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A. K. will find a description of wire rope transportation on p. 370, vol. 31.—R. J. will find a recipe for mica varnish on p. 241, vol. 32.—J. T. will find directions for preserving shingles on p. 123, vol. 33.—F. D. R. will find that an inoxidizable white metal is described on p. 119, vol. 33.

(1) U. N. O. says: 1. I have used a paste or glue that is used by the various express companies, that is excellent for all purposes such as attaching labels, etc. It is a dry brownish powder, and is prepared for use by pouring hot water on it; it looks like pulverized gum arabic. Can you tell me what it is? A. We are unable from your indefinite description to tell of what it is composed. If you consider it to be gum arabic (C₁₂H₁₁O₁₁), test it as follows: A solution of it in water is precipitated, by alcohol and by ether, in white flocculi, or, if dilute, in the form of a milky turbidity. If boiled with dilute sulphuric acid, it is gradually converted into dextrin, and then into a fermentable variety of sugar. 2. Please give a recipe for good paste for labels, that will set quickly and stand exposure to weather. A. Dissolve gum sandarac and mastic, of each 2 ozs., in 1 pint spirit of wine, adding about 1 oz. clear turpentine. Then take equal parts of isinglass and parchment glue; and having beaten the isinglass into small bits, and reduced the glue to the same state, pour the solution of the gums upon them, and melt the whole in a vessel well covered, avoiding as great a heat as that of boiling water. When melted, strain the glue through a coarse linen cloth, and then put it again over the fire. This preparation may be best managed by hanging the vessel in boiling water, which will prevent the matter burning on the surface of the vessel, and the spirit of wine from taking fire.

(2) R. S. S. asks: Can you give me an account of the process of making ferro-manganese? A. You will find an article describing the process in the *Journal of the Franklin Institute* for May, 1874.

(3) G. G. asks: What will remove the tarnish from plated goods that have turned dark, probably from the action of gas? A. Steep the plated ware in soap lye for 2 hours; then cover it over with whitening, wet with vinegar, so that it may stick well upon it and dry it by the fire; by thus drying, the whitening is removed from the crevices without the least difficulty. Rub off the whitening and pass over it with dry bran; the silver will look exceedingly bright.

(4) J. W. asks: 1. Will galvanized iron tubing in a bored well be durable? Would the water from such a well be wholesome? A. The use of galvanized iron pipes for family water supply is not desirable. For a short pump, if the water is pure, and the precaution is taken not to use water that has stood long in the pipes, perhaps no bad effects would result. But there have been repeated examples of poisoning from the use of galvanized iron conducting pipes. In a case at Portsmouth, N. H., a family of four persons were thus poisoned, and Dr. Jackson found four grains of oxide of zinc in the water. In another case, near Boston, where the house was piped with galvanized iron pipes, one of the young members of the family died and, a post mortem examination revealed the presence of oxide of zinc in the stomach and other organs. Death was directly attributed to the use of the above pipes. They are made by heating and dipping the iron pipes in melted zinc.

(5) E. M. K. asks: Why does water shorten a rope? A. We were under the impression that wetting a rope exposed to strain causes it to stretch.

(6) S. S. says: A. says that there is no power required to raise water to the pump, that the atmosphere does part of the pumping. B. says it requires just as much power to raise water 1 foot below the pump as it does to force the water 1 foot above the pump. B. contends that, in our case, the pump being 21 feet above the water, it requires the atmosphere in the pump to be reduced to about 5 lbs. to the square inch in order to let the water flow in; and he also contends that, to do this, he has to add 10 lbs. additional weight or power to his plunger to reduce the air. Which is right? A. B., certainly; if the pressure of the air forces the water into the pump barrel, that pressure must first be removed.

(7) J. S. G. asks: Can we, by continued observation, see the whole surface of the moon, or do we always see only the one half? A. We only see one half for reason that the moon turns once on its axis in the time of making a revolution in its orbit.

(8) W. S. S. asks: What is your method of getting the foundation bolts of an engine in the proper place, supposing we have our center line on the bed plate template all right? What is the best mode of getting a right angle line from that, so that the back box will be in its right place when it is over the foundation bolts? A. Make holes in the template corresponding to those in the bed plate, and put in the holding down bolts, with packing blocks under the top nuts, making the distance from bottom of template to top of packing blocks equal to thickness of bed plate at bolt holes. Then arrange the template in position, and level it, placing it so that the under side is where the bottom of the bed plate is to be. Proceed to

build the foundation, first anchoring the bolts at the bottom, and building them into the masonry, as the work proceeds. In this way, when the work is done, you will have the bolts firmly secured in the proper positions.

(9) A. D. B. asks: What internal atmospheric pressure can I with safety put on an ordinary lined oil barrel, holding about 40 gallons? A. We think you can safely use a pressure of 10 or 12 lbs. per square inch. Perhaps some of our readers have data in relation to the matter, which they will send.

