## Notes & Queries

T. A. B. and others, who ask as to books on the locomotive engine, should read Forney's "Catechism of the Locomotive." D. W. P. will find formulæ on the strength of boilers on p. 186, vol 32.—J. C. W. will find full instructions for polishing lenses on p. 363, vol. 31. Consult Prechtl's "Dioptrik," if you can read German.—J. H. R. should use the Léclanché battery. See p. 362, vol. 31.—P. H. G. will find directions for polishing shirt bosoms on p. 203, vol. 31.—H. H. T. will find particulars as to the invention of the screw propeller on pp. 151, 241, vol. 30.—E. R. J. will find a description of the method of preparing bone charcoal on p. 54, vol. 28.—J. L. H. will find a recipe for cement for glass and brass on p. 117, vol. 32.—F. B. S. will find a description of an electric engine on p. 241, vol. 33.—A. K. will find full directions for mounting maps, etc., on p. 91, vol. 31.—R. W. will find that painting on zinc is described on p. 116, *Science Record* for 1874.—W. N. C. will find directions for bluing steel work on p. 123, vol. 31.—W. A. will find directions for hardening needles on p. 347, vol. 31.—J. C. R. will find the dimensions of the Great Eastern steamship on p. 346, vol. 31.—J. C., of Moscow, Russia, will find a description of a wood-splitting machine on p. 79, vol. 28.

(1) S. L. S. asks: Please to inform me how I can dissolve aniline green, or how to prepare it for coloring purposes. A. We are acquainted with two varieties of this color, namely, aldehyde green and iodine green. The former is soluble in 2 parts of sulphuric acid, and from 50 to 70 parts of alcohol. The latter dissolves readily in equal parts of alcohol and water.

(2) W. M. J. asks: 1. Why would it not answer as well to place the coils of a magnet $\frac{1}{16}$ of an inch apart instead of putting them the thickness of a fine silk thread apart? What would be the result provided the same length of wire be used? A. It would not answer so well, because the same number of convolutions could not be contained in the space occupied by the wire when the latter is covered with a thin layer of silk only. 2. What is the theory of a current of electricity, passing around a piece of soft iron, magnetizing the same? A. Ampère's theory assumes that each individual molecule of a magnetic substance is traversed by a closed electric current. It is further assumed that these molecular currents are free to move about their center of gravity. The coercive force, however, tends to keep them in any position in which they may happen to be. When a current of electricity is passed around the substance, its tendency is to place all of the molecular currents in a parallel direction; by this means the action of the latter on external matter becomes apparent. 3. Is the magnetic influence derived from the passage of a current of electricity? A. Yes. 4. Would it not do as well, if practicable, to replace electricity with heat? A. Yes. It is not practicable, however, until the heat is first transformed into electricity.

(3) J. R. C. asks: If the two disks of an achromatic object glass are $5\frac{3}{16}$ inches in diameter, the bi-convex and the contact side of flint glass being ground to 31 inches radius, what should be the curvature of the posterior side of the flint glass? If the disks be 4¼ inches in diameter, and the three curves (as above) are ground to 24 inches radius, what should be the posterior or correction curve? The lenses are of French glass. A. Assuming the glass to be of medium quality, in the first instance, the posterior curve should be concave, of 146 inches radius. The latter should also be concave, of 113 inches radius.

(4) J. E asks: How can I make glycerin soap? A. It is made by incorporating, with any mild toilet soap, $\frac{1}{25}$ or $\frac{1}{20}$ by weight of pure glycerin, while in the melted state. It is generally tinged of a red or rose color with a little tincture of orchil or of dragon's blood, or orange yellow with a little annatto. It is variously scented; but oil of bergamot or rose geranium (ginger grass) supported with a little oil of cassia, or oil of cassia supported with essential oil of almonds, appears to be the favorite perfume. The greater portion of the so-called glycerin soaps contain not a particle of glycerin.

