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 $\frac{1}{32}$ 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.

(29) R. E. asks: Will soap suds improve the soil, no matter what soap has been used? The suds contain sal soda. A. Yes, if the quantity used be not excessive.

(30) F. C. S. asks: 1. Please give directions for preparing a simple but good silver solution for plating by the battery process. A. Dissolve ¾ oz. cyanide of potassium in a pint of water, and hang in it sheets of silver connected with the positive pole of a battery. A porous cup, containing a like solution, and an iron or copper plate connected to the negative pole of the battery, is also placed in the jar with the silver. When a deposit forms on the plate in the porous cup, the solution will be of a proper working strength. 2. With what shall I charge a Bunsen battery? A. Fill the porous cup with strong nitric acid, and the outside vessel, which contains the zinc, with water to which from twelve to twenty parts sulphuric acid in one hundred parts water have been added. 3. How can carbon plates be preserved? A. They should be placed in water after being used, and allowed to remain until the absorbed battery product has been dissolved out of them.

(31) J. H. S. asks: Can you tell me of any acid that will dissolve the oxide of iron? A. There is nothing cheaper or more effective than muriatic acid for the purpose. Dilute sulphuric acid will dissolve it, but is not nearly so effective.

(32) C. W. C. says: Ships laden with petroleum in cases (and so far as I have been able to learn, the same is true if the oil is shipped in casks) experience more or less local deviation in their compasses, varying as to the position of the ship's head and the length of time occupied in loading. This deviation is found to gradually disappear during the progress of a protracted voyage. At least this has been my experience. My theory is that it is due to a polarization that takes place in the iron contained in the packages containing the oil, while laying a long time in a ship with the head towards the north, as is usually the case with ships loading at the wharves in the East river, New York. But why should this be so much more marked with petroleum-laden ships than with ships laden with other cargoes? Many captains with whom I have conversed upon the subject are of opinion that it is the oil which affects the compasses. Can you enlighten me? A. Your theory is undoubtedly the correct one. During a long voyage the changes in position of the vessel would tend to dissipate the previously induced magnetism of the casks. As petroleum is not sufficiently magnetic to affect the compass, some other cause must be looked to for the marked deviation of the needle on petroleum-laden vessels.

(33) A. B. C. asks: Can you inform me if there is any chemical or other article, the fumes of which, when burnt, will be destructive to flies and other small insects? A. The sulphurous acid gas evolved by burning sulphur in contact with the air will accomplish this; but its bleaching properties are such that, if it be permitted to come in contact with colored woolen and other fabrics, their colors will be destroyed.

(34) F. S. A. says: I have an aquarium holding 5 gallons, which I wish to stock with salt water animals and plants; but although I have repeatedly attempted to do so, both animals and plants have died from the water becoming foul. Could I purify the water by driving air through it or by forcing the water to a hight of 5 feet and allowing it to fall back into the tank in a constant stream, ¼ inch in diameter? A. In similar cases on a larger scale, the mechanical method of aerating the water by a steady current of finely divided air forced into the water is for the most part resorted to. Where this method is employed very little vegetation should be used, and much of the light excluded.

(35) C. W. M. asks: 1. What should be the diameter of a helix whose length is 6 inches, to give the greatest lifting force? Of what size should the wire with which it is wrapped be? A. Such questions can be answered definitely only when the other relations of current magnitude, resistance of circuit, etc., are known. Three or four Daniell cells and a helix of No. 20 or 23 copper wire will charge an iron core sufficiently to lift 4 or 4 lbs. The helix should be about ½ inch internal and 1¼ inches external diameter.

