Business and Personal.

Notes & Queries

C. C. R. asks: How can I make the best varnish for a violin?

E. H. R. asks: What is Box's process for treating peat for fuel?

T. A. asks for the process of stamping and retinning tin ware.

C. H. W. Jr. asks for the best method of softening the scale on cast iron.

D. B. B. asks for a plan for an oven for annealing small steel forgings. What is the best material for fuel?

J. H. says: Can any one give a rule for determining the relative position of the frets on the finger board of the guitar?

D. B. B. asks how he may heal a natural opening in the side of a young cow's teat. There is no projection, but simply an opening from which the milk issues.

J. A. F. asks: Is it considered dangerous to use rain water for drinking and culinary purposes if it is conveyed through lead pipes? If it is, what is the best kind of metal pipe to use?

L. A. C. asks how to make a composition of metals which will be nearly or quite as hard and durable, and will make as smooth and sound a coating, as brass, which can be melted in a common iron ladle.

J. A. F. says: Our court room is defective as regards accoustics. The room is 54x65x29 (pitch of story) with gallery at one end, extending (on the sides) half the length of the room, Can anything be done to improve it?

R. M. F. asks: 1. Which is the chief cause of the surf, wind, or tide? 2. In a dead calm, would the rise, distributed through a space of several hours, cause any surf on the coast? 3. During calm weather, how does the tide affect the surf where the rise and fall of the tide is 50 feet or upwards, or on any coast where the rise and fall is great?

S. D. S. asks: In a musical wind instrument, to be blown as a trumpet, what length of the instrument makes a tone, and what length makes a semitone? What is the length in inches measured on the instrument between C and C? If the instrument be one half inch diameter in the bore, will the distance for a tone and a semitone be the same as if the bore were three fourths of an inch in diameter? Would these distances be the same on a crooked instrument as on a straight one?

Answers to Correspondents

E. C. B. asks: 1. How does the fly wheel of the Scott and Morton revolving steam engine, illustrated in your edition of April 5, receive its motion? I don't understand how the power is applied to it from the cylinder. 2. How is it that salt is put on ice to preserve ice cream, but if it is put on ice on a sidewalk, etc., it melts it? Answers: 1. The fly wheel and cylinder are not concentric, their centers differing by a half stroke. Let A represent the position of the center of the cylin-

D A B C

der, B the center of the fly wheel, and C the wrist pin when at the end of a stroke, the piston rod being as far out as possible. At the end of a half revolution the wrist pin will be at D, the piston being at the other end of the stroke. In the figure BC=BD, and AB= one half stroke. 2. Salt always melts ice, thereby absorbing a certain amount of heat from surrounding bodies; and since it takes heat from the cream, it cools it. On the side walk it also melts the ice, thus taking a certain amount of heat from the air, the stones, and the feet that travel upon it; hence car horses' feet are often frozen when the tracks are salted.

A. B. asks: What is the best method of amalgamating a large zinc cylinder for a Bunsen's electrical battery? To immerse the cylinder would require a large amount of mercury, and I cannot succeed by rubbing it on. If the zinc, after being washed in sulphuric acid, is immersed in mercury, and the greater part of the surface is not brightened in the least, and is apparently unaffected by the mercury, what is the cause and how can it be remedied? Answer: Into a flat porcelain dish containing 2 or 3 ozs. of mercury, pour half a pint of strong muriatic (hydrochloric) acid; roll your zincs in the dish, so that the acid and mercury will touch the zinc at the same time; in this way the mercury will unite (or amalgamate) with the zincs with very little rubbing. After this rinse them in clean cold water, and place them in the battery jars: pour clean water on the mercury left in the dish, until the acid is washed away, then pour the mercury into the jars, and the battery is ready for the solutions.

J. M. says: I have been trying to construct a galvanic battery, but have not succeeded. It is made on the plan of Daniell's constant battery, and consists of two copper cups each 6 inches high and 4¼ inches in diameter, with a perforated shelf near the top, ⅝ inch wide. Two porous cups 3 inches wide and ½ inch thick, and two solid zinc rods 1¼ inches in diameter, are used. The porous cups are placed in the copper cups, and the zinc rods are insulated and hung inside of the porous cups, which are made of round drain tile. In the porous cups I placed a solution of one part of oil of vitriol in seven parts of water, and in the copper cups, a solution of blue vitriol and a little oil of vitriol. After standing awhile, I took hold of the handles but could feel no shock, nor has it worked since. What is the matter with it? Answer: The electricity from a battery of two of Daniell's cells of the size you mention could hardly be felt with the hand; but if you place the terminal wires on your tongue, without touching each other, it can be tasted. The proper way for your purpose is to allow the electricity, direct from the battery, to pass through the primary coil of an electro-magnetic machine and then pass the induced current from the secondary coil of the instruments, through your body, and it will require no great sensitiveness to feel it. The instrument will cost ten or fifteen dollars, according to power.

