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## Notes & Queries

E. will find details of the process of transferring engravings to glass on p. 298, vol. 31.—J. R. M. will find a rule for calculating speeds of pulleys on pp. 28, 73, vol. 25.—L. K. Y. can make a copper dip by the process described on p. 30, vol. 31.—G. H. B. will find formulae for calculating the horse power of an engine on p. 16, vol. 23, and p. 54, vol. 30. For a process for making ether, see p. 34, vol. 31.—T. F. S. can calculate the supply of water through his pipes at any given head by the formulae given on p. 48, vol. 29.—A. M. can refine rosin oil by the process given on p. 263, vol. 31.—C. H. F. can remove ink stains from woolen fabrics by the method described on p. 139, vol. 29.—A. S. T. can temper tools for cutting granite by the process given on p. 202, vol. 31.—W. H. will find a good recipe for mucilage on p. 202, vol. 31.—A. M. and H. A. do not send sufficient data.—G. H., J. F. S., and many others should refer to p. 48, vol. 29, as to friction of water in pipes.—C. F. S. will find directions for making rubber stamps on p. 156, vol. 31.—G. D. F. will find a method of softening paint brushes on p. 75, vol. 28. The manufacture of plaster of Paris from gypsum is described on p. 393, vol. 29.—C. A. S. will find the details of engineers' pay in the navy on p. 394, vol. 31.—J. W. will find how to ascertain the radius of an arc, when chord and height are known, by varying the formula given on p. 139, vol. 31.—C. A. H. will find directions for making molds for small castings on p. 236, vol. 24.—J. B. can ascertain the lifting power of hydrogen by referring to p. 74, vol. 31, and can calculate accordingly for other gases.—G. F. L. will find the recipe for a hair stimulant on p. 363, vol. 31.

(1) C. S. asks: Which has the most strength, a  $\frac{3}{4}$  inch bar of iron with a  $\frac{3}{4}$  inch hole in it, or a solid bar of  $\frac{3}{4}$  inch iron? A. The solid bar.

(2) G. H. B. asks: 1. Are cannon ever molded of wrought iron, so as to retain their malleability? A. No. 2. Is wrought iron ever run into molds? A. No.

(3) V. L. W. asks: If an engine will do less work with 40 lbs. of steam, will it be better to carry just 40 lbs., or would it be better to let it go up to about 50 or 55 lbs., in order to have dry steam? A. If the steam of a higher pressure is wire-drawn down to 40 lbs., it is better to carry only the latter pressure; but in an engine with an automatic cut-off, the higher pressure would be the best.

(4) E. C. H. asks: What becomes of the exhaust steam when an engine running at full speed is reversed? Does not the engine pump air into the boiler? A. No.

Is it at all probable that, during the great conflagration of Chicago, providing the wind was favorable, that the smoke or scent of fire would be observed in the vicinity of Philadelphia? A. No.

Is the 1,000 foot tower all a hoax, or is to be erected for the Centennial? A. Address the designers. What kind of joint should be used to close the blow-off port of a boiler by a cap, so to make the most serviceable and reliable joint? A. It is sufficient to screw on the cap.

(5) Z. says: I read in Ganot's "Physics," p. 390, that "as a gas is increased  $\frac{1}{2}$  of its volume for each degree C., it follows that at a temperature of 273° C. the volume of any gas, measured at zero, is doubled. In like manner, if the temperature of a given volume at zero were lowered through 273°, the contraction would be equal to the volume, that is, the volume would not exist." It appears to me that, if the volume is doubled for every 273° of heat, it would be reduced one half for the same number of degrees of cold. Therefore at -273° the volume would be  $\frac{1}{2}$  of what it would be measured at zero. At -273° x 2 it would be about  $\frac{1}{4}$ ; at -273° x 3 it would be  $\frac{1}{8}$ . If this be correct, there appears to be no more reason for placing the zero of temperature at -273° C. than at any other point in the scale. A. If the gas is heated 1° C., its volume is increased  $\frac{1}{273}$ . Similarly if it is cooled 1°, its volume is decreased  $\frac{1}{273}$ ; if cooled 2°, the volume is decreased  $\frac{2}{273}$ , and so on; so that on being cooled 273°, the volume is decreased  $\frac{273}{273}$ .

