Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Enquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical enquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to enclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to enclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

B. F. R. will find a recipe for marine glue on p. 43, vol. 32.—C. S. will find a description of bisulphide of carbon on pp. 306, 368, vol. 28.—W. R. will find directions for making gas from coal oil on p. 65, vol. 32.—R. W. can make sulphate of indigo by the process described on p. 250, vol. 34.—J. K., B. L., H. T., W. H. N., T. W., J. M., M. B., and others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) T. C. D. asks: Is not the velocity of a rifle ball greatest at the moment when it leaves the muzzle? A. Yes.

(2) C. E. B. says: In setting valves on a locomotive I differ from a master mechanic. In squaring valves, I heretofore observed (after finding the dead centers on the wheels in the usual way, and adjusting the eccentric rods with the reverse lever thrown clear forward or back, and on those points giving the proper lead) that, by hooking the lever up say to 12 inches, at times the valves do not show square at that point, and the rods may have to be changed. I still work from my center on the wheels. The master mechanic says that, on some engines, valves cannot be squared in that way. He does not use the center on the wheels at all, when the lever is hooked at 12 inches, but measures 12 inches on the guides, and there squares the valves. Working my way, the valves showed $\frac{1}{8}\frac{1}{2}$ opening thrown clean forward or back, and $\frac{1}{4}$ opening hooked at 12 inches, both sides being the same. He claimed after running with steam that the valves were not square, or at least did not sound so. After squaring my way from dead center on wheels, and attempting to do it in his style by measuring on guides, the valves would show $\frac{1}{4}$ inch of opening more on one side than the other. Who is right? A. You are.

(3) C. C. E. asks: Would a gun or other strong vessel, if filled completely with water and sealed up, and then subjected to intense cold, freeze and burst, or would the water remain liquid? A. Ordinarily, it would burst.

(4) W. J. M. asks: What is the effect of the gas of burning coal upon lime or mortar? A house was recently burnt under these circumstances: A light brisk wood fire was kindled and afterwards every spark of fire was supposed to be extinguished. In an hour afterwards the house was discovered to be on fire in the upper part. One theory is that the coal gas had injured the mortar and rendered the chimney unsafe, and so the fire was communicated through the chimney thus rendered unsafe. A. If the mortar employed in the construction of the chimney were originally of good materials, it is not at all probable that it would have been injured by the constant contact with the products of combustion; the lime in the mortar, at the exposed surfaces, would under ordinary circumstances speedily be converted into carbonate, sulphide, hyposulphite, and finally entirely into sulphate of lime, which would resist further change. The real cause of the gradual disintegration and final destruction of chimneys is rather to be looked for in the constantly varying and unequal expansion and contraction of their constituent materials, caused by the heat of combustion in the furnaces and climatic changes, and aided by the occasional shocks, jars, and the almost constant vibration to which all such structures are subject.

(5) C. D. S. asks: Please give a rule for working out this problem: The chord of an arc is 120 feet, and the versed sine 1 foot; what is the radius? A. From the rule for finding the versed sine when the chord and radius are given, which is: Square half the chord and square the radius: deduct the square root of their difference from the radius, and the remainder will be the versed sine: it is easy to deduce that the radius is equal to

$$\frac{(\text{versed sine})^2 + (\text{semichord})^2}{2 \times \text{versed sine}}.$$

(6) W. M. S. asks: How can I make a lead tree? A. Nearly fill a somewhat narrow-necked bottle with a saturated aqueous solution of acetate of lead, and suspend therein, just below the surface, a small bundle of zinc wires or strips, about two inches long; cork the bottle, and allow to stand undisturbed. The lead is precipitated by the zinc, which takes its place in the solution.

(7) E. A. T. asks: If the earth's axis were inclined 30°, what effect would it have upon the seasons? A. Their length would be the same; but in all places above 23·5°, the summer would be warmer and the winter colder.

