ANSWERS TO CORRESPONDENTS

C. J. A. can repair his rubber boots by following the directions on p. 203, vol. 30.—E. A. A. can japan iron castings by the process described on p. 208, vol. 26. Bronzing is detailed on p. 298, vol. 27.—M. can remove fruit and wine stains from table linen by the process explained on p. 171, vol. 30.—A. F. can repair his glue kettle with the cement described on p. 42, vol. 25.—A. E. S. will find a recipe for paste for paper labels on tin on p. 235, vol. 30.—W. H. P. does not send his name and address.—F. H. B. will find directions for making modeling wax on p. 58, vol. 24.—E. will find that Colburn's books on the locomotive engine are complete and authentic.

(1) P. asks: If two horses are drawing 1 tun with a four foot double tree, and one of them be given his end shorter by 1 inch, what would be the apportionment of the draft to the horse with the shorter end of the double tree? What would be the proportion if his end were two inches shorter? A. This case is analogous to that of two men carrying a weight suspended from a pole, the force exerted by each being inversely proportional to the length of lever between the hand and weight.

(2) H. P. asks: Does color exert any influence on the heat-radiating powers of bodies, boilers, etc., being usually painted black in preference to any lighter color? A. According to Melloni, color exerts no influence upon the radiant power of surfaces, white, black, and red radiating alike; so that, as regards the loss of heat from this source, the color of a substance is of no importance. On the contrary, color powerfully influences the absorption of luminous heat. Dr. Franklin spread differently colored pieces of cloth upon the snow in the sunshine. The black sunk farthest, that is, melted the most snow, and of course received the most heat. The blue sank to a less depth, the brown still less, and the white hardly at all. Hence by scattering soot over snow, its melting may be hastened.

(3) E. M. W. asks: Has anything been discovered that will harden gutta percha as sulphur hardens rubber? A. We believe not.

(4) A. M. asks: How can I construct a battery strong enough to charge a horseshoe magnet 12 inches long, with an electromagnet 5 inches long made out of ⅜ iron, wound with 800 feet of No. 22 wire? A. A Bunsen battery would be the best for the purpose, and your cheapest plan would be to buy it from the regular dealers in the article.

(5) L. P. asks: Is white a color? A. If the separate colors of the spectrum are considered each as an element, white light is a compound, formed by perfectly blending together all these elements, and cannot, therefore, be properly termed a color.

(6) G. C. J. asks: 1. How long does it take to transmit one word across the ocean by cable? A. About one minute, although it is constantly varying. 2. What is the charge per word? A. To England, the charge per word is $1, gold.

(7) W. L. C. asks: How can I preserve the color of fascicled evergreen leaves, and prevent them from falling from the branch? A. Try dipping in pure dammar varnish.

(8) P. E. W. says: I wish to make brick out of the clay dredged from a channel at a seaport. The salt causes the bricks to glaze, and makes them worthless. How can the difficulty be obviated? A. To our knowledge, there is nothing that would accomplish this.

(9) F. R. R. says: I have a large glass globe, mounted on a pedestal of the same material. In the former, near its junction with the latter, is a fracture extending around two thirds of its circumference at that point. Can you tell me of a composition with which I may cement the interior of the globe, so as to strengthen it at the fractured point, have no deleterious effect upon the water contained therein, and at the same time prevent leakage? A. Try diamond cement.

(10) M. C. asks: 1. Can you give me a good recipe for soft soap, made with potash and domestic grease? A. Add 3 galls. rain or other soft water to 1 lb. of concentrated ley; boil it and put into it 4 lbs. tallow and soap fat. When the solution becomes clear, add 12 galls. more water. It is ready for use when cold. 2. Is a cellar a good place to keep it in? A. Yes. 3. Would freezing hurt it? A. Very probably. 4. Does the addition of salt to soft soap (to make hard soap) injure its quality? A. Yes.

(11) G. W. D. asks: What kind of varnish can I put on metal, so that the latter will not be injured when coming in contact with a solution of nitrate of silver? A. Try paraffin varnish. See p. 91, vol. 31.

(12) J. A. asks: Is there any elastic substance that would take the place of rubber in cloth, and resist boiling water? A. We do not know of any such substance.

(13) P. V. C. asks: Please give me a description of the spectroscope. A. You will find descriptions on pp. 64 and 276, vol. 30.

