Notes & Queries

G. C. will find a recipe for liquid glue on p. 9C, vol. 32.—F. G. S. will find a description of the ventilation of the Paris opera house on p. 134, vol. 33.—J. O. M. will find a description of artificial ivory on p. 234, vol. 30. See above for liquid glue.—R. W. E. will find directions for making an æolian harp on p. 315, vol. 33.—J. H. P. will find a recipe for a light metal on p. 347, vol. 32.—N. M. E. will find directions for cleansing water pipes on p. 49, vol. 34.—F. L. J. will find full directions for making paper boats on p. 163, vol. 27. This also answers F. T. H.—E. S. S. will find full directions for constructing a windmill on p. 241, vol. 32. This also answers B. W. S.—N. will find directions for filling black walnut on p. 315, vol. 30.—F. B. M. will find the information he wants, as to condensation on a cold vessel, on p. 43, vol. 31.—A. J. should address the School of Mines, Columbia College, New York city.—J. H. K.'s query as to color of gold, etc., is answered on p. 363, vol. 53.—N. E. F. will find a description of toughened glass on p. 20, vol. 33.—J. W. B. will find a description of a brown stain for wood on this or the next page.—S. B. will find a description of a battery suited for plating on p. 26, vol. 32.—G. H. W. should read Chevreul's book on color, to be obtained through any good bookseller.—A. N. will find directions for gilding on stone or marble on p. 59, vol. 30.—J. B. will find full directions for bending gas pipes on p. 150, vol. 33.

(1) P. C. says: Please state the number of shots that can be fired from the best kind of mitrailleuse. A. About 400 rounds a minute, we believe.

(2) J. M. R. asks: 1. How much steam will pass through a 2½ inch pipe in 1 minute at a pressure of 60 lbs. to the square inch? A. The question cannot be answered generally, as it depends on the length and arrangement of the pipe, the quality of the steam, etc. As a rough approximation, the amount may be taken as between 1,600 and 1,700 cubic feet a minute. 2. How many cubic feet of steam will 1 cubic foot of water make? A. It will depend upon the pressure of the steam. You will find tables in any good modern treatise on the steam engine. 3. How many cubic feet of water will a boiler (diameter 62 inches, 15 feet long, with 40 three inch tubes) evaporate in one hour, fired externally, to maintain a pressure of 60 lbs. to the square inch? A. Between such boilers in practice, about the following range of results is obtained: Coal burned per square foot of grate per hour, 5 to 15 lbs., water evaporated per lb. of coal, 6 to 10 lbs. Hence you see that it would be tolerably difficult to answer so general a question as you have proposed, in a definite manner. 4. How many cubic feet of steam will pass through an 12 x 14 engine in one hour, running at a speed of 150 revolutions per minute, at 50 lbs. pressure per square inch? A. There is about the same range in engines of this size as there is in the boilers, the amount of water used per horse power per hour varying from 30 to 100 lbs.

(3) W. M. asks: What is the name and what is the mode of drawing the proper curve upon which to turn the points of piles in order to have them sink the deepest with a given blow? A. We imagine that you refer to the so-called anti-friction curve, or tractrix. Its equation, referred to rectangular axes, is as follows: $x = h \times log. \left(\frac{h + \sqrt{h - y^2}}{y}\right) - \sqrt{h^2 - y^2}$

(4) F. T. T. asks: Can you point to a series of experiments upon the resistances to transverse stress on very short bars, the lengths of which are, as a maximum, but little greater than the lines that are the measures of their cross sections? A. If, as we understand you, you refer to a load uniformly distributed over a very short beam, fixed or supported at the ends, we imagine that you might safely proportion the part by a consideration of the shearing resistance. We shall be very glad, however, to receive and publish any experimental data that our readers may have.