C. M. W. says: 1. I have an electro-magnetic machine from which, at times, I can feel electric shocks through one conductor without any connection with the other whatever. How is this? 2. Can I fix the machine in any way so that I can get the shock through but one conductor without any connection with the other? If so, how? 3. Can I charge a chair or stool with electricity, or charge myself with it, so that a person touching any of the above can feel the shock without their touching the conductor? Answers: 1. This effect is very noticeable when using the induction coils or frictional machines. While experimenting at home with a small induction coil, we have frequently illuminated a six inch Geissler tube by holding it with the thumb on one of the platina terminals, and the other terminal within a half inch of one pole of the instrument, without any apparent connection with either pole; of course there was a connection, or passage, and it was through the air, as may be easily proved by connecting the outside coating of a well charged Leyden jar with the gas or water pipes (so as to expose a larger surface for the escape); on presenting the knuckles to the knob of the jar, the shock will be felt without it being necessary to touch the gas pipe or outer coating. 2. In reality, no, but the connection may be so disguised that it will not be apparent. 3. If you stand on a stool with crown glass legs, you may be charged so that you can, with your finger or an icicle, ignite alcohol contained in a tin cup and held by some person who need not be in direct apparent connection with the other pole. In this case, the same principle is involved as in the charging and discharging of the Leyden jar, namely, that it would be impossible to charge either without a connection being established with both poles. We think the best machines, for the class of experiment in which the connection or circuit is not apparent, are those that produce very intense electricity, such as the instrument of Professor Holtz (described on page 380 of our volume XVI) or the ordinary frictional plate machine.

H. W. U. asks if the common burning gas will pass through water in a gas pipe, with the ordinary pressure. Answer: A column of water, one inch cross section and about 2·3 feet high, weighs one pound. Gas, to rise through a column of this hight, must consequently have a pressure of one pound per square inch; and the pressure required per square inch will vary with the hight of the column of water through which it is to pass.

A. W. asks: 1. How much horse power will it require to raise water through a tube one inch diameter from thirty to forty feet perpendicular? 2. Does condensed air press as many pounds on the inch as steam does? Answers: 1. Multiply the number of pounds of water delivered per minute by the hight to which it is to be raised, and divide the product by 33,000. This will be the horse power required, to which must be added the friction of the water in the pipe. 2. Yes.

C. P. W. asks: About how many degrees of heat will water absorb under a pressure of one hundred pounds? In other words, does not water change into steam at 212°? Answer: According to the generally accepted theory of heat being a mode of motion, water does change into steam, under atmospheric pressure, at a temperature indicated by the thermometer of about 212° Fahr.; but before it changes its condition, it requires an addition of about 967° of heat, which are not indicated by the thermometer, but can be observed by condensing the steam. This amount of heat, which is ordinarily called latent heat, is supposed to be converted into the work exerted by the particles of water in changing into steam.

F. W. asks: Will the iron radiator used for steam heating radiate as much heat in proportion to internal temperature if filled with hot water instead of steam? Answer: If the circulation is equally good, in both cases, the amount of heat radiated in proportion to temperature will be the same.

G. W. F. asks: 1. Is water compressible? If so, to what extent for a given amount of force? 2. Is there any ratio between the compressibility (if such exists) of different liquids and their specific heats? Or to put the matter conversely: Supposing an equal quantity of heat be applied to substances of different specific heat, water and mercury, for example, is the force of expansion the same or different in each case? Answers: 1. Water is compressible to the extent of about fifty millionths of its volume by a pressure of 15 pounds per square inch. 2. There is no such ratio. Generally, the most expansible liquids are the most compressible.