Can iron be decomposed by any acid, and will its decomposition generate electricity? A. Iron, being an elementary body, cannot be decomposed; but with strong nitric acid, it may be used as the positive element in the battery.

(14) S. A. asks: Is there any means whereby the color may be taken from the heavy black residue or tar left in the still after running the burning oils off from the crude petroleum, at the same time letting it retain its former body or consistence? A. This cannot be done without altering some of its properties.

(15) H. P. G. asks: 1. What will effectually disguise the smell of ammonia? A. The smell of free ammonia, that is, ammonia not in combination, cannot be disguised nor destroyed; but by combining it with a base, not volatile at ordinary temperatures, this may readily be accomplished. 2. What will prevent alcohol from evaporating? A. We know of no better method than that of keeping it in airtight vessels.

(16) H. C. J. asks: What book explains the terms marcasite, biotite, muscovite, blende, etc.? A. If you do not possess a dictionary, we cannot help you, since a certain amount of knowledge must be possessed by all readers of scientific publications. You can find full definitions of the names of these minerals in Webster's "Unabridged Dictionary."

Can you explain scientifically the operation of salt raising bread? A. Your meaning is not very clear. Raising salts or yeast powders commonly consist of such salts as cream of tartar (bitartrate of potash) and bicarbonate of soda. The leavening is due to the action of the liberated tartaric acid on the soda salt, which liberates the carbonic acid.

(17) W. E. J. asks: What kind of battery is required to operate the Atlantic cable? A. A modification of the Daniell battery, called the Minotto or sawdust battery, is employed for the purpose, twenty cells being used.

(18) J. C. C. asks; 1. What should be the temper of the steel in a permanent U magnet? A. See p. 175, vol. 30. 2. Which will magnetize a U magnet the better, a helix in two parts, one for each leg of the magnet, or a single coil? A. The latter.

There is a law in Ohio imposing a fine or imprisonment upon any person who sells, or offers for sale, a patent in any county without having first exhibited the letters patent to the probate judge of the county wherein the patent is sold or offered for sale, and having made oath, in his presence, of ownership, name, and place of residence. Is such a law constitutional? A. No. See p. 137, vol. 25.

(19) G. H. J. asks: How is black paint for steam boilers made? A. Common asphalte dissolved in turpentine is a very good paint for this purpose.

What is Venice turpentine? A. Turpentine prepared from the sap of the *laryx Europæa*, or larch.

What is the theory of a draft in a chimney when there is no hot air to produce a draft? A. Unless there is a difference of temperature, between the air within and the air without the chimney, there is no draft.

(20) S. W. says: When our nickel five cent pieces were issued, it was reported in newspapers that the ir diameter was a certain number of centimeters, so that the measures of the French metric system might be derived from them. Is this true? A. The diameter of our five cent nickel coin is two centimeters.

How shall I rid my house of roaches? A. There are several good preparations for this purpose for sale by druggists and others, than which we can recommend nothing better.

In making a chess board by gluing veneers upon a board, the veneers curled up as soon as wet with the glue. How can I get over the difficulty? A. It is common, on applying the thin glue to such veneers, to moisten the opposite side with warm water.

(21) W. D. P. K. asks: Is there any chemical that, placed on or near a gas jet, will increase the luminosity? A. A device, used for this purpose, consists of a jet placed at the side of the gas burner, through which a supply of oxygen is allowed to escape.

Is there anything that I can take with me in a boat to keep me warm on a cold day? A. It is customary to use for this purpose a watertight vessel, previously filled with boiling water.

(22) J. B. T. says: We have a drug store in a wooden building, and are using kerosene, as we have no gas. We are always uneasy for fear of fire. Would it cost very much more to light the store by electricity? A. Yes. An electromotive force equal to forty Grove cells is the least that a suitable light could be produced with, and this would cost at least $1 per hour for one light sufficient for the store.

(23) L. F. R. asks: Can a Bunsen or a bichromate of potassa battery be changed to a Leclanché, simply by using the proper chemicals? A. Yes.

How are round balls of soap formed? A. They are cast or pressed in molds.

Please describe the manner of finding the latitude on board ship. A. The latitude is equal to the zenith's distance plus or minus the declination for the day. The latter is found by referring to the *Nautical Almanac*.

What is made of chromate of iron? A. Chromic acid.