(5) A. J. asks: 1. In driving a sawmill, is it practicable to transmit power by a cog wheel on the engine shaft geared to one on the saw mandrel? A. No. 2. How would this compare for safety with the usual method of using a long belt? A. Not well. 3. How many feet of soft timber per hour, with suitable feed, can be sawn with a 52 inch saw driven by a 15 horse power engine? A. This depends on a variety of conditions. 4. Is it true that the bore of a new engine cylinder is always an even number of inches? A. No.

(6) J. W. P. says: I am about making an engine to drive an ordinary skiff. I think that two oscillating cylinders, each about 1½ inches bore by 3 inches stroke, will be about as good a form as any: but I do not know how to build the boiler. I wish you would be so good as to tell me the proper size and form of boiler, also the best kind of fuel to burn, and what degree of power it would be likely to develope. A. Make a boiler from 18 to 20 inches in diameter, and 3½ feet high, with two inch tubes. Use anthracite coal, nut size, for fuel. In regard to the horse power of this or any other boiler, we can give you no information.

(7) B. L. asks: What is meant by sulphuric acid at 50° B.? A. 50° of Beaumé's hydrometer.

What shape of tool is most suitable for turning felt wheels, such as are used for polishing with crocus, etc.? A. A carpenter's chisel.

(8) W. T. says: I am about to put an engine of 1½ horse power, making usually 300 revolutions per minute, into a boat 18 feet long, 5 feet wide, drawing 8 inches forward and the diameter of the propeller aft. What should be the size and pitch of the propeller? A. If you use one propeller, it should have a diameter of at least 18 inches, and about 2½ feet pitch. 2. Should the shaft be placed parallel to the surface of the water or parallel to the keel? A. Make the shaft approximately parallel to the keel. It is difficult to give a general estimate of the slip of small propellers, but for a small boat like yours you will do very well if the slip does not exceed 25 or 30 per cent.

(9) J. E. R. says: Will you please inform me how I can restore edge tools, such as plane bits, chisels, etc., to their original temper, after they have gone through a fire? A. Heat them to a cherry red, and quench them endwise in lukewarm clean water. Then brighten the surface with emery and reheat them slowly over a piece of heated iron until a brown color appears, then quench them in water.

(10) J. B. J. says: I wish to roll sheet brass and crimp the same while hot. The heat softens the metal and takes all of the stiffness out of it. By what process can it again be hardened? A. By rolling it cold.

(11) C. B. asks: 1. Is there any way of making wiped joints on water pipes other than freezing the pipes, in case the water could not be turned off? A. We know of none. 2. What is the use of an air chamber in a force pump? A. To make the supply and delivery of water even. 3. Why does a water pipe burst when frozen? A. Because the water expands in freezing.

(12) D. H. asks: Does the pressure on the valve of a common slide valve engine depend on the area of the valve or the area of port? A. On the area of the valve.

(13) J. S. asks: 1. What temper is required for a butcher's steel? A. The steel may be hardened as hard as fire and water will make it, or tempered to a brown color. 2. Is there a certain quality of steel for sharpening steel? A. Use cast steel.