(5) J. F. P. says: I propose to build a fruit house with ice house overhead. I propose a triple brick wall, with two air spaces of two inches each, with cut-off at every two feet in hight. Would it be better to fill one or both spaces with non-conducting material, like sawdust, or leave them as dead air spaces? A. In this case [illegible] would suffice.

(6) J. O. P. asks: How can I make vinegar in 10 hours, from pure cider? A. The best ferment is vinegar. An old cask in which vinegar has been kept is the best to ferment in. Other ferments are used, such as bread soaked in yeast, sour dough, dough of wheat, or rye bread soaked in cream of tartar and vinegar. All these are used in small quantities, a few ozs. to the barrel. Vinegar made with them is more apt to spoil. The more ferment there is present, the quicker will be the process. The cider is put into the cask, which is best painted black outside to absorb the sun's rays when the weather is cool; the bung is left out, the bung hole is covered with a piece of slate, and in about four weeks the rectification is complete. The lower the temperature is, the slower will be the change.

(7) G. J. asks: In what position is the compass placed on board iron steamers, so as not to be affected by the metal of which the ship is constructed? A. It is mounted on an elevated standard, sufficiently high to be out of the sphere of the ship's attraction.

(8) J. C. R. asks: Where is native sulphur found, outside of Sicily? A. The great depositories of sulphur are either beds of gypsum and the associate rocks, or the regions of active or extinct volcanoes. In the valleys of Noto and Mozzaro, in Sicily, at Conil, near Cadiz in Spain, at Bex in Switzerland, at Cracow in Poland, it occurs in the former situation. Near Bologna, Italy, it is found in fine crystals, imbedded in bitumen. Sicily and the neighboring volcanic isles, Solfatara near Naples, and the volcanoes of the Pacific Ocean, etc., are localities of the latter kind. It is also deposited from the hot springs of Iceland; and in Savoy, Switzerland, Hanover, and other countries, it is met with in certain metallic veins. Near Cracow and in Upper Egypt there are large deposits. A fiberous variety is found near Sienna, in Tuscany, and is abundant in the Chilian Andes.

(9) G. M. says: I wish to know something of the nature and properties of phosphorus. A. Consult some elementary work on chemistry.

1. Does lodestone possess the same properties, in every respect, as an artificial magnet? A. Yes. 2. Which is the most powerful? A. Artificial magnets are much the more powerful. 3. Where is lodestone found? A. Lodestone occurs in large quantities in the northern parts of New York State. 4. In a horseshoe magnet, made of a bar of steel 8 inches in length, how far apart should the ends be to secure the greatest power? A. About ½ inch apart.

(10) W. T. G. asks: 1. What are the qualifications necessary to become a midshipman in the United States navy? A. A fair English education, good physical development, and age between 14 and 18 years. 2. Who would be the proper person to apply to for a position in the lake squadron? A. There is no lake squadron. To become a midshipman requires recommendation to the Secretary of the Navy by the member of Congress of your district. 3. Which offers the best chance for study and advancement, the United States navy or the merchant marine? A. In the navy, you are sure to be advanced if you live long enough. In the merchant service, the case is the same as in any private pursuit; individual merit and ability tell.

(11) S. H. L. says: I have an ornamental piece of white ivory, in the shape of a cylinder, which has lately cracked. Do you know of any plastic material with which I could fill the crack, to conceal the defect, and not in any way affect the ivory? A. Place a small quantity of pure gelatin in a strong solution of alumina. When entirely penetrated by the alumina, remove from the solution, and use immediately. When dry, it may be readily polished.

(12) J. R. says: I am interested in a quartz mine, which assays from $40 to $80 per tun of gold; but the sulphuret of iron is so abundant that the quartz mill men claim that they cannot amalgamate the gold. Can you inform me of some cheap method of destroying the sulphuret of iron? A. Pulverize the ore, and roast it at a high temperature in a current of air. This will expel the sulphur as sulphurous acid gas, leaving the iron behind as an oxide.

