

turn dark by heat if mixed with any substance that resists water. You might try silicate of soda with a color and a little lime as a water color. 2. Please decide between two persons, A and B, the difference, if any, between a square foot of measurement and a foot square? A says there is no difference, while B maintains that a foot square is equal to a cubic foot. Who is right? A. There is no difference between a foot square and a square foot, but a great difference with any other number. A foot square is not a cubic foot. "Square feet" is superficial measure, while "cubic feet" is solid measure.

(7) O. F. T. writes: In "America; an Encyclopedia of its History and Biography," by Stephen Morrill Newman, M.A., speaking of steamboat speed, it says: "In 1873, at a trial of steamboat speed, the Mary Powell ran on the Hudson, from New York to Poughkeepsie, 76 miles, in 3 hours and 3 minutes," which would be nearly 25 miles an hour (24.9+). How is this? A. The speed given in the "American Encyclopedia" was probably attained on a strong flood tide, and perhaps strong wind in her favor. The distance to Poughkeepsie is 74 1/4 miles, not 76 miles. This would reduce the speed to 24 1/4 miles per hour. A strong flood tide is from 3 to 3 1/2 miles, which deducted gives a speed through the water say of 21 1/4 miles. An average of several runs by same boat on her regular service, from accurate notes taken by Mr. Skeel, gave 19.2 miles. Haswell gives the result of a run to Poughkeepsie in 1867 on flood tide, a speed of 22.37 miles; deduct 3 miles for tide gives 19.37 miles through the water. We know of no greater speed by steamboat than made by this boat. We are quite sure no boat has ever made 25 miles per hour through the water.

(8) S. S. W. asks if there are any chemicals that can be used to remove paints and varnish from wood so it would not injure the wood. Something that has very little potash or soda in it, as the above articles are injurious to the wood. A. The best plan is to use either soda or potash. The following receipt is a good one: Mix 1 part by weight of American pearl ash with 3 parts quick stone lime, by slaking the lime in water and then adding the pearl ash, making the mixture about the consistency of paint. Lay the above over the whole of the work required to be cleaned, with an old brush; let it remain 14 or 16 hours, when the paint can be easily scraped off. If the foregoing is not satisfactory, the paint can be wetted with naphtha, repeating as often as is required, but frequently it is claimed one application will dissolve the paint. As soon as it is softened, rub the surface clean. Chloroform mixed with small quantity of spirit of ammonia has been employed very successfully to remove the stains of dry paint.

(9) G. H. P. asks (1) for a receipt for making white ink. A. White ink is prepared as follows: Mix pure, freshly precipitated barium sulphate or flake white with water containing enough gum arabic to prevent the intermediate settling of the substance. Starch or magnesium carbonate may be used in a similar way. These must be reduced to impalpable powder. 2. Also the composition of Chinese white, and the nature of it? A. For the manufacture of Chinese white: Take as much as is required of zinc white finely ground, put it on a marble or glass slab, mix it into a cream of the required consistency by adding mucilage of gum tragacanth, grinding with a glass muller. For quantity required to fill an ordinary sized Chinese white bottle, add to above 10 or 12 drops of thick gum arabic mucilage and 5 or 6 drops of pure glycerine; grind well together, and fill bottle by aid of palette knife.

(10) F. Y. - The height of hills can be readily measured by the aneroid barometer, 900 feet elevation to 1 inch depression of the barometer, or parts in proportion, for ordinary use. For more exact work see a work on the aneroid barometer and its use, by Plympton.

(11) F. L. N. - "B-ham," of which you write, means *Birmingham*, the English wire gauge. Its numbers are from one to two sizes larger than the American gauge. Any hardware store should have both kinds on hand.

(12) E. J. R. writes: I have a 4 inch exhaust pipe 60 feet high from the heater. Standing in the open air, the condensation is very great. What kind of condenser can I use that I may catch the water and lead it back by a drip pipe to the feed water tank? A. You may turn the exhaust pipe down into the mouth of a large receiver upon the roof, with a drip pipe from the bottom to your tank. Would not advise you to return the exhaust drip to your boiler.

(13) T. D. W. P. - There is very little reliable knowledge as to the average age of mankind in ancient times. The accounts of the ages of noted persons and rulers of ancient times go very little toward establishing the average of the common people. From considerations of the wastefulness of life, through a crude medical care, and exposure of children from ignorance and low state of civilization among the common people, as against a primitive vital strength, we are of the opinion that the average duration of modern life in civilized countries is increasing. You will derive much information on this subject in works on anthropology and ethnology.