(24) C. T., writing from Valley Falls, N. Y. says: A controversy has arisen in our community caused by the bursting of a flume, and we appeal to you to settle the question. All parties are agreed to abide by your decision. What is the difference between the side pressure of a flume of water ten feet deep and twenty feet square, and one ten feet deep and ten feet square? A. The pressure per square foot upon the sides of the flume is the same in both cases, namely, 312½ lbs. per square foot. To compute the pressure in such cases, multiply the area of the side of the flume by the height of the center of gravity of the water in feet. In this example the height of the center of gravity is 5 feet. Multiply the product by 62½ lbs., the weight of a cubic foot of water.

(25) J. S. H. says: On. 203, vol. 31, you gave directions for making a phosphorescent lamp. I tried it, but the phosphorus would not dissolve in the oil. What shall I do? A. Phosphorus should dissolve in the oil. If you follow the recipe and your phosphorus and oil are pure, the process will not fail. Enough phosphorus should be used to keep the oil saturated.

(26) E. H. asks: 1. Does a large body of liquid require a greater proportion of battery power than a smaller one? I have a copper bath 2 feet long containing about 20 gallons, which I can drive with 4 Callaud batteries, the zincs of which are 8½ inches in diameter, or with 3 small Bunsen batteries, and I have another copper bath 6 feet long, holding about 80 gallons, which I cannot drive with 14 Callaud batteries. If I put more goods in the large one than in the small one, the deposit is very slow, and soon ceases. Is nickel more easily deposited than copper, and does it require greater or less power than a copper bath of equal size, filled with the same amount of goods? A. So much depends upon the relative distance between your electrodes, the strength of your bath or electrolyte, and the coupling or arrangement of your batteries, as to the requisite quantity and tension of current, that, with so limited a description, we can give you no definite answer. 2. What is the relative power of Daniell's, Callaud's, and Smee's batteries? A. The electromotive force of a Grove being 100, Bunsen's is 98, Daniell's 56, Smee's about 25, Callaud's about 45

(27) W. P. asks: In adding the malt or diastase to a mashing of raw grain (which action is supposed to first convert the raw grain into starch, then, after standing a proper time at a certain temperature, to transform the starch into grape or starch sugar), how am I to know when the starch sugar is formed? A. The boiling of the starch with dilute sulphuric acid is effected on a small scale in leaden pans, but in an extensive preparation iron pans are employed. The requisite quantity of water is first heated to the boiling point, and to this is added the sulphuric acid, diluted with about 3 parts by weight of water. The starch is also brought, by the previous addition of water, to a milky consistency. The liquids so prepared are mixed, and the boiling continued until all the starch is converted into sugar. An intermediate stage, not usually noticed by the manufacturer, is the conversion of the starch into dextrin, which in turn suffers decomposition into grape sugar. The entire conversion of the dextrin into grape sugar cannot be ascertained with certainty by the iodine test, as sometimes a purple-red tinge is produced, while in others there is no change. The most reliable test is that with alcohol, founded on the known insolubility in that menstruum. To one part of the solution to be tested there are added 6 parts of absolute alcohol; if no precipitate is thrown down, there is no dextrin remaining, and the conversion has been entire. The proportions of the materials are generally, to 225 lbs. of starch meal, 8 lbs. of ordinary sulphuric acid at 60° Baumé and 75 to 100 gallons of water. The separation of the sulphuric acid from the sugar solution is a most important operation, for the color, purity, and flavor all depend upon success in this stage of the process. The acid is neutralized by baryta or by lime, with either of which it forms an insoluble salt. The baryta can be employed as carbonate (witherite). Lime is most generally used, for its greater cheapness.

(28) I. F. A. asks: What is the best paint or coating to resist the action of sulphuric acid, to be applied to the inside of an open vessel? A. The best covering for the inside of tanks, etc., to hold sulphuric acid is sheet lead. This will perfectly resist all action.

(29) S. E. M. says, in reply to J. E. W., who asked how to burn coal slack: We use it all the time in our boiler, starting the fire with soft coal, and then using half soft coal, mixed with slack. Our draft is not very good. In one place they think they cannot burn this mixture, without wetting it and then draining well before burning. I have tried this, but failed to see any good results. If J. E. W. will fire often and break up the crust that forms on top, he will have no trouble in using this mixture. I have put in steam blowers above and below the fire, but was glad to take them out again, because they took too much steam.