(13) O. C. says: You say that the earth received its motion at the creation, and that motion keeps up from the fact that there is no resistance. As the moon draws after it a great tidal wave, extending nearly from pole to pole, the land must feel this draft; is not this an enormous resistances, and would it not of itself bring the earth and moon to a standstill, if there were not some great and perpetual force keeping them in motion? A. Mayer has demonstrated that the tidal wave due to the moon exerts a retarding influence on the rotation of the earth; but that, at the present period of its existence, the retardation is exactly counterbalanced by the acceleration due to its contraction in size by cooling. He holds that there will come a time when the cooling has proceeded so far that no more contraction will take place, and that then the retardation by the moon's action will commence, and go on until, in the course of ages, the earth will always turn the same side to the moon. He holds also that the moon has gone through this process.

(14) J.C. R. asks: 1. Are there any sulphur mines in the United States? A. Sulphur is found in this country near the sulphur springs of New York, Virginia, etc., sparingly, in many coal deposits and elsewhere, where sulphide of iron is undergoing decomposition, and in microscopic crystals at some of the gold mines of Virginia and North Carolina; as a powder and in crystals in the western lead regions: in cavities in the limestone, in minute crystals on cleavage surfaces of galena; and the beds of California afford large quantities of sulphur for commerce. 2. Excepting for $SO_3$, gunpowder, and friction matches, is there any considerable use or demand for sulphur? A. Yes, it is used in large quantities for sulphurizing hops and vines; as a preventive against some diseases of these plants, the quantity of sulphur used annually for this purpose in France, Spain, and Italy amounts to about 45,000 tuns. It is further employed in the production of sulphites and hydrosulphites, sulphide of carbon, cinnabar, mosaic gold or bisulphide of tin and other metallic sulphurets, ultramarine, various cements, and for vulcanizing and ebonizing india rubber and gutta percha.

(15) O. C. says: Suppose the continents led east and west, and the oceans extended around the globe in the same direction, with no land to check the tidal wave, what would be the result? Would not the tidal motion of the sea constantly increase, rushing like a cataract over land of an ordinary hight, and carrying everything before it? A. Undoubtedly some straits have been made, or at least their formation largely assisted, by the tidal waves. If there were no land to check the tidal wave, it would go round from east to west, and not be deviated in various directions, as is now the case. In some narrow straits it might rush, as is now the case, but not reach such a hight as to carry everything before it, the hight of the tides being due to the balanced attractions of earth, sun, and moon.

How far are the seven stars of the *Pleiades* supposed to be from each other? A. The mutual distance of the starsis on an average equal to their distance from us; there are, however, spots in the heavens where stars are fewer, and where this distance is greater; and inversely, there are some star groups where the distance is much smaller; such a group is the *Pleiades*, their material distance varying from one fiftieth to a five hundredth part of the distances from us. The telescope reveals clusters where the stars are still closer together, hundreds of them throwing a glow around like that of a furnace.

(16) J. J. asks: Do you know of any means whereby the law of gravitation can be suspended? A. This law is so universal and inherent in matter that there is absolutely no means of the kind.

(17) W. H. says: We have a reservoir on a hill which we wish to make use of for fire purposes in our mill, situated at the foot. It would be costly and inconvenient to tunnel through the side of the hill in order to lay pipe from the bottom of the reservoir to the mill, the top of which is 60 feet below the bottom of the reservoir. Could a siphon be used with advantage and certainty, so as to give us command of all the water in the reservoir in case of fire? The siphon could be sunk in the bank a few feet below the level of the water surface. If a siphon be practicable, how deep below the surface ought it be laid? The reservoir is 20 feet deep. A. The reservoir being 20 feet deep, and the highest part of the bend being a few feet below the surface of the water in the reservoir, there can be no doubt of a siphon's working well. The shortest leg of a siphon ought not to be more than 30 feet long, as the weight of the atmosphere counterbalances only from 32 to 36 feet of a column of water; but in this case your shortest leg will be not more than, say, 18 feet. The pipe should be so laid as to prevent freezing; for this purpose four feet below the surface will be deep enough; it should be also sunk in the bank down the side of the reservoir to guard against the same difficulty in case of low water. Take iron pipe and cover it with tar. 2. Is there a possibility of boring through the side of the hill to the bottom of the reservoir? A. In boring through the side of the hill, there would be danger of leakage to your reservoir, through which you might lose all of the water.