(14) P. R. writes: I want to make a flue boiler of steel 1/2 inch thick, 4 feet long, 15 inches in diameter, with 22 one inch flues. Boiler to be a plain cylinder with fire under it, and the draught to return in the flues. The dealer the steel was got from said it had a strength of 65,000 pounds. Now, what pressure will the boiler safely stand, and please give me the rule for finding it, if there is a rule? A. For the bursting strength of your boiler, $\frac{65,000 \text{ lb.}}{8} = 8,125 \text{ lb.}$, strength for 1/2 inch thick; $\frac{8,125}{3} = 2,708 \text{ lb.}$, strength half diameter of 7 1/2 inch boiler of steel for 15 inch shell; $\frac{2,708}{3} = 903 \text{ lb.}$, strength of shell for good double riveted seams. This should stand a test of 150 lb., and be safe for 100 lb. steam pressure. The heads should be 1/2 inch steel, well riveted, with expanded ends on tubes. Also a bolt brace from head to head in center of space above tubes.

(15) W. S. W. asks: What size boiler will be required to run an engine 1 in. by 1 in.? What pressure should it carry? How thick to carry twice

that pressure? How long would a 2 in. iron pipe (such as is used for drive wells) have to be to furnish boiler capacity enough, and how much pressure would it stand with cast iron caps screwed on each end? A. Two square ft. of fire surface; 4 ft. of 2 in. pipe used as a generating surface will answer your purpose. If the pipe is good and lap welded, you can carry any pressure up to 100 lb. The pipe should be equal to 500 lb. pressure.

(16) J. G. H. asks for the best way of heating a large building—whether by having steam pipes around the building, or by heaters and blowing hot air around. A. Placing coils of pipe along the walls is far the cheapest and best method of heating factories.

(17) M. C. J. asks: 1. What is a good, clear, cheap, gold lacquer for fine polished brass work? A. Make the lacquer with 95 per cent alcohol, 1 pint; best shellac or seed lac, 1 ounce; dragon's blood, 1 drachm; put all in a bottle and shake up every day for a week and let it settle. When settled, decant the clear lacquer into another bottle. Dilute with 95 per cent alcohol until it will spread with a camel's hair brush to suit. The color may be varied by using gamboge for yellow, which with the dragon's blood will give, by mixing, various shades from a deep yellow to orange. 2. How is it applied? A. Warm the brass work to 175°, or nearly the heat of boiling water, and spread the lacquer quickly with a flat camel's hair brush, one-half to one and a half inches wide, according to size of piece to be covered. Then place in a warm oven for half a minute, which gives to the lacquer a fine gloss. 3. What sort of metal or alloy is used for making cast iron door bells, and the process of casting the same? A. Cast iron bells are made in the same manner as other iron castings, but poured with hard iron.

(18) A. D. S.—The niter of salt you ask about is probably saltpeter, and may be sodium nitrate or potassium nitrate. Your salt soda you say is used in boiler is, no doubt, *sal soda*, or common washing soda; it is largely used to clear boilers of incrustation where hard water is used. It is harmless, and recommended such purposes.

(19) C. P. S. writes: 1. How can I arrange two vessels so that, when water or liquid is poured into one, the water will remain at a higher standpoint in the other? A. This cannot be done except by placing in the two vessels fluids of different specific gravities. For example, you may place water in one vessel and oil in the other. 2. Is there a siphon that, automatically, will take water from a vessel and convey it to a higher point or vessel? A. There is no siphon that will answer your purpose. 3. How can a name be put upon a razor, so that the letter will go below the surface, the handle being made of bone or gutta percha? A. Coat the razor blade with an asphaltum varnish or with ordinary beeswax, and trace the characters you wish to etch with a needle, then apply to the lines so traced a mixture of nitric and muriatic acids. 4. Where can I find out about the lost arts? What are the lost arts? A. A lecture delivered many times by Wendell Phillips covers the ground very entertainingly. 5. How can I make a fountain (miniature), so that it will throw water higher than the vessel supplying the same, the fountain working automatically? A. Heron's fountain, described in almost all works on physics, throws water higher than its source. 6. Is the construction of a perpetual motion a possibility? A. No.

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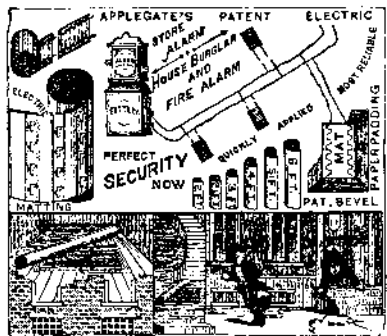
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