Notes & Queries

G. C. will find a recipe for liquid glue on p. 90, 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.

(32) Q. C. asks: 1. How many degrees or what portion of a degree is an ohm according to Oersted's law? A. That depends upon a number of conditions, and consequently varies with different instruments. You will find full information on the subject of testing rods in No. 1 of the SCIENTIFIC AMERICAN SUPPLEMENT. 2. How can I tell if a current of electricity is passing through a lightning rod? A. If occasional tests show little or no appreciable resistance, there is no occasion to trouble oneself further. As a general thing, however, it may be assumed that currents are always traversing the rod. 3. Could a pocket compass be arranged for that purpose? A. See article above referred to.

(33) J. A. asks: 1. Which is the most effective, a glass or a hard rubber plate, for an electrical machine? A. Ebonite plates are recommended as preferable to glass. 2. Is the construction of the machine the same with either plate? A. Yes. 3. Must an amalgam be used on the cushions of a hard rubber plate machine? A. Yes.

(34) E. A. F. asks: Why is it that a circular saw, after being used long enough to require two or three gummings, becomes rim bound, or, in other words, becomes expanded in the center, and the saw becomes dished? A. There exists in the minds of many persons, who are not fully acquainted with the principle upon which circular saws are made, an erroneous opinion that a saw should work the same until worn out, if it is not accidently sprung in use, or strained in gumming. So far as any damage to the saw is concerned, there is no difference between the use of a burr gummer and a file; but if proper care is not exercised in the use of the emery wheel, there is more danger from their use than with the file or the burr. After a few times gumming, the saw will be enlarged on the rim, so that the slightest warmth will cause it to buckle, and there is no remedy left but to send it to a saw maker and have it rehammered. Some, however, entertain the erroneous impression that a saw rehammered will never run as well as when new. Never was there so great an error; on the contrary, a saw rehammered will generally run better than when new, because all the elasticity (or nearly all) is worked out of the saw by using, and it generally works stiffer than when new. A saw must become red hot to change the temper. Inserted toothed saws are not as liable to become expanded on the rim as solid saws.—J. E. E., of Pa.

(35) J. M. H. says: I wish to give a nice finish to the walls of my parlor, and propose to use the recipe on p. 53, vol. 12. Would you recommend it? Is the size spoken of a paste or preparation of glue? Please give me proportions of ingredients, etc.. A. We have not tried the process referred to, and cannot vouch for it. We presume the size intended is the ordinary glue water. You would do well to try experiments with it on a piece of wall that it would not injure.

(36) S. B. Jr. asks: I. Which electro-magnet requires the least number of coils of a given sized wire, one to lift an armature weighing ½ lb. suspended $\frac{1}{16}$ of an inch from its poles, or one where the distance is $\frac{1}{32}$ of an inch and the weight 1 lb.? A. Electro-magnets, such as are used for telegraph sounders, having three or four ohms resistance, will answer for either case. 2. How many cells of Callaud battery are required to enable such an electro-magnet, through the medium of ½ mile of ordinary line wire, to lift the armature as above? A. Six or eight cells of Callaud battery will answer, provided the resistance of the circuit does not exceed 30 ohms.

(37) C. F. S. says: I want to make a magnetizing coil that will take a core ¼ inch in diameter and 6 inches long, and magnetize it to saturation. Will you please tell me what size of wire, number of layers, and battery power will serve my purpose? A. A couple of sounder coils like those to be seen in any telegraph office, with two or three cells of battery, will charge a soft iron core highly.

(38) N. Y. S. asks: Is the compound used in charging fire extinguishers a secret? A. No. Carbonates of the alkalies or alkaline earths are commonly employed for this purpose, such as carbonate or bicarbonate of soda, carbonate of lime, etc, etc. These are placed in the lower part of a suitable vessel; and immediately over it is placed a vessel containing a strong acid, such as muriatic or sulphuric, so arranged that, when the instrument is required for use, the vessel containing the acid may be inverted, thus emptying its contents upon the carbonate below. A violent action immediately ensues, and carbonic acid gas is liberated in great quantity. This gas is the fire extinguisher. Various modifications of this instrument, in the method of placing and manipulating the reagents, etc., have been invented since the value of carbonic acid gas as a fire extinguisher was first recognized; but the principle is the same in all.