(14) J. H. says: It is proposed to change the course of a slow, circuitous, and now unhealthy stream. It has a fall of 1 in 700 feet. The bridges are 50 feet wide, and are ample to resist spring freshets. It is proposed to cut through a bank of clay above the town: this cut would be 1,000 feet in length by 22 feet deep, and in it a fall of 10 feet would be obtained, and the water would go clear by the town. With this additional fall, what width would we require to cut to carry off the amount of water mentioned? A. The proposed fall of 10 feet in 1,000 would create a velocity too great for the permanent stability of the bottom and sides of the cut, on account of the scouring effect it would have upon them. This would, therefore, involve the necessity of paving the bottom and sides, to prevent the gradual abrasion of their surfaces and the ultimate caving in and destruction of the cut itself. Considering this necessity and the depth of the excavation required, you will find it more economical to construct a light, brick, cylindrical aqueduct, and to effect your excavation by tunneling, through the 1,000 feet, the neat size of the aqueduct, without disturbing the surface of the ground. The size of the excavation should be 6 feet 8 inches in diameter, cut true to a mold or pattern, and then lined with a brick arch 4 inches thick, carefully laid in cement: this would give a clear section of 10 feet, and would discharge all the water of the stream, even in the season of freshets. In excavating, begin at the lower end and follow on at once with the brick arch, being careful to pack the earth well over the top of the latter, and behind the sides of it, as fast as a course may be constructed; in this way you will support the earth as you progress, and make all safe. You can secure the proper grade by means of a leveling instrument, having the bottom edge inclined at the gradient of 1 inch in 100 inches, and the top edge level; this can be applied to the bottom of the aqueduct. In removing the excavated material, let it be done upon boards laid upon the bottom to protect the brickwork. If you should strike a vein of sand, this need not prevent your proceeding, as in this case you can use the shield tunnel excavator.

(15) L. M. S. says: I have care of an engine which is 12 x 25 inches, and runs at 130 revolutions per minute. It cuts off at ¾ stroke, and has ⅛ of an inch lead (that is, the port is open ⅛ an inch when the engine is on the center). Is the lead too much? A. The $\frac{1}{16}$ inch lead will be better. You may cut off at ⅞: but if you give steam to the full length of the stroke, your engine will be less powerful for want of a free exhaust.

(16) D. P. P. asks: 1. If a water wheel is attached to a force and lift pump, could the pump throw up as much water as the wheel would require to operate it? A. No. Such a machine would be a perpetual motion, which is absurd. 2. If I fill a small strong chamber with air and compress it sufficiently to drive a small air engine, could I get power enough to operate one or more air pumps to keep up the pressure in the air chamber for any length of time? A. No. This is another version of the idea in your first query.

(17) T. D. W. says: I am about to make a foot lathe to swing 8 inches. Will you give me your opinion as to the bearings for the spindle? I want it to run as light as possible, and to turn solid and not to require setting up very often. I tried a cone on each end of spindle, but found that the spindle ran very hard. It would jamb or shake, no matter what care was used. Were the cones at a wrong angle? They were at 30° from the horizontal. A. Place two broad projecting rings on the first bearing of the lathe spindle, and your lathe will run all right.

(18) I. B. asks: 1. What is the best quantity of grate area in proportion to heating surface in a boiler? A. From 30 to 38 square feet of heating surface per square foot of grate. 2. Does this proportion vary for different kinds of fuel? A. Not essentially. 3. What is the proportion of cross section of area of tubes to grate area? A. From ⅛ to ⅙. 4. What is the proportion of area in the second row of return tubes? A. Generally somewhat smaller; for instance, if $\frac{1}{6}$ in first row, $\frac{1}{7}$ in second. 5. Would you consider it just as economical in fuel to get the same amount of cross section by one row of 5 inch return tubes as by two rows of 3 inch return tubes? A. Generally, there would not be any great difference.

(19) L. G. C. asks: Is there a method to find a true circle if there is not room to put the center? A. Any number of points may be found, in a similar manner to that in which they are determined for a railroad curve. Perhaps some of our readers will be sufficiently interested in the problem to try their hands at a geometrical solution.

(20) H. S. T. asks: How can I make a stain for wood to imitate mahogany? A. A simple way of effecting the object is to brush the wood with aquafortis, and dry it at the fire. This is good for veined birch and beech. The latter may also be stained by putting 2 ozs. dragon's blood into 1 quart rectified spirit; let the bottle stand in a warm place and shake it frequently; and when the gum is dissolved, the stain is fit for use.

(21) J. B. Jr. asks: How can I make lime water? A. Slake 4 ozs. lime with a little distilled water, then add distilled water to make 1 gallon. Cover the vessel and set it aside for 3 hours. Pour off the clear liquor for use.