(36) H. C. says: I was told by a friend that if I used a solution of common washing soda in water it would make my hair blonde. I was so foolish as to try it, and my hair is now an ugly red. What in the world am I to do? A. The application of alkaline solutions such as you employed not only removes all the natural oil from the hair, but soon weakens and finally destroys its vitality, as well as reduces to sesquioxide all of the iron salts to which was due its dark color. In fashionable society, at various times, this and even more objectionable, not to say dangerous, means have been resorted to, such as the employment of orpiment, chlorine water, sulphurous acid solutions, and even aqua regia (nitro-muriatic acid). It is hardly necessary to add that, in the majority of cases in which the hair has been thus misused, the result has been its complete or partial loss. We would advise you, as the safest and most sensible method, to have your hair cut as short as possible; this will cause the remainder to grow quite rapidly, and with its natural color. If it is very objectionable to have the hair thus shortened, a suitable dye might be employed of as near the color of the original hair as possible. Make only one application of this dye; and as fast as the hair grows, cut off a corresponding length from the extremity of the dyed capillus until all of that portion has been removed. The former suggestion is, however, much the quicker and better method. It would be well to keep the hair moist with a little simple pomatum.

(37) L. M. K. asks: I want to build a small steamboat 20 feet long and 10 feet wide, to draw as little water as possible. How shallow can I make the hull? I want the boat to run at the rate of from 7 to 12 miles an hour. A. We doubt the practicability of making a boat of this size, with the limited conditions mentioned, having the desired speed.

(38) A. C. C. asks: How can I make a spectroscope? A. See p. 261, vol. 31.

What will remove the brownish deposits in porcelain urinals? A. First wash well with a little lime and potash, rinse with water, wash again with dilute muriatic acid, and rinse finally with water.

(39) H. M. says, in reply to T. C. D., who asks what is the lowest temperature indicated in any polar expedition: *The Polar and Tropical World* says: "The voyages of Kane and Belcher have made us acquainted with the lowest temperatures ever felt by man. On February 5, 1854, while Kane was wintering on Smith's Sound (78° 37′ N. latitude), the mean of his best spirit thermometer showed a temperature of —68°, or 100° below the freezing point of water. Then chloric ether became solid, and carefully prepared chloroform exhibited a granular pellicle on its surface. The air had a perceptible pungency upon inspiration, and every one had to breathe guardedly, with compressed lips. About the same time (February 9 and 10, 1854), Sir E. Belcher experienced a cold of —55° in Wellington Channel (75° 31′ N.) and the still lower temperature of —62° on January 13, 1853, in Northumberland Sound (76° 52′ N.). Whymper, on December 6, 1866, experienced —58° at Nullato, Alaska (64° 42′ N.)

(40) J. W. D. E. says, in answer to E. H., who wishes to know why his cannon has lost its loud report: This is very common to all guns which have been long in use. The reason is that the bore of the gun, probably several inches from the breech, has become enlarged, in which case there is a vacant space between the bore of the gun and the charge; and at the instant of discharge a considerable amount of the gas escapes.

COMMUNICATIONS RECEIVED.

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

On Rat-Tailed Larvæ. By R. M.

On Expansion and the Locomotive. By F. G. W.

On Lightning Rods. By W. J. C.

On Removing Shrunk-On Pulleys, etc. By T. J. B.

Also inquiries and answers from the following:

J. H. A.—H. F. W.—H. D. E.—J. E. B.—J. R. A.—S. H.—H. C.—H. C.—J. E. H.—W. F. W.—H. H. L.—W. G. W.—C.—E. H. R.

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 knitting machine needles? Who sells mariner's compasses? Whose is the best machine for drilling holes in brush backs? Why do not makers of astronomical apparatus 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]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending August 29, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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APPLICATION FOR EXTENSION.

MAKING CARPET LINING.—J. R. Harrington, Brooklyn, N. Y.

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9,473.—EMBROIDERY.—E. Crisand, New Haven, Conn.

9,474 to 9,477.—CENTER PIECES.—S. Kellett, San Francisco, Cal.

9,478.—NUBIAS.—J. Phipps, Philadelphia, Pa.

9,479, 9,480.—CARPETS.—A. Righter, Philadelphia, Pa.

9,481.—OIL CLOTH.—J. Robley, Brooklyn, N. Y.

9,482.—SHIRT FRONT.—S. Steinweg, New York city.

9,483.—CHAIN SWIVELS.—V. Draper, North Attleborough, Mass.

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