(39) J. H. P. asks: How is prepared rubber made? A. We do not recognize any material by this name. Do you mean ordinary vulcanized rubber, vulcanite, or ebonite?

(40) J. H. P. says: A lady in the N. Y. *Times* says that ¼ lb. saltpeter dissolved in 1 pint alcohol is an excellent remedy for swollen joints caused by rheumatism. I attempted to dissolve some niter in alcohol of 95 per cent, and it would not dissolve. What is the matter? A. Niter is almost absolutely insoluble in strong alcohol. Dissolve the saltpeter in the smallest quantity of cold water possible, and add the alcohol in small quantities at a time, with constant stirring. The addition of too much of the alcohol will precipitate the salt.

(41) P. L. & Co. ask: How can we make sensitive cards, which, when placed upon the hand, immediately curl up with the heat? A. By passing a good quality of gelatin, previously softened by hot water, between oiled rollers set so as to propuce a film of the required thickness.

(42) H. F. B. says: In constructing a grinding mill, the grinding being done by cast iron rings, it is very desirable to have them of the hardest metal. I believe that an extremely hard metal can be obtained by mixing cast iron with spiegeleisen. Am I correct? A. Yes. Aceording to the percentage of spiegeleisen employed, the percentage of carbon may be changed in the pig produced, with a similar change in properties.

(43) P. S. B. says: 1. I have in my possession an oriental ruby of great hardness, weighing about ½ lb. What is it worth? A. A ruby of extremely fine color, brilliancy, etc., is said to be even more highly valued than a diamond of the same weight. The exact value of your ruby could not be given without seeing it. 2. What book or books must I consult in order to obtain the most the most exhaustive knowledge of the finer metals and precious stones? A. Consult Emanuel on "Diamonds and Precious Stones," and Jones on "The Treasures of the Earth."

(44) D. L. asks: Would it be possible to restore vision in an eye of which the lens is destroyed, by putting in an artificial lens? A. Theoretically, yes; but the science of surgery has not, as yet, become sufficiently skilled to attempt such an operation on this most delicate and susceptible organ.

(45) S. R. asks: 1. Can sulphuric acid be concentrated to sufficient strength in lead kettles to treat the refractory silver ores of Colorado and Nevada? A. Concentrated sulphuric acid must be employed, and for this lead vessels are not adequate. Instead of making the ore digesters of platinum, the practice of late in Europe has been to employ digesters of cast iron, white or mottled iron being preferred. It has been found that these vessels are unacted upon by the strong acid, since the surface becomes coated with a thin layer of metallic silver. 2. In using iron pyrites and ores heavily charged with sulphur, what fuel would be the best? A. Such ores should first be calcined, either in a special furnace or in heaps in the open air; the ignition of the sulphur in the ore being effected by placing the latter upon a layer of brushwood. The roasting must not be carried too far, but sufficient sulphur must be left to produce a proper regulus. The roasted ore may then be reduced with coal, etc.

(46) S. C. P. asks: What is the origin of the symbols used in apothecaries' weight? A. These symbols are supposed to have been derived from inscriptions on the ancient monuments of Egypt. This supposition is made more probable by the recent discovery of a papyrus concealed between the bones of a mummy in a tomb of the Necropolis at Thebes. This papyrus contained a treatise on medicine, written about 1552 B. C., and is consequently more than 3400 years old. In it the volumes are indicated by special signs, and figures with dots above them represent weights. The unit of volume is thought to be the *tenat*, which is equivalent to $\frac{6}{10}$ of a liter. The sign for a half *tenat* bears a striking resemblance to our sign for a drachm.

(47) D. D. asks: Can you inform me how white wine or whisky vinegar is made? A. Obtain a large cask, and about a foot above the bottom construct a false perforated bottom. Above this fill the cask with good, well burnt charcoal in coarse lumps, over which pour first a sufficient quantity of good vinegar to thoroughly moisten it. Let the whole stand for a short time, when it will be ready for the introduction of the alcoholic liquors This should be introduced in small quantities at a time, and the apparatus kept in a moderately cool place to prevent too energetic an action. This method will give you a pure vinegar, which will suffer considerable dilution. Use a very small quantity of annatto as coloring matter.