(6) C. F. O. Jr. says: A boiler whose dimensions are 9 feet long and 2 feet 6 inches diameter, with a steam dome 20 inches in diameter and 24 inches high, the shell being  $\frac{1}{8}$  inch thick, and the heads  $\frac{1}{2}$  inch thick: made of the very best C. H. No. 1 Pennsylvania iron (except the sheets at the bottom half of the boiler and the back head, which are of Eureka or Silgo fire-box iron) is to be used for supplying a steam heating apparatus with steam at 20 lbs. pressure. It is to be tested to a hydrostatic pressure of 50 lbs. to the square inch. Is not this high pressure injurious, and will it not weaken the boiler materially? A. If the test is properly performed, by filling the boiler with water and heating it, we do not think that any material injury will result.

(7) M. H. K. asks: What is the simplest mechanism which I can use to turn a light machine, very rapidly if possible, using an air pressure from a fan? I would like to have the air enter at the center and discharge at circumference of the motor. A. Something on the plan of the Barker mill would no doubt serve the purpose.

(8) G. C. P. Jr. asks: What is the cause of the thumping noise in engines? A. Probably water in the cylinder and pipe.

(9) W. S. S. says: 1. I want to make a cylinder casting with ports about  $\frac{1}{8}$  inch wide. What can I make the cores of so that I can clean the ports out easily? A. Of baked clay and sand.

2. Would it do to make the patterns as for large cylinders? A. Yes. 3. Would ports  $\frac{1}{4}$  inch by  $\frac{1}{16}$  inches be large enough for a cylinder  $1\frac{1}{2}$  inches by 3 inches? A. Yes.

(10) C. S. asks: I want to use 2 horse power; could I not get it from a 10 horse engine as cheaply as I could from a 2 horse engine? A. In some cases, the large engine might be run as economically as the small one, but in general, no.

What pay do locomotive engineers and firemen get? A. Engineers from \$80 to \$100 a month, firemen from \$40 to \$60.

How is acid made out of wood, for setting the colors in cloth? A. It may be prepared by treating nutgalls with ether.

(11) G. B. asks: Does it make any difference as to the safety of a bridge whether a train is run over it at the usual or at reduced speed? A. It is safer to cross the bridge at a reduced rate of speed.

(12) C. B. W. asks: 1. What is meant by a sniffing valve? A. A blow-through valve attached to an engine for the purpose of expelling the air. 2. What is an equilibrium valve? A. It is a valve which can be moved without being affected by the pressure of the steam. 3. What is a gridiron valve? A. A cut-off slide valve with several ports. 4. What is multiple gearing? A. A train of gear wheels.

(13) R. O. B. asks: Is the odontograph applicable to internal epicycloids as well as to all other forms? I have tried in vain to adapt it to the above-named gearing; and if it can be applied to wheels gearing internally, I want the process and also the radii of a pair of wheels so gearing, so as to occupy a space  $2\frac{1}{2} \times 16$  inches and  $1\frac{1}{2}$  pitch. A. The odontograph can be used as you suggest. You will find an explanation of the method and a very good summary of the rules for proportioning wheels in the article on gearing in Appleton's "Dictionary."

(14) G. S. asks: How much will a brass tube expand in length when heated from the temperature of cold water (as it comes from hydrants) to that of boiling hot water, the tube being  $1\frac{1}{2}$  inches in diameter and the bore 1 inch, and the tube being 1 foot long? How long a tube would be required to expand  $\frac{1}{8}$  inch in length? A. It will expand about  $\frac{1}{1000}$  of its original length. From this you can readily calculate the requisite length. 2. What hard metal expands most, and how long a tube of that metal expands  $\frac{1}{8}$  inch in length? A. Zinc expands  $\frac{1}{1000}$  of its original length.