W. S. says: We have in a mine a pump with the discharge and suction pipes both 4 inches in diameter. From the discharge pipe we connected a 6 inch pipe for a column which is nearly 1,000 feet up a slope. L. S. J. claims that there is no more weight of column on the pump with a 6 inch pipe than there would be with a 4 inch pipe. D. R. J. claims, on the contrary, that there is, for the reason that the 6 inch column will hold more water than the 4 inch, and this makes the column heavier. Answer: There is certainly more weight of column when the 6 inch pipe is used, but the pressure on the pump piston is the same, in each case. The pressure on the base of a column of liquid is proportional to the hight of column and area of the base, and independent of the cross section of any part of the column, other than the base.

J. J. Y. says: In a factory in this place, pressure is obtained by means of a lever or handle attached to an eccentric. How is the power obtained by it calculated? Is it done in the same way as with a simple lever, the fulcrum of which is the axis of the eccentric? If not, how? Answer: This is simply a bent lever, and the calculations are made in the usual manner.

J. H. asks: Are bristle cuttings of any value as a fertilizer? If so, how could they be prepared? Answer: Mix with wood ashes and use as a fertilizer.

R. F. says: W. B. asks for a recipe for cement that will resist oil on the joints of a tin box; I suppose he means the joint round the cover. I have proved that thick shellac varnish, made with alcohol as a solvent, applied to the inside of a leather vessel, will hold whale oil three to five months: therefore I conclude that, if W. B. makes a thick paste by dissolving gum shellac in water by heat, and applies it thoroughly to the joint and, when dry, cements a strip of paper by the same paste around the joint, he will accomplish his purpose; or if he labels his boxes, let him cover the joint. Gum shellac dissolved in water as above is the best cement I ever found for labeling on bright tin; and by using it, he will accomplish a double purpose.

J. H. M. says, in answer to W. H.'s query about foul water in a well: Let him clean out his well, take out his pipe, fasten or solder on a piece of wire screen, about one sixteenth inch mesh, on the lower end of the pipe and bore a number of half inch holes through the pipe within a foot or two of the bottom end, covering the holes also with the wirescreen. Insert the pipe in the well, having it terminate in the center of the bottom of the well, and then fill up the well with clean washed gravel. The same thing can be done by using a pump log instead of pipe, and serving in same manner. I was troubled in the same manner that W. H. was, and have tried the above plan and it gives me the best water in this vicinity. It might, perhaps, be an improvement to occasionally put in a layer of charcoal when filling up with gravel, the coarsest charcoal being in the bottom of the well. Will W. H. give us the result after pumping out the water enough to clean the gravel? If the stones of the well were taken out, before filling as above it would be still better.

M. V. B. asks: Are meerschaum or other pipes made from froth of the sea? Are they not made from clay found in some parts of Europe? Answer: Meerschaum is a German word, signifying sea foam, and is applied to the mineral silicate of magnesia—of which meerschaum pipes are made—on account of the light and white nature of the substance. The best qualities come from Asia Minor.

E. J. C. asks how to burnish gilding on china. Answer: We give the following from Wagner's "Chemical Technology:" The gold employed for decorating the porcelain is dissolved in *aqua regia*, and precipitated with either sulphate of iron, nitrate of protoxide of mercury or by means of oxalic acid. In its application the gold must be intimately mixed with a flux, generally nitrate of bismuth. The article to be gilt must be thoroughly freed from grease, else the gold will not adhere. The gold powder, finely ground up with honey or sugar, or some such soluble substance, is applied with a pencil brush. The burning in is effected in a muffle. The gold is not melted during the burning, but becomes firmly set upon the article by means of the flux. After burning the gold does not at once appear bright, but requires burnishing with an agate tool. Bright gilding is effected by burning in a solution of sulphuret of gold or fulminating gold in balsam of sulphur which requires no burnishing.

J. T. D. asks what is the best work on mineralogy. "I would like to have some good work to assist me, as I find rocks that I cannot understand. 2. What would it cost to have ores of silver and lead assayed?" Answers: 1. Use Dana's "Mineralogy." 2. Assays of lead, gold, or silver cost $10 each.

