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Notes & Queries

W. A.'s query as to radiation does not give sufficient data.—E. C. H. should read our answer to S. O. M., as to supposed diamonds.—J. D. G. will find full information as to the ether ice-making process on p. 228, vol. 34.—A. R.'s communication is founded on a misconception. See pp. 195, 228, vol. 33, as to the nature of electricity.—A. J. R. will find on p. 120, vol. 33, directions for making muslin uninflamable.—C. W. and others ought to know that the only way to find buried treasure is to dig for it.—X. Y. Z. can copper his cast iron articles by following the directions given on pp. 90, 139, vol. 31.—E. F. M. will find full directions for plating with nickel on p. 235, vol. 33. For plating with gold, see p. 116, vol. 33. For plating with silver, see p. 362, vol. 31.—A. B. can ebonize wood by following the directions given on p. 50, vol. 33.—W. B. J. can gild his clock hands by the process described on p. 116, vol. 33.—A. G. L. should proceed in zincography exactly as in lithography. The specimen sent appears to be a photo-engraving from a pen and ink drawing.—L. M. M. will find full directions for electro-silvering with a battery on p. 361, vol. 31.—E. D. N. can remove the rust from his sword by the method given on p. 56, vol. 33.—W. D. should read our article on p. 241, vol. 33, on constructing a windmill.—J. C. H., F. A. H., J. H. G., L. N. B., M. G., J. L., S. H. W., P. S., G. D., F. G., J. H. M., C. M., G. G., 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) B. V. P. asks: Please inform me of some way to harden light common iron wire in quantities. A. Box harden it, by the process described in No. 5 of "Practical Mechanism," p. 69, vol. 31.

(2) H. J. W. asks: 1. I am running an old-fashioned high pressure engine. The cylinder is 15 by 48 inches stroke, cut off at half stroke. It has a balance wheel of 15 feet diameter, also a pulley attached, 11 feet in diameter. It takes steam through about 15 feet of 3 inch pipe. The governor is an old-fashioned throttle. I have been running 48 turns per minute, and wish to increase it about 8 turns; but I think the latter is rather too much, as the brasses and journals on main shaft are badly worn. Would it be safe to run her so fast? A. You had better not increase the speed if the bearings are worn. 2. Would it use any more steam to speak of? A. If you run your engine faster, you will use more steam in proportion. 3. Would I have to run the governor faster or slower? A. Run it slower.

(3) O. M. B., of San Juan Bautista, Mexico.—If you reduce the speed of your engine you reduce the power, unless, as you propose, you increase the steam pressure. It would probably be better to alter the size of the gearing, thus using the same steam pressure and same piston speed, and to decrease the speed of the rollers; while their power will be proportionately increased.

(4) W. S. says, in reply to the query: How is it that minus multiplied by minus gives plus, and plus multiplied by minus gives minus? By trigonometry, the cosine of any arc divided by its sine is equal to its cotangent. Take the arc of 135°:

$$\frac{-\sqrt{5}}{\sqrt{15}} = -1. \text{ Clearing of fractions, } -\sqrt{5} = -1 \times \sqrt{5}.$$

That is, a minus quantity is equal to a minus quantity into a plus quantity, which was to be proved. The secant of any arc is equal to 1 divided by the cosine.

$$\frac{1}{-\sqrt{5}} = -\sqrt{2} \text{ Clearing of fractions, } 1 = -\sqrt{2} \times -\sqrt{5}.$$

That is, a plus quantity is equal to a minus quantity into a minus quantity. A. This is an illustration which might possibly be admissible, if at all, only in the higher analysis, but would be obviously out of place for establishing the fundamental principles of elementary analysis.

How far is the earth from the sun, as estimated recently by the transit of Venus? A. The observers have not got that far, we imagine. Indeed, we noticed that, at the last meeting of the British Association, one of the members stated that he thought they would be doing very well if they worked up the observations in seven years.

(5) R. S. N. says: 1. I have a turning lathe operated by a treadle attached to the shaft of a 36 inch wheel of 4 inches face. The treadle cranks make 6 inches sweep; the bearings are 3/4 x 2 1/4 inches. The chuck spindle bearings are 3/8 x 2 1/4. A. Such a lathe will require about 1/2 horse power. 2. What do you think of this arrangement? A. It is a powerful lathe to be worked by the foot.

(6) S. M. says: 1. A line joins two fixed points on the earth's surface. Presuming that no earthquake or any other convulsion has affected these points, will time produce any change in the direction of this line? Can it point due north today, and 1° or 2° east or west of north a few years hence? A. No. 2. In other words, if two surveyors state its direction differently, an interval of time intervening, can you predicate error of either or both? A. If we knew by what method the sur-

vveyors determined the astronomical meridian and applied it to the line above spoken of, we should probably be able to predicate the error of one or both.