(15) C. F. asks: Is there a rule by which I can ascertain the power exerted by a pump, say with three plungers of  $\frac{3}{4}$  inch diameter and 4 inches stroke, driven at the rate of 50 strokes per minute by a 6 inch belt? A. It must be determined by experiment.

(16) C. N. says: 1. I am making an engine, to run a jeweler's lathe, of 1 inch bore and  $1\frac{1}{2}$  inches stroke. Will such a cylinder be large enough, and will  $\frac{1}{8}$  inch be enough cushion? A. The dimensions will answer very well. 2. At what point should steam be cut off? A. Three fourths of the stroke.

(17) N. A. J. asks: How can I ascertain the number of acres in a triangular piece of land? My method is to add the three sides together and take half their sum. From this take the three sides severally, and multiply the half sum and the several remainders together and extract the square root of the product. Am I right? A. This method is correct.

(18) A. G. C. asks: In a plain slide valve engine, is it better to have an extra large steam chest? A. No.

(19) H. M. asks: What is the weight of 1 cubic inch lead, wrought iron, and cast iron, respectively? A. Average: Lead 0.410 lb., wrought iron 0.282 lb., cast iron 0.261 lb.

Can you give me a rule for finding the side of an inscribed hexagon, also of an inscribed octagon? A. Side of hexagon = radius of circumscribing circle. Side of octagon =  $0.7654 \times$  radius.

What is meant by squaring the circle? A. Finding a square of the same area.

What is meant by the pitch of a propeller? A. See p. 240, vol. 31.

(20) H. H. asks: In what does indicated horse power of an engine differ from horse power? A. Indicated horse power is that due to the pressure of the steam, and includes the power required to overcome the friction of the engine. Effective horse power is the power available for useful work after deducting that consumed by prejudicial resistances.

(21) A. S. P. asks: 1. Does compressed air press equally in all directions? A. Yes. 2. What is the pressure per square inch of 1, 2, and 3 atmospheres respectively? A.

1 atmosphere, average, 14.685 lbs. per square inch.  
 2 " " " 29.370 " " " "  
 3 " " " 43.055 " " " "

What is the weight of a cubic foot of water? A. A cubic foot of distilled water of maximum density weighs 62.425 lbs.

(22) M. E. H. says: I have kept a gun in such good order that I have worn all the varnish off. It is now so bright that, when the sun shines on it, it is almost impossible to shoot well with it. How can I revarnish it? A. Try chloride of antimony, mixed with olive oil, heating the gun barrel slightly.

(23) G. & Co. ask: What is the rule for gaging casks? A. The rule varies considerably, according to the kind of cask. You will find a good summary of rules and methods in Haswell's "Mensuration." A general method is to ascertain the mean diameter by a number of measurements taken at close intervals, and then treat the cask as if it were a cylinder with this (mean) diameter.

(24) H. M. says: 1. Are half inch oak boards thick enough for the planking of a boat 20

feet long? A. Yes. 2. Would screws do in place of rivets, provided I countersink the head and putty them over? A. No. 3. Would an engine with a cylinder of 3 inches bore and 6 inches stroke, under 50 lbs. pressure of steam, be large enough to run the said boat? A. Yes. 4. What power would the above sized engine, running 300 revolutions per minute, give? A. Between  $1\frac{1}{2}$  and 2 horse power. 5. What sized screw would it take to run the above boat? A. One of 2 feet diameter and 3 feet pitch.

(25) G. E. P. asks: Who was Euclid? A. A celebrated geometer, who lived in Alexandria, about 300 B. C.

(26) W. M. W. asks: 1. Is the coating on enclosed pills all sugar? A. It is principally sugar. 2. What is mixed with sugar for coating pills? A. M. Garot recommends 10 parts gum tragacanth and 2 parts water. This is screened through fine linen, and mixed with 20 parts of sugar of milk. It is spread out in thin layers, and, when dry, pulverized. The pill is first dipped in water and then powdered over with the above compound. Pure gelatin is sometimes used for this purpose, also mixtures of gum, sugar, and starch. M. Calloud gives the following recipe, and the mixture is claimed by him to be less hygroscopic than any of the foregoing: Boll together 1 part flaxseed, 3 parts white sugar, and water sufficient to make a thick mucilage. Evaporate to dryness, pulverize, and dip the pill in on the point of a pin, to which is to be given a rotary motion.