(10) H. L. says: Please tell me the number of square inches bearing surface of the ordinary screw propeller, such as is in use on the Erie canal? A. To determine the surface of a propeller, form its development or view of the blades if flattened down on a plane surface. Then its area can be found by the rules for irregular figures. Any calculation of the probable slip of a new form of propeller will be of very little value, unless verified by experiment.

(11) W. P. says: A friend claims that it is impossible that salt water, taken from the ocean, can be made fit for drinking by working it by steam through a filtering bag, or some other way so as to take the salt taste from it. Is this so? A. Salt water is very commonly prepared for drinking by evaporating it, and condensing the steam. Nearly all ocean steamers are fitted with fresh water condensers.

(12) J. C. M. says: 1. I propose to build a boat, 20 feet over all, 18 feet keel, 18 inches beam, 15 inches deep, of 1/4 inch selected pine. On each side will be a smaller airtight boat, 10 feet long, 6 inches beam, 4 inches deep, connected by iron arms 1/4 x 1 inch, 4 feet long, to the main boat, which is for one person, decked over and containing 8 watertight compartments, with the cock pit amidships. I have an engine 1 1/2 inches stroke x 1 1/2 inches bore, tested to 600 lbs. per inch. Would it run the boat, and at what speed? A. Yes, at 4 or 5 miles an hour. 2. What dimensions of wheel and how much steam should I use? A. Wheel 18 inches in diameter; steam pressure 100 lbs. 3. Could I make a coil of gas pipe in a drum of sheet iron answer for a boiler, and how small should it be? A. We think you will have difficulty with this arrangement. 4. Could I use gas made from zinc and blue vitriol for fuel, and would I need a retort? A. We advise you to design your boiler for the use of coal or charcoal.

(13) C. S. says: 1. I am running a portable engine, and drawing water from a well slightly impregnated with salt. Will it injure the boiler? A. It will form scale in the boiler. 2. Do not ocean steamers use salt water? A. Ocean steamers are ordinarily fitted with surface condensers, for the purpose of supplying as far as possible fresh water to the boilers.

(14) R. C. P. says: I have a large upright boiler that leaks badly; leakage is caused by scale. It think it is becoming loose and falling on the crown sheet; but the flues stand so close that it is impossible to get a scraper through them. Will anything dissolve it, so that it could be washed out with a hose? A. On hauling the fire at night let the water remain in the boiler until morning, or until it is quite cool. Then run it out and wash out the boiler, in all parts inaccessible by hand, with a stream of water from a hose. By repeating this operation several times, at intervals of a few days, you may succeed in removing the scale. Possibly, however, you may find it necessary to use some preparation, such as tannate of soda, in the feed water. These remarks will also serve as an answer to G. S., who sent us a small package of scale, which seems to be mostly composed of mud.

(15) J. A. asks: With two steam gages, one connected to boiler and one connected to steam pipe, some 200 yards distant from boiler, both gages being on a level, should there be any difference in the indications? A. The pressure would be less in the more remote gage on account of the pressure required to give the steam motion, and the losses from radiation and condensation.

(16) M. F. P. says: I am making a boiler of 6 inch wrought iron pipe of three sections each, 18 inches long, with 6 inch flues in each. I connect them at top and bottom to a three-sided casting with a core of 1 inch square, which gives a good circulation at the top and bottom, each with the other, and I enclose all three in an iron jacket, connected at the top with the smoke bonnet and stack; the grate is 15 inches in diameter; the heat goes up through the flues and the space around the cylinders. Is it a good plan, and will it drive a cylinder 3x5 at 40 lbs.? A steam dome is also placed on the top for superheating the steam. A. The idea strikes us quite favorably. We would be glad to have an account of your experience.

(17) S. W. asks: 1. What proportions of copper and zinc make the strongest brass? A. Take, by weight, 25 parts copper, 2 of zinc, and 4 1/2 of tin. 2. What can I use as a flux for brass, to make it flow freely, and cast smooth and solid small articles? A. Melt the copper first, then add the tin, using a mixture of potash and soda as a flux; add the zinc last.

(18) C. W. says: Does the cone form of the tread of the car wheel produce oscillation of the car? A. The oscillation is due to irregularities in the track, and to the fact that there is necessarily some play between the tracks and the flanges of the wheels. The most successful preventives of oscillation seem to be close coupling of cars, weight of cars and trucks, an increase of the number of wheels for a truck, and the use of an improved form of springs between car bodies and trucks.