(7) B. K. A. asks: Will you let us know what is the difference between a high pressure and a low pressure engine? A. A high pressure engine exhausts the steam when the piston has arrived at the end of the stroke. A low pressure engine condenses the steam, and thus has live steam on one side, and a partial vacuum on the other side, of the piston.

(8) E. R. says: I propose to build a yacht 90 feet long and of 18 feet beam, to draw 12 inches of water when light, and not to exceed 18 inches with all machinery and 6 tons of coal on board. I intend to use two engines 8 x 10 inches (to work quartering), two upright boilers of 36 inches diameter, with 75 tubes, 1 1/4 inches in diameter and 4 feet long. Fire grate surface is 2 1/2 feet x 3 1/2 feet in each boiler. I will use the best propeller I can find, and fully submerge the same under the boat without loading down the boat. What kind of a sea boat will she be? A. We do not think such a boat would stand rough weather very well; and for smooth water it might be advisable to use side wheels.

(9) M. M. C. says: We are putting in a 50 horse power engine which will run at 85 revolutions of the crank per minute. The drive pulley is 4 feet in diameter; distance to main shaft is 15 feet. What should be the width of the leather drive belt? A. About 13 or 14 inches.

(10) A. C. asks: How many times more water will go through a 3 inch pipe than would through a 1 inch pipe? A. The question is too indefinite to admit of a single answer. If the velocity in each pipe is the same, the discharge will be in proportion to the squares of the diameters. If the head is the same for both pipes, and the pipes have the same length, the velocities will be different and the discharge will vary as the products of the velocities by the squares of the diameters. We give below Weisbach's rule for determining the velocity: Let l = length of pipe in feet, d = diameter of pipe in feet, v = velocity of flow in feet per second, and h = head of water in feet. Then $v = 8.02 \sqrt{h + \sqrt{1.505 + \left(0.01439 + \frac{0.017155}{v} \right) \times \frac{l}{d}}}$

(11) J. W. G. asks: What is used in the navy for blacking boilers? A. Paint made of common charcoal ground in oil is an excellent article for the purpose.

(12) T. W. R. asks: 1. Will steam after heating a building, return to the boiler, no matter how much pressure you may have in the boiler, that is, will steam return against 20, 40, 60 lbs. of steam? A. It can be made to return, by the use of a suitable trap. 2. Is the pressure equal on all sides of a boiler? A. The pressure is greatest on the bottom, on account of the weight of water in the boiler. 3. In low pressure boilers, could not the return be run half way below the waterline as well as at the bottom of the boiler? A. An arrangement of this kind is not uncommon.

(13) R. S. Jr. asks: Will my engine, the cylinder of which is 2 1/4 inches bore by 5 1/2 inches stroke, drive a back-gear engine lathe of 16 inches swing and 5 1/2 feet bed? A. Your engine and boiler are both rather too small for the purpose.

(14) J. & C. say: We have a stationary engine of 16 inches diameter, 5 feet stroke, using steam from 90 to 100 lbs., and cutting off at 10 to 12 inches on the stroke, as the work requires. The fly wheel is 20 feet in diameter, weighing 18,000 lbs., made in 8 sections and held together at periphery with wrought iron key and links. The center is held by two flanges bolted together through the arms. Would it be safe and economical to run the engine at 35 revolutions per minute? A. Yes, if the bearing surfaces of your engine are sufficiently broad and strong to stand the wear and tear.

(15) W. E. P. says: For extinguishing kerosene flames, I would recommend ashes from the stove. When the flames were 4 feet high, cold ashes from the stove extinguished them immediately.

(16) A. M. T. asks: 1. Has the pump, used on locomotive engines, suction? A. Yes. 2. Are the air pumps, used on ocean steamers, ever made of brass or steel? A. Brass.

(17) W. T. H. asks: Why is it darkest just before dawn? A. The statement to this effect is without foundation.

(18) S. asks: Does cast iron contract or expand when cooled from a liquid state? A. Iron acts very much, in this respect, like water. Solid iron floats upon the molten metal and is consequently lighter. As molten iron cools, within certain limits, it gradually expands; but when it has reached a certain temperature, it begins to contract, and this it continues to do however low the temperatures may be carried. It is for this reason iron copies so accurately the molds into which it is poured while in a molten condition, and allowed to gradually cool.

(19) J. McC. asks: How are pictures produced on white porcelain glass cone shades? A. They are for the most part put on by the decalcomanie process.

What is the coloring principle in ruby-stained window glass? A. Purple of Cassius.

(20) J. A. G. asks: What can I use on or in a rubber hose to prevent kerosene oil from rotting it, or what flexible material can I use in place of rubber to draw kerosene from a large tank? A. There are several methods by which the tube may be protected completely or in part; but we should recommend, as liable to give the best satisfaction, the use of a good tube of leather of sufficient

suppleness to avoid the objectionable tendency to close the duct by creasing, when bent at a moderate angle.