(48) E. G. A. says: A glass globe has two yellow spots marked on the opposite sides. The globe holds five gallons, and is placed close to the wall on a table directly between two windows. The light from the windows passes through the water in the globe and strikes the opposite side. The spots are of a soft, slimy nature, easily rubbed off. Can you tell me what they are composed of? A. The spots may consist of several substances. Send some of the material, and we will tell you what it is and the mode of formation. It is not improbable that the water held bicarbonate of iron in solution, which gradually became decomposed on standing in a warm room, and, from some peculiarity in the currents generated in the vessel, deposited hydrated sesquioxide of iron in the manner indicated.

(49) W. C. says: Please give me a recipe for dyeing veneers green. A. Put the veneers in a box or trough with clean water, and let them remain immersed for 3 or 4 days, changing the water once or twice as occasion may require. Let them dry for about 12 hours before they are put into the dye: by observing this the color will strike quicker, and be of a brighter hue. Prepare the dye as follows: To 1 gallon of strong vinegar add 1 lb. of the best verdigris finely ground, 2 ozs. sap green, and 2 ozs. indigo. Place this in an iron or copper vessel, with as many of the veneers as the liquor will cover, and boil for several hours or until the requisite intensity of color is obtained.

(50) J. M. says: I am building a small engine. The boiler is 5 feet long x 16 inches in diameter, without flues; it is made of ⅛ inch iron. Could this boiler afford steam enough to run a drag saw requiring 2 horse power, and what pressure could it stand to the square inch with safety? A. We do not think the boiler would be large enough to do the work satisfactorily. You could maintain a working pressure of about 50 lbs. per square inch.

(51) A. J. H. asks: 1. What preparation will produce a good sensitive surface? A. A collodion film holding iodide and bromide of silver. 2. Can the camera obscura be utilized for photography? A. Yes, but not so conveniently as the ordinary camera. 3. Does any number of the SCIENTIFIC AMERICAN contain directions for photography? A. No complete treatise, but valuable suggestions will be found in almost every number.

What is the enclosed substance? A. Caramel and salt.

(52) C. L. asks: What effect (if any) do the many steam mills, locomotives, and steam vessels have upon the humidity of the atmosphere? A. We do not know of any observations especially relating to this point: but we imagine that the effect, if any, is very slight and strictly local.

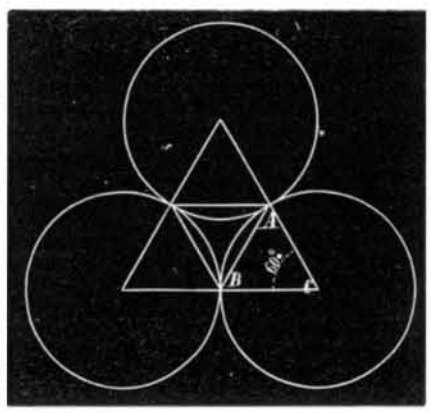
(53) F. G. W. says: The Boston and Albany Railway Company has some 240 locomotives, most of which have no steam domes; and if you ask the men who handle these engines how they carry their water, they will tell you that no engines work drier steam or less water than they do, under all circumstances. It is well known that much of the track of this line, on the mountain slope between Westfield and Washington, lays on a grade of 83 feet per mile. Steam domes are not only expensive, but are a decided injury to a boiler, and if locomotives work as well, they are certainly much better without them. This company is continually building locomotives without domes, which seems to be the best evidence possible that they are as useless as a steeple to a church. A. There are many locomotives which have no steam domes. The celebrated Crampton engines, made in 1847, had none, and gave excellent results. It is usually considered, however, that drier steam is obtained from the top of the dome than from the shell of the boiler.

(54) W. H. B. asks: Where was the first railroad located? A. Railroads or tramways, used in mines, worked by horses, are very old. The first mining road worked by steam was at Killingworth, England; the first passenger road worked by steam was the Stockton and Darlington Railway, England.