(19) R. M. says: 1. I have a hand power jig saw, that I turn by a crank. I can saw hard 2 inch oak rather easily, but the work becomes tiresome when done for half a day at a time. Can I

use some motor besides steam? A. An air or gas engine would answer your purpose. 2. I have thought that, if a tank were built 30 feet above the earth, to hold 100 barrels of water, and the water came down through a tube to a small water wheel, a pump pumping some of it back into the tank, power enough could be realized to drive the saw. Would this do? A. The water project is too nearly of the nature of a power creator to be successful.

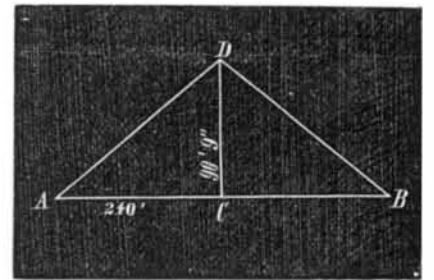
(20) C. S. asks: Is there to be a canal across the Isthmus of Panama? A. The matter is only discussed, as yet.

Is there any paint made that is better and as cheap as white lead and oil, for the outside of houses? A. We would be obliged to decide upon the claims of a number of rival manufacturers, to answer this question; and we do not care to make such a distinction in these columns.

Do you think the engineer's trade a good trade to learn? A. The trade which has numbered in its ranks such men as Watt, Rankine, Brunel, and a host of others whom the world delights to honor, needs no eulogy from us.

(21) F. H. D. asks: Why is not towing canal boats in trains practised on the Erie canal? A. It is not advisable, principally on account of the large number of locks.

(22) C. S. asks: What is a proper description to be given in a deed of a piece of land, as shown in the engraving? A. Beginning at a point,



(A state how determined) running thence southerly in a straight line to a point distant 240 feet, thence in a northeasterly direction in a straight line to a point distant easterly in a straight line 90 feet from the middle point of the line running southerly from the point or place of beginning, thence in a northwesterly direction in a straight line to the point or place of beginning.

(23) S. T. J. says: Vapor of ammonia has been tried as a motor. Can you inform me wherein it needs practical improvement? A. So far as we know, the ammonia engine has been pretty well worked out in principle, and it only requires perfection in matters of detail and construction. You will find a very interesting discussion of the theory and description of such engines in Dr. Barnard's masterly "Report on the Paris Exposition."

(24) M. C. K. asks: Is there any more heat in steam at a high pressure than at a low pressure? A. The total heat in 1 lb. of steam increases with the temperature, at the rate of 0.305 of a unit for each degree Fah.

(25) S. E. S. asks: 1. What is the metal composition used in making small toy engine cylinders? A. We believe it is a kind of type metal composed of lead and antimony. 2. Will solder, used for soldering tin, do for soldering sheet iron also? A. No. Use a solder composed of equal parts of copper and zinc.

(26) A. B. W. asks: 1. How are electroplating and silvering done? A. For gilding, see No. 28 on this page. Silver solution is prepared with least trouble by dissolving cyanide of potassium in water (1/4 oz. to the pint), and adding the silver by the battery process. This is done by placing a sheet of silver and a porous cup in the cyanide solution; the silver is then connected to the positive pole of a battery, and an iron or copper rod, placed in the porous cup, is connected with the negative pole. The porous cup also contains some of the cyanide solution. When a deposit begins to form on the metal in the cup, the solution is of the right strength. One or two Daniell cells form sufficient battery power; if gas is given off, reduce the strength sufficiently to prevent its evolution. Work at a temperature of about 60° or 70° Fah. 2. How is silvering on glass done, to make mirrors? A. Bottger gives the following method for silvering on glass: Nitrate of silver is dissolved in distilled water, and ammonia added to the solution till the precipitate first thrown down is almost entirely redissolved. The solution is filtered and diluted so that about 1/10 of a quart contains 1543 grains nitrate of silver. Next, 30.86 grains nitrate of silver is dissolved in a little water and poured into about a quart of boiling water 25.6 grains Rochelle salt is added, and the mixture boiled a short time, till the precipitate contained in it becomes gray, and it is then filtered hot. The glass plates, thoroughly cleaned with nitric acid, caustic soda, or alcohol, are placed in a shallow vessel and covered a quarter or half an inch deep with equal volumes of the two solutions. In an hour the reduction will be complete. The plates are then washed and the operation repeated until a sufficient coating of silver is obtained. When the silvered surfaces are dry, they may be cautiously polished with the palm of the hand. If the silver is only required as a coating of the back surface, this polishing is, of course, superfluous. In this case, also, the operation may be shortened by heating the solutions to about 58° Fah. before mixing. The silver may then be varnished over as a protection. When prepared, the solution will keep about a month in a dark place.

(27) E. J. W. says: Will steam, when exhausted into a cistern through a number of small holes in a coiled pipe, heat the water to a higher degree of heat than it does when exhausted through a straight pipe into the cistern, and why