelling house? A. Strips of metal are attached to the doors and windows, and to the frames, in

such a manner that the raising of a window or the opening of the door will close a circuit and ring a bell. 2. What kind of a battery is best? A. A. Callaud, Smee, or Lecianché battery wlll furnish a cheap and constant electromotive force, and all are equally good.

(20) R. asks: How can india rubber be hardened? A. Take 30 parts sulphur, and 70 parts pure rubber cut fine, mix thoroughly, put into a mold: keep under pressure of about 12 lbs. to the inch in a heat of 315° Fah. for 2 hours.

(21) G. C. P. Jr. asks: How can I make printer's ink? A. Take balsam capivi 9 ozs., lampblack 3 ozs., indigo and Prussian blue together 11/4 ozs., Indian red ¾ oz., yellow turpentine soap (dry) 3 ozs. Grind to an impalpable smoothness.

(22) W. H. H. asks: Can you give me a recipe for a baking powder containing ammonia? A. Take tartaric acid ¼ lb., alum ½ lb., bicarbonate of soda ¾ lb., farina 1 lb.; powder them all, dry, mix, and add 3 ozs, sesquicarbonate of ammonia in powder. Keep closely packed or in a stoppered bottle.

(23) J. J. asks: How can I solder brass? A. Mix copper and zinc in equal proportions, cover the surfaces to be joined with a paste of borax and water, put in the alloy in powder, lute together, and hold in a flame till the solder melts.

(24) C. A. R. asks: How can I soften old putty on window frames? A. Pass a red hot irou over it, near the surface of the putty.

(25) F. M. H. asks: What materials are used in making a nickel solution for plating with? A. Dissolve the nickel in nitric acid; add cyanide of potassium to precipitate the metal. Wash the precipitate, and then dissolve it by the addition of morecyanide of potassium. Another method is to precipitate the nitrate solution with carbonate of potash. This should be well washed, and then dissolved in cyanide of potassium. This method of preparing the nickel-plating solution is simple and good. The electrotyping is done by a process analogous to that of silver plating. Of course you must use an electrode of nickel.

(26) W. H. F. asks: 1. Given the resistance of a line, how shall I determine the electromotive force necessary to operate it? A. You require about one volt for each 80 ohms, or about one cell of Daniell or gravity battery for each two miles of wire. 2. Can you give me the average resistance of No. 23 copper wire, B. W. G., at 60° Fah.? A. It is 83·16 ohms. 3. What is the electromotive force of the ordinary Hill gravity battery compared with the electropoion cell? A. Calling the electropoion 100, the electromotive force of the Hill, Callaud, gravity, Minotti, Eagles, or any other modification of the Daniell battery, is 56.

(27) A. M. says: I would often make use of the electric light if the Grove and Bunsen batteries were not so troublesome. I have seen a metallic battery praised as the most powerful of constant batteries. Could I produce, with such a battery, an electric light equal to one produced by 50 Groves (the platinum being 6 by 21/2 inches), and what number of cells would be required for this purpose? A. Yes. It would require 100 cells.

(28) C. C. asks: 1. In electrotyping, must the wood blocks or engravings be oiled before taking a wax impression? A. No. Brush them over with black lead. 2. How is the electro deposit removed from the wax (after it is taken out of the battery) so as to be perfectly true and level? A. Melt the wax by dipping the plates in hot water. 3. What is the metal backing composed of? A. Lead. 4. How long must it remain in the battery to receive a sufficient coat of copper for ordinary printing? A. About 24 hours. 5. What battery would be necessary for electrotyping an engraving 4 inches square? A. Two cells of a Daniell or Callaud battery.

(29) C. E. C. asks: What are the best treates on electroplating? A. "Elements of Electro-Metallurgy," by Alfred Smee; "A Manual of Electro-Metallurgy," by James Napier; Walker's "Electrotype Manipulation;" Sturgeon's "Art of Electrotyping," and How's "Manual of Electro-Metallurgy.'

(30) E. T. T. says: A friend and myself have a couple of telegraph instruments, with a large wire between them. We tried to use a ground. but we could not close the circuit. Our houses are only about 200 feet apart, and we had 4 cups of battery. I then bought enough of No. 18 copper wire for another main wire; and it worked splendidly and has never troubled us since. At what distance will a certain number of cups close a ground? At what distance will they close a double wire circuit? A. Different substances conduct electricity with more or less freedom, according to collect the former question, however, it was sup-posed that both saws made the same number of ly. It is the moisture in the earth which gives it most of its conductive capacity, but water itself is manymillion times a poorer conductor than copper; hence, in order to conduct as well as a copper wire, the volume of water must be many million times as great as the wire. If the two ends of your wire had beensoldered to a water pipe which was buried for a considerable distance in wet earth, it would have worked; or if you had buried copperplates twelve feet square in wet earth at each end of your line, and attached the ends of vour whe to them, it would have served your purpose. The cheapest plan for you, however, was to run another wire, and make a metallic circuit.

(31) J. N. G. asks: How many Callaud cells would be required to work three relays on a small copper wire of half a mile long, wire No.17? A

(32) E.A. F. T. asks: 1. Will an engine, 11/2 inches bore x 3 inches stroke, with a conical boiler 18 inches high and 8 inches across at top, and 12 inches at bottom, of $\frac{1}{6}$ inch iron, be large enough to run a 6 inch swinging lathe for ordinary work, or an 18 inch grindstone? A. Yes. 2. Could