(55) I. L. asks: 1. How can I construct a float, to use in a steam boiler to indicate the water level or to operate a valve? Can it be made sufficiently light and yet stand the external pressure of 100 lbs. per inch? A. Make your float of copper. 3. I have thought that a float made of common tin, made airtight, with a small quantity of water in it, would answer, as the water inside the plate would be converted to steam from the heat of the steam outside the float, the quantity of water used to be equal to that required to fill the float with steam at the required pressure. Would this be practicable? A. Your plan of a tin float is impracticable. 3. Is the fusing point of common tinner's solder sufficiently high that 100 lbs. of steam would not fuse it? A. Yes.

(56) R. W. R. says, in answer to W. H., who asks as to preserving a cotton rope used in the open air: We are carrying 20 horse power by a cotton rope 1 inch diameter and 800 feet long, over V-shaped pulleys 5 feet in diameter. To protect it from wear and the weather, it is slushed occasionally with ⅛ black lead and ⅔ tallow.

(57) W. C. S. says, in solution of his problem proposed on p. 107, vol. 34: The answer is as follows: Assume that R, the radius, =1. Then area of circle=3·14159264, area of sector, A B C,= 0·52359877, area of triangle=0·4330127, area of segment A B=0·09058507, area of centerspace=0·16125449, Thesefore 0·16125449: 43560 (feet in an acre) :: 1: 271032. 271032=520·6+feet, the required radius.



J. E. N., F. L. R., M. B., F. E. B., D. E. Q., J. H. B., C. J. T., J. W. I., C. A., E. L. W., M. R., P. J. D. S., J. E. N., A. W. F., Dr. B., J. R. D., E. I. T., T. S. M., S. N. M., J. M. G., F. W. W., G. W. C., A. G. F., M. C., P. M., R. F., A. F. C. & Co., and K. Q. X. send answers which, like the above, are approximately correct. J. S. W., C. H. B., G. D. T., E. McC., L. B., N. M. B., V. P. B., F. G. G., I. D. S., H. M. A., G. D. T., R. C., R. J. McL., W. J. McG., and G. H. O. send erroneous answers; and L. S. W. sends different solutions with no results stated. C. W. M.'s answer is incomplete. C. says: "One curious fact I notice is that the division of the 160 rods by the exact figure, which is a trifle less than 0·162, gives the following regular arrangement of numerals, the root of which we extract for the answer: $\sqrt{987654321}$=31·4269."

(58) H. S. says, in answer to F. H. D.'s query as to cast iron and steel sleigh shoes: Wrought steel sleigh shoes are not tempered, as it would crook them out of shape; and cast iron shoes, if they are what they ought to be, are made of quite hard iron, that cannot be drilled or filed, and shows a white crystaline fracture when broken.

(59) G. G. W. says, in reply to several correspondents who ask for recipes for caseharden-ing: To caseharden wrought iron, take wood soot and urine, mix and work them up into a dry mastic, and cover the article to be hardened with it: heat to a red heat slowly in a charcoal fire, so as to heat through. Take out and knock off the soot, and plunge in cold water; then draw the temper, as done with steel.

E. M. M. asks: How can I make and use a good oil finish, similar to that used on parlor organs?—A. S. B. asks: Can you give me information as to the actual number of miles of railroad laid in England, Ireland, and Scotland?—E. P. asks: How is printing in gold or bronze done, to produce a smooth surface and a clear, sharp, outline?—J. J. T. asks: How is wall paper varnished after it has been hung?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Resources of Georgia. By M. E. C.
On the Angora Goat. By H. G. O.
On Magic Squares. By J. S.
On the Epicycloid. By L. F.
On Spontaneous Combustion. By J. S. W.
On a First Class Tool Maker. By D.
On the Power of Figures. By G. B. M.
On a Singular Medical Case. By R. W. B.
On Spirit Photography. By C. M.
On Head Work. By J. K.
On Bank Vaults. By S. K.
On Food. By C. S. P.

Also inquiries and answers from the following:

S. G. H.—J. M. S.—Z. S.—J. G. McC.—H. J. M.—E. J. P.—T. G.—J. N.—J. H. M.—G. M.—J. K.—C. K—B. L.—W. B.—R. N.—T. W.—W. M.—M. H.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes rake teeth? Who publishes works on pottery and porcelain? Who makes phosphorus in large quantities? Who buys bone dust? Why do not makers of microscopes advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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