(8) L. P. S. says: A magneto-electric machine is constructed on the principle of the Gramme machine, and used in a plating room. It seems to contradict a law which I supposed was unchangeable, namely, that, when the electric current was once established in a machine of this kind, it would continue to flow in the same direction so long as it revolved the same way, and the coils were undisturbed; but this does not appear to be always the case. The inducing magnets at one end of the revolving magnets became inert, probably from disconnection of the wire which supplied the exciting current. The wire, leading to the bath from this inert half of the machine, was changed to the corresponding electrode on the other section, which continued to give off a current. In this condition of things the plating went on very well, but with diminished power, for two or three hours; when, to the astonishment of the workmen, the current was found to be flowing in the wrong direction. The wires were then changed so as to bring the current right, and everything worked well for an hour or two, when it was traveling the wrong way again; and I find that other similar machines have behaved in the same manner under like conditions. I am at a loss to account for this singular action, and would like to have your opinion on the subject. A. The phenomenon described is common to most magneto-electric machines. It is caused by the extra current that is generated in the wires when the circuit is broken. One obvious remedy is never to open the circuit while the machine is running at full speed. There are others, but we think this will be found very satisfactory.

(9) P. J. H. asks: Can large telescopic lenses be made of the proper shaped glass cells filled with a liquid? A. No good lenses can be made this way on account of the flexure of the material.

(10) M. M.—The curious arrangement of the air bubbles you witnessed was probably caused by the ascending and descending currents of the warmer and cooler water in contact with the metallic sides of the vessel. The surface of the water in the center would thus be slightly higher than towards the sides of the cooler, and, owing to the capillary attraction at the points where the liquid was in contact with the metal, these would also be higher: anything, therefore, floating on the surface of the water would remain at an intermediate point. Cohesive attraction, we think, would explain the rest. We do not see anything in this explanatory of the nebular hypothesis you mention.

(11) D. F. asks: How can I restore the original color of small ornaments made of white holly and other light woods, that have grown yellow from age? A. Place them in a vessel over a quantity of chloride of lime (hypochlorite of lime) to which add a very small quantity of diluted sulphuric acid, and close the vessel tightly.

(12) R. B. C. says: A young friend has an aquarium. A silver fish which has been rusticating in it over a year has suddenly changed to a gold fish. Why is this? I should mention that the water, though changed often, is strongly impregnated with iron. A. We should feel better able to give an answer if we had seen the fish mentioned. It would probably be more nearly to the point to call the animal an "iron fish," in contradistinction to his more noble fellows, as the color is probably due, at least in part, to a slight incrustation of the scales with the yellowish-brown sesquioxide of iron.

(13) C. C. B. asks: Is there not an error in your statement that the Microscopical Society's screw has 55 threads per inch? A. Yes. It should have read 36.

(14) H. Mc. says: 1. Supposing that a wheel is 20 feet in diameter, with an axle of 6 inches, how much will a 10 lb. weight on the rim of the wheel raise on the axle? A. Between 300 and 400 lbs. 2. What amount of weight would be required on one side of the wheel to be equal to an eighty horse power engine? A. This question is too indefinite. A force of 1 lb., acting with sufficient velocity, would exert the same power as the engine.

(15) C. H. W. asks: Is the intensity of radiant heat in space or ether in inverse ratio of the square of the distance from the source of heat as it is in air? A. It is considered to be so.

(16) J. F. says: I am building a grist mill to use 48 cubic feet water per second. It is estimated 600 feet below the dam, and the water is to come in a pipe underground. What should be the size of a circular pipe to feed 48 cubic feet per second without losing more than 1 foot head? I find by using M. Prony's experiments, and also Messrs. Boulton and Watt's rules, that a pipe 4 feet diameter will feed that amount of water to a distance of 600 feet, with a frictional head of 10·4 inches? A. This seems to be right. Weisbach's formula, which is perhaps better authority, gives the friction head at about 9½ inches; and as these are theoretical results, for clean and smooth pipes, it may be best to use a 48 inch pipe. 2. Would a flume near the mill be of any benefit? I think that a decked penstock in which the wheels are placed, giving the water plenty of access to them, is as good. The power of water is proportioned to the pressure: and a flume would not increase it at all, as the hight of water in it would depend on the pressure only. Am I right? A. Yes.

(17) C. H. W. says: Please tell me of some mode of renovating and killing the smell on curled hair. A. Try fumigating in a large, tight box with the sulphurous acid gas evolved from a dish of burning sulphur.

(18) P. F. asks: With what velocity will water flow into the suction pipe of a pump which is 16 feet in perpendicular hight, supposing that the vacuum is perfect. Please give me a rule for ascertaining the velocity at any hight. A. The velocity with which the water will flow is 8·02 times the square root of the effective head. In the case you have given, the total head is one atmosphere, equivalent to a column of water about 34 feet high. The lift is 16 feet, leaving 18 feet head, and from this must be subtracted the friction head, which depends upon the diameter of the pipe. Suppose the friction head to be 5 feet: this leaves 13 feet available head: whence the velocity will be about 29 feet per second.