(18) C.G. W. asks: Is there any chemical that will assist a diamond in drilling hardened steel? A. Moisten the steel with a little turpentine or benzole. The latter is the better of the two.

(19) R. H. B. says: I have a tin roof put in with what tinners call standing seams. In a high wind it rumbles a good deal. Is that an ill omen? A. Tin plates for roofing are sometimes put together in the shop in rolls, taken to the building, and laid upon the roof, extending from the ridge to the eaves; the edges of the rolls are brought together, secured to the roof by nailing a cleat of tin between them, and the two edges and cleat are made into a standing joint, bent over at the top, one within the other, into what is called a double lock. By this style of roofing, the tin has quite a limited nailing to the roof boards; and should the edges become loose at any place to admit the entrance of the wind, it could very easily be stripped off by that means. This danger, provided the rolls are wide, more than compensates for any advantage it may possess in respect to its yielding, without injury, to expansion and contraction. The usual mode of laying the tin, plate by plate upon the roof, where every plate is securely nailed, has generally, we think, met every reasonable expectation in regard to durability, and is to be much preferred to the former method.

(20) S. L. T. asks: I am about building a sawmill in which I wish to run a muley saw or a 36 inch buzz saw. There are two engines in view; one has a cylinder 5 x 10 inches with a 30 inch balance wheel, the other has a cylinder 6 x 8 inches with an 8 inch balance wheel. Which in your opinion is the best for me? A. The 6 x 8 engine.

(21) W. O. P. asks: Is it practicable to melt cast iron on an ordinary blacksmith's forge, in sufficient quantity to make a casting of 15 or 20 lbs. weight? A. No.

(22) L. L. H. asks: The wild cane growing throughout many parts of our country can be utilized for making pipes for conveying water and other liquids. Some of them attain a diameter of several inches. With an iron rod heated to redness, the joints may be entirely cleaned out; and by means of large corks bored with smooth holes, they can be united in any length. By coating them with coal tar they will remain serviceable for years. Is there a way by which they may be curved or bent (and remain so) so as to suit a change of direction? A. Try steaming them, as is done for wood bending.

(23) J. A. G., of Manchester, England, asks: Can bright steel goods be hardened and tempered without affecting the polish on them? A. No.

(24) O. F. says: 1. We have a 10 by 16 inches single valve engine, of which the valve is 10¼ inches long and 5½ inches wide, with a recess in it for steam exhaust 9 inches long by 2⅝ inches wide. The entire width of valve seat is 7 inches, and the width between outside margins of steam ports is 4¾ inches, and between inside edges, 2¾ inches, the ports being consequently each 1 inch wide. The exhaust port is 1⅝ inches wide, and all are 9 inches long. The throw of the valve is 2¼ inches, the eccentric being set so as to begin to admit steam as the piston reverses its motion. The feed pipe is 2½ inches and the exhaust pipe 3 inches diameter. The engine runs at 120 revolutions per minute. Are the ports, valves, and other portions rightly proportioned? A. The cylinder exhaust port is a little too narrow, and the valve travels too little. 2. The piston does not come to within an inch of the cylinder heads. Can anything be done to economize steam and improve the working capacity of the engine? A. There is too much clearance at the ends of the stroke, to remedy which increase the thickness of the piston head or the cylinder heads. 3. The present boiler is 10 feet long and 3 feet in diameter, with 26 three inch tubes, supplemented by a heater. How much boiler room would be required to run the engine at 200 revolutions per minute, and maintain 60 lbs. pressure in boiler? A. Your boiler pressure, if increased by nearly one third, will maintain 200 revolutions.