What is the best material to use on boots that are exposed in water a great deal? A. Try a solution of india rubber in bisulphide of carbon.

(21) J. W. says: I had occasion to remove a piece of mica from a stove, and noticed that, on being crushed, it gave out flashes similar to those noticed on scooping hard sugar with a metal instrument. Can you give an explanation? A. The flashes of light are due to the electrical disturbance consequent upon the forcible disruption of contiguous laminae. It is a well known phenomenon.

(22) P. asks: What will prevent the pigment permanent white from scaling off parchment? A. Try the following: Reduce to powder and dissolve quickly in cold water a quantity of gum tragacanth. There must be sufficient water to give to the diluted gum the consistence of a jelly. Mix with this your pigments (sulphate of baryta), and, after finishing the work, spray with a little naphtha in which has been digested for sometime a quantity of caoutchouc. The naphtha will soon evaporate, leaving behind the caoutchouc an extremely thin and adhesive, but perfectly transparent, film.

(23) A. L. E. says: A friend of mine states that, to be able to run an engine in a small building in New York city, the engineer must have a certificate showing that he has the ability to run the engine. I say that he does not need it. Which is right? A. Your friend's statement is correct.

(24) A. C. McK. asks: 1. Is tellurium valuable? A. Yes. 2. Is it difficult to extract? A. Very. 3. Is there any market for the ore or the metal in America? A. The market will have to be made, since, owing to the scarcity of the metal, it has as yet been little employed in the arts. 4. What is the probable cost of extraction per ton? A. The cost will have to be determined by trial.

(25) R. J. P. asks: Can ordinary Indian ink have anything added to it to make it indelible? A. Try the addition of a little nitrate of silver just before using.

(26) A. C. McK. asks: How can I extract tellurium from its ore? A. Professor von Schroetter has lately published the following method of separating tellurium in its free state: The finely crushed ore is first digested with strong hydrochloric acid (in order to decompose or dissolve the sulphides of arsenic, antimony, lead, etc.), and separated from the insoluble residue, which is then treated with aqua regia, when gold and tellurium are dissolved, and thus separated from silver. From the solution thus obtained the gold is precipitated by protosulphate of iron, and the tellurium by metallic zinc. The gold is melted in a graphite crucible with borax, and the tellurium in an iron pot, when both metals are obtained in a pure state, the latter being a white metal of from 6.0 to 6.4 specific gravity and of great fusibility. The present value of tellurium (fused) is about \$200 per lb. avoirdupois.

(27) W. L. S. asks: Can you tell me of a safe way of preventing mildew in cotton duck sails, etc.? A. We find the following recorded as a good preventive of mildew: Boil the fabric for several hours in a solution consisting of 50 parts common salt, 4 parts lime, and 1 part alum, dissolved in a suitable quantity of clear water.

(28) A. B. O. says: I find the following alloy to answer for repairing the damage to steam chests, valves, etc., which have been eaten out and honeycombed by the use of impure suet, tallow, and other bad oils: First make molds of Russian sheet iron, bent at right angles where surfaces or corners are to be built up, stopped with red molder's clay or plaster. Clean the surfaces: and if there is no hold for the alloy, small holes must be drilled in the iron to secure the casting in place. The alloy consists of 2 1/2 parts copper, 1 1/2 parts antimony, and 6 parts tin. Heat the casting in a common ladle to dull red, and file the mold. The alloy cannot be worked down with anything but file and scraper. I have saved with this alloy a couple of steam chests which would have cost \$500 to renew in a short time.

(29) T. H. W. asks: Is there any instrument, similar to a thermometer, for indicating the degree of purity of the air? A. This desirable little instrument has not yet been invented; and from the numerous obstacles to be overcome, it is not probable that anything of practical utility in this line will ever be devised.

(30) M. R. asks: How can I make ink to write blue, and afterwards turn black? A. For blue ink changing to black, take 3/4 lb. finely powdered nutgalls, and digest for 2 or 3 days in 1 gallon of cold water; add to this about 6 ozs. each of finely powdered copperas, gum arabic, and sulphate of indigo (chemic or Saxony blue). Heat the whole to the boiling point, and allow to stand with occasional stirring for several days in a warm place. Then filter through a fine linen cloth, add a few cloves, and bottle for use. To make the so-called sulphate of indigo (Saxony blue): Dissolve well sifted indigo in 5 times its weight of strong oil of vitriol, previously heated over a water bath to about 150° Fah. Neutralize the solution by cautious additions of carbonate of potassa in the form of a fine powder. Collect and dry the precipitate.

(31) M. C. asks: How can I dress Arkansas diamonds? A. With copper wheels, and emery or corundum.

(32) C. asks: Which is the best soap for the toilet, and which for washing clothes? A. Use for the toilet a good variety of glycerin soap. The common yellow soap answers well enough for laundry purposes.

1. Is there an alloy that resembles gold, and is as hard as 14 carat gold after it is annealed? A.