(19) H. F. asks: How can I prevent broomcorn from breaking when worked up? A. Steep or boil the broomcorn in water, and then dry it.

(20) E. S. E. says: I am using a pump with connections made direct with the city water supply. I do not get a steady pressure, and find it impossible to use the exhaust steam, as the water sometimes rises, forcing the exhaust steam back and flowing into the cylinder of the engine, thereby endangering the cylinder head. What shall I do? A. Fit up a tank, which you can do very cheaply by using a hogshead, and draw your feed from that.

How can I test oils to find which is the best lubricant? A. The fact that one oil is heavier than another does not prove that it is better. You can best judge of the quality of different oils by using samples on the same bearing, and see how far a quantity of each, costing the same amount, will go.

(21) M. B. asks: Is there any internal application or other mode of preventing the very rapid destruction of pipes leading from stoves in which anthracite coal is burnt? In some cases the pipes do not last more than a winter. A. This is very probably due to the quantity of sulphides contained in the fuel. We do not know of any practical way of overcoming the difficulty except it be to use a better quality of coal, and pipes of the best Russian iron.

(22) C. S. P. says: A friend states that eggs cannot be hatched in an incubator with the heat coming from the bottom. I say they can. Which is right? A. The conditions are that the temperature should be uniform, not too great, or yet too low, and that the eggs should be turned occasionally. From whatever direction the source of heat, only provided that the above conditions are realized, we think the eggs may be successfully hatched.

(23) A. B. W. asks: What is the highest temperature that asbestos will resist without injury? A. Pure asbestos will resist the highest temperatures to which it may ordinarily be subjected; but at the temperature of the blast furnace or the oxyhydrogen jet, it fuses to an enamel-like glass.

(24) C. K. N. asks: 1. Is kerosene oil of the best grade, such as is used for illuminating purposes, likely to injure the leather or stitching of shoes when poured in to stop squeaking? A. No; but such treatment of shoes is not at all desirable. 2. What will prevent shoes from squeaking? A. Rasp, with a coarse rasp, the outsole and insole, and every other piece of leather that comes in contact in friction by the action of the foot. Then apply freely good wheat or rye paste. If this is well attended to from heel to toe, the boot or shoe will not squeak.

(25) C. asks: What is hyposulphate of soda, and has it any other name? A. You probably mean hyposulphite of soda; it is a salt formed by the combination of soda with hyposulphurous acid. We do not know that it has another name, except, perhaps, that of "hypo," given to it by photographers, who use it largely as a developing bath.

(26) T. H. P. says: We have a stream of mine water throwing 70 gallons per minute, which we would like to bring down the side of the mountain in troughs, a distance of 850 feet, with a fall of 220 feet, to run an overshot water wheel, and pump up a stream of spring water throwing 10 gallons per minute, to a point 20 feet above the starting point of the mine water. Can it be done? If so, what should be the proportions for wheel, pump, stroke, diameter of bore, and size of gas pipe required? A. It is probable that you will have plenty of surplus power, under the conditions stated, so that you may use such apparatus as can most conveniently be applied.

(27) C. A. A. says: 1. I wish to make some billiard balls out of wood. What kind would be most suitable? A. Use rock maple or apple wood. 2. How can I stain and polish the same? A. Stain with extract of logwood, and polish with a little oil and shellac in alcohol.

(28) I. R. says: 1. I want to make a few electrotype plates, about 5 x 6 inches. What will be a cheap form of battery for the purpose, and how many cells are necessary? A. One or two cells of Daniell battery is sufficient. That known as the gravity form is easily arranged. It consists of a copper disk placed at the bottom of a jar and a zinc plate or casting supported from the top. Wires for connecting the battery in circuit lead from the two metals. The one soldered to the copper disk is insulated by a gutta percha covering on that portion which is within the jar. Fill the latter about ⅔ full with water in which a little sulphate of zinc has been dissolved. Then drop a few crystals of sulphate of copper on the bottom plate, taking care that none remains on the zinc, and the battery is ready for use. 2. How must the wax mold be connected with the wire? A. Push several small wires through the wax in different places, so that the ends just show the black lead over them. 3. Is there anything that can be substituted for plumbago to coat the mold with? A. Yes, but you will get good results with plumbago, if careful. 4. How thick ought the copper to be deposited, and how long will the process take? A. That is a question to be answered by individual taste.