J. L. S. asks: Why is it that a certain quantity of inflammable gas, burning in an ordinary gas stove gives out so very much more heat than when consumed in the common form of a light? I can easily understand how the heat is greatly increased by means of the free access of oxygen in the air, but can conceive no cause for the astonishing difference that actually exists. The same amount of gas burned in open air, even when it is bountifully supplied with oxygen, produces a sensible heat, insignificant when compared with that emitted from the gas stove. Is the heat generated in the two cases actually so different in intensity, or is it approximately the same, but only more generally diffused in the latter instance? If the last be true, why? Answer: Gas burned in a gas stove or Bunsen burner is mixed with air so as to be completely consumed; hence we have a blue flame and no light. In an ordinary batswing burner the air has access only to the outside of the flame, and the heated particles of unconsumed carbon give luminosity to the flame. In a gas stove, too, the arrangement is such as to heat as large a current of air as possible, and to diffuse the heat in all directions. You will find this fully explained in any work on chemistry or cyclopædia, under the title of combustion. The oxyhydrogen blowpipe produces a more intense heat than any stove or furnace, because the combustion is perfect, yet it does not heat a room where it is used so much as your gas stove, because it is not so arranged as to readily diffuse this heat through the surrounding atmosphere.

W. E. M. asks: Is there any process by which silicate of soda or potash, after it has been dissolved in boiling water, can be made to possess the same qualities as before dissolving? The qualities I desire are as follows: It must be nearly or quite transparent, nearly or quite insoluble in cold water, and must stand a heat of 600° Fahr. Thus far I have failed to get a satisfactory result after dissolving. I have tried chloride of calcium, which leaves an opaque silicate of lime, and does not answer. I have tried drying it in a heat of 130°, which is the greatest degree it will stand; and, after allowing it to dry in the air for three or four days and in this heat for eight hours, it would not then stand 150° without blistering. I must have it in the liquid so as to apply it in successive coats until I get a thickness of ⅛ of an inch. Would dissolving it in any other liquid which is not very costly give a better result? Answer: Try using it in a state of fusion, either by fusing the commercial dry silicate of soda, or by fusing a mixture of pulverized quartz 45 parts, calcined soda 23 parts, carbon 3 parts, and pouring the melted glass over the surface, which should be warmed also.

J. J. G. asks why vermilion turns dark, and if there is any remedy that will make the color permanent. Answer: Vermilion of commerce often contains red lead and chrome red, which blacken in an atmosphere containing sulphur. Pure vermilion can be sublimed, leaving the impurities behind. Blackening may also be due to a molecular change, difficult to account for and more difficult to prevent, since there is both a red and a black sulphide of mercury, the latter being the most stable.

J. A. H. asks: 1. Which of the elements is it that will not combine with oxygen, as stated in Roscoe's "Chemical Primer"? 2. How is it that some works on chemistry give 64 elements and others 63? Which one are they uncertain about? Is it pelopium? Answers: 1. Oxygen will not combine with fluorine. 2. Nearly all text books, including Roscoe, Barker, Cooke, Rolfe and Gillett, Gorup-Bessanez, Steele, Attfield, mention but 63 metals. Pelopium was the name given by H. Rose to a metal supposed to exist in American columbite, along with columbium or niobium. He afterwards concluded that what he had supposed to be pelopic acid was only another compound of niobium. It has since been discovered that both these errors were caused by the presence of tantalum. Jargonium and norium were also once supposed to be new elements.

C. M. P. says: I am constructing a telescope. 1. Would an instrument with a 4 inch objective be large enough to aid in the study? 2. I have devised a machine which will grind a perfect lens of any size or shape; but I do not know how to give glass the fine polish necessary. Please inform me of the process and the materials used. 3. Please inform me what would be the cost of good lenses, of the size mentioned, at the manufacturers? What would be the cost of a complete instrument? What standard work on astronomy would you recommend? Answers: 1. We should recommend a telescope of four inches aperture. The price of such a lens is $100; with equatorial mounting, complete, about $250. 2. Your device was anticipated by an experiment of Professor Boyle of this city. A local polisher of rhomboidal shape, moving in cycloid curves, was found to correct a four inches lens in twenty minutes. Directions for grinding and polishing specula are given by Professor Henry Draper "On the Construction of a Silvered Glass Telescope" (*Smithsonian Institute*, price $1.) 3. Useful standard works are, for observers: Proctor's "Star Atlas," Guillemin's "The Heavens," and Schellen "On Spectrum Analysis;" and, for students, works by Loomis and Chauvenet.

W. asks: Will zinc and lead fuse together so as to form a perfect alloy? If so, are there any particular directions to be followed? Answer: Zinc and lead will probably form an alloy. Zinc must be fused in a covered crucible to prevent its taking fire. Their melting points do not differ greatly.