(22) J. P. M. says: A trough is 12 inches wide, 1 inch deep, and has a fall of 3 inches. How many feet of water will run through the same per minute? A. You do not send sufficient data, as the discharge will depend upon the length of the trough, as well as the other elements. You can make the calculation, approximately, by the following formula: Velocity in feet per second = $\left(\frac{\text{area of way in sq. ft.}}{\text{wet perimeter in ft.}} \times 2 \times \text{fall in ft. per mile}\right)$

(23) R. R. Z. asks: How high a column of water can air be forced through with a pressure blower? How many lbs. air pressure would it take to force air through a 2 inch pipe and up through a column of water 12 feet high, with no obstruction to the passage of the air on the top of water? A. A question of this kind could best be determined by experiment. If any of our readers have data, we would be pleased to hear from them.

(24) G. B. asks: How can I make impression paper? A. Take the very thinnest writing paper, and smear it with lampblack made into a paste with pure tallow. Let the paste remain on 12 hours, then wipe smooth with a piece of cotton waste. Any colored pigment may be used in place of lamp black, but it must be very finely pulverized.

(25) W. P. C. asks: How can I obtain iron in the form of impalpable dust? A. The iron obtained by hydrogen, commonly kept in the drug stores, answers your description; it can be prepared as follows: Take 30 troy ozs. subcarbonate of iron, and wash thoroughly with water till no traces of sulphate of soda are shown by the appropriate tests; then calcine, in a shallow vessel, till free from moisture. Spread it on a tray made by bending an oblong piece of sheet iron in form of an incomplete cylinder, and introduce into this a wrought iron reduction tube, about 4 inches in diameter. Place the reduction tube in a charcoal furnace; and by means of a self-regulating generator of hydrogen, pass through the mass a stream of that gas, previously purified by bubbling successively through a solution of sub-acetate of lead, diluted with three times its volume of water, and through milk of lime, severally contained in half gallon bottles, about one third filled. Connect, with the further extremity of the reduction tube, a lead tube bent so as to dip into water. Lute all the junctions airtight; and when enough hydrogen has passed to exclude all atmospheric air from the apparatus, light the fire, and bring that part of the reduction tube occupied by the subcarbonate to a dull red heat, which must be kept up as long as the bubbles of hydrogen contain aqueous vapor. When the reduction is complete, remove the fire, allow the whole to cool, and withdraw the product from the reduction tube.

(26) W. S. H. M., of Reading, England, asks: Has it ever been proposed to utilize water and other power, now running to waste, by storing it up for future consumption? A. Yes, very often. The compression of air in strong vessels, for conveyance to where the power is needed, is frequently suggested.

(27) L. L. H. asds: How can I prevent oil paintings from cracking? A. Cracks occur in oil paintings when the colors were ground in oil containing impurity or otherwise unfit for the purpose. Linseed oil is the best, poppy oil the next; but purity is the essential quality of all vehicles for colors.

(28) J. D. R. asks: Is there any remedy for tender fingers? I am a printer, and my fingers get sore and the skin peels off. A. Printers frequently burn paper on an iron surface, and rub the sore place with the resulting oil.

(29) G. H. C. W. asks: 1. Does multiplying the square of the diameter of a circle by 0·7854 give the area in square inches or circular inches? A. In square inches. 2. What is a circular inch? A. A figure the square of the diameter of which multiplied by 0·7854 gives 1 square inch.

(30) A. B. D. says: I am finishing wire work with paint mixed with varnish; it takes too long for it to dry hard. What will dry quickly and not break off easily? A. Boil good linseed oil with enough litharge to make a stiff paint; add 1 part by weight of pigment to every 10 parts of the litharge. Boil for 3 hours over a gentle fire.

(31) G. H. S. asks: Is there anything that will remove the smell of tobacco from old cigar boxes? A. Varnish the box on the interior with a thin covering of shellac in alcohol.