(27) S. A. asks: Can a person be cured who is suffering from trichinae? A. Yes, if discovered in proper time, that is, before the trichinae have passed from the alimentary canal. 2. What are the symptoms? A. The symptoms are diarrhoea and abdominal pains, followed by muscular pains. "These symptoms occur within a few days after the ingestion of trichinous meat, that is, as soon as the young worms have been produced and become developed sufficiently to begin to migrate towards the muscles. It is not difficult to understand that the aggregated punctures of the mucous membrane by these parasites should occasion notable disturbance, when it is considered that the trichina which have been found to be contained in half a pound of meat may be sufficient to give birth in a few days to a brood numbering 30,000,000. It is stated that peritonitis may be produced by the passage of worms into the peritoneal cavity. The secondary symptoms relate to the muscles. Pains resembling those of muscular rheumatism are occasioned by the entrance of the trichinae in the muscles. Certain of the muscles become contracted, in some cases, and their extension occasions great suffering. Constitutional disturbance, more or less marked, accompanies both the primary and secondary symptoms. The general symptoms are not unlike those of typhoid fever, for which the disease is liable to be mistaken. Oedema of the face or lower extremities is apt to occur, and sometimes anasarca. Sweating is generally prominent as a symptom. Death takes place in a certain proportion of cases, after a protracted period of suffering and exhaustion, being often preceded by coma. The danger, *cateris paribus*, is proportionate to the abundance of trichinae generated within the alimentary canal. If the number be not sufficient to cause death from the amount of local and constitutional disturbance which they occasion, recovery takes place very slowly, the illness lasting for several weeks or months. The trichinae become encapsulated in the muscles, thereafter remaining quiescent, leaving the muscles more or less impaired. An accumulation of a larger number of cases than is at present practicable is necessary to furnish data for a complete clinical history of the disease, and for determining the relative proportion of deaths and recoveries." 3. Do not trichinae sometimes infest fowls? A. We do not remember such an occurrence. 4. How long can a person live with them in his body? A. That depends upon the constitution. 5. Can the disease be taken any way but through the stomach? A. Not that we are aware of.

(28) G. R. L. C. asks: 1. What kind of a curve is the tractrix? A. A tractrix is a transcendental curve in which the distance between every point of tangency and a fixed line, measured on the tangent, is the same. 2. Is there an equation for the tractrix? A. If  $x$  and  $y$  are rectangular coordinates, and  $h$  the constant, the equation, referred to the center, is  $x = h \times \log \left( \frac{h + \sqrt{h^2 - y^2}}{y} \right) - \sqrt{h^2 - y^2}$ .

(29) S. and D. ask: Were potatoes first found in Ireland or America? A. The common potato is a native of America, and was introduced into Europe by Sir Walter Raleigh.

(30) R. J. K. asks: I wish to prevent pine logs from fouling the water in wells. Has burning or charring ever been tried for such a purpose? A. Yes. The plan is frequently used, and is often efficacious.

(31) H. W. J. says: I have the following idea for a planer: On the sides of the lathe bed are bolted two arms, with a cross piece at the top, to which is attached the slide rest in a vertical (as compared with its usual) position, with the upper slide reversed; then a bed is made which moves on the lathe bed and is operated by a toggle arm connected at one end with the lower part of the head stock, the other end being connected with the traversing planer bed. Will this succeed? A. It will work very well. There is a somewhat similar planer in the market, which can be attached to a vise.

1. I wish to build a model engine of 2 inches stroke and 1 inch diameter. How would a boiler 1 foot high by 10 inches diameter, with 1 tube 3 inches in diameter, answer? A. The boiler is rather too small. 2. Of what thickness of metal should the boiler (of iron or copper) be? A. Make it  $\frac{1}{8}$  of an inch thick.

What is the plane line of a governor? A. The line joining the centers of the balls.

What books can you recommend on turning? A.