Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries

J. J. P. can harden strips of iron by the method described on p. 69, vol. 31.—H. E. Jr. will find a good recipe for mucilage on p. 251, vol. 33.—W. A. B. will find directions for making a rust joint on p. 213, vol. 32.—S. T. C. will find rules for proportioning boats on p. 299, vol. 28.—D. M. will find a good recipe for blacking on p. 283, vol. 31.—Soap-making is described on p. 218 vol. 28.—J. C. McG. will find directions for polishing shirt bosoms on p. 203, vol. 31.—T. T. will find a rule for ascertaining the horse power of an engine by referring to p. 33, vol. 33.

(1) M. C. S. asks: We often have occasion to make a large quantity of an alloy composed of 80 parts of copper to 20 of tin. What is the best flux to prevent the slagging of the metals? The furnace is a large reverberatory one. A. Use a little potash, or a mixture of potash and soda, putting it on top when the metal is melted.

(2) W. B. says: 1. I am building a boat 80 feet long, and will use 13 foot side wheels. What sized hub should I use? A. Two feet in diameter. 2. How many spokes would be best? A. Twenty. 3. What should be the size of the paddles? A. About 18 or 20 inches long, and 8 or 10 wide.

(3) J. S. C. says: Owing to the situation of the earth's aphelion at the present time, the northern spring and summer is seven and a half days longer than the southern spring and summer. Now when the earth's aphelion comes to be situated at a point in the earth's orbit opposite to what it is at present, will the spring and summer for southern latitudes be seven and a half days longer than the northern? If not, what is the difference that will then exist? A. There will be no difference.

(4) N. S. T. asks: 1. How can I describe a circle whose circumference shall pass through one angle and touch two sides of a given square? A. This is the problem of passing a circle through any three points, not in the same straight line, which is given in nearly every work on geometry We understand you to mean the vertex of the angle, in speaking of the angle. 2. How can I draw the geometrical representation of a circle of any given size and from any given point of vision? A. You will find it fully explained in the "Student's Draftsman's and Artisan's Manual," by Professor Warren.

(5) J. E. W. and others.—We do not know what is meant by an engine of 25 nominal horse power, as this term has no fixed signification.

(6) J. B. L. says: In your issue of January 1874, is an article on cheap telescopes, signed B., in which he mentions a meniscus lens of 1 inch in diameter and 48 inches focus as a proper objective for a small telescope. 1. I propose to get one 1½ inches diameter and 48 inches focus; and would like to know if it would not make a more powerful object glass than the one selected by your correspondent. A. A lens of 1½ inches diameter will not be more powerful than one of 1 inch, if the focal length is the same; but it will admit more light. The form of the larger lens must be very perfect, otherwise the images will not be as sharp. It is for this reason that diaphragms are used to cover up the imperfections of large inferior lenses. 2. Is it a rule that the focus should be any ratio to the diameter? A. There is no rule for focus and diameter; but 1½ inches is a rather small diameter for 4 feet focus, and only highly illuminated objects can be distinctly seen through such a telescope, of which the great defect is want of light. 3. Will a plano-convex ½ inch in diameter and of 1 inch focus make a good eyepiece? A. A plano-convex will make only a tolerable eyepiece. 4. What would be right? A. Have two such lenses in the eyepiece, combined on the Huyghenian principle. 5. What would be the power of the instrument constructed of the glasses proposed? A. The power of a telescope is found by ascertaining how often the focal length of the eyepiece goes into that of the objective. Your eyepiece being 1 inch, its length is contained 48 times in the focal length of the objective: and the magnifying power will be 48. With a ¾ inch eyepiece it would be 64; with a ½ inch eyepiece, 96; and the same eyepiece, used with an objective of 48 feet focus, would give 1,152.

(7) E. G. A. asks: How can I obtain membership of the American Association for the Advancement of Science? A. You have to be proposed by a member at the next meeting, in Buffalo, N. Y., August, 1876, and then you pay $5 initiation fee and $3 annual dues.

(8) W. A. H. asks: 1. Is it possible that any opaque substance may be colorless? A. When opaque substances are colorless, they are white or black. Chalk is white, and coal is black; this means that coal absorbs the luminous rays, while chalk reflects them: if not all, at least equal quantities of each colored ray. 2. Does it follow that opacity of matter is consequent upon laws of color and light? A. Of course opacity of matter as well as transparency depends as much on the laws of light and color as in the material. 3. What constitutes opacity of matter, aside from the general definition of not being transparent? A. Opacity of matter depends on the internal structure of the substance; if it is adapted to transmit light with a certain degree of perfection, it is called transparent; if the light is transmitted only imperfectly, it is called translucent. 4. Why is not colored glass opaque? A. Colored glass may be opaque, and may be made so as well as transparent or translucent; it is used in the imitation of various colored gems, some of which are opaque and some transparent. For instance, the onyx is translucent, with opaque layers, in a variety of colors.

(9) J. M. S. says: I have a small spyglass which magnifies very well, but the view is slightly indistinct. Can anything be done to improve it? A. See if the lenses are clean and not scratched; see if they are put in right, and not reversed, as is sometimes done after cleaning them, which will spoil the best glass. Perhaps the objective needs a diaphragm, a black disk with a hole in the center, placed outside in front of the objective; this addition will often make very inferior glasses more distinct. Make several of these diaphragms, and find out which suits best. The smallest holes give the most distinct images, but admit the least light, and *vice versa*.

(10) W. B. says: I have a double lens microscope; the lenses are 1¾ inches in diameter and 0·2 inch thick in the center. I wish to make a field glass of it; how long a tube should I make? Must I use both lenses or only one? Must I have a smaller lens for the eyepiece, or should this be a plain glass? A. A microscopic lens cannot be used at all for an object glass in a telescope, and it makes a very bad eyepiece. Try an object glass of 17 inches focal length; and if it is of good glass, you may perhaps use the strongest power of your microscope, but you will see everything upside down. The object glass will cost you as much as a whole telescope or field glass. We advise you to leave the microscope as it is, and buy a field glass ready made; it will be the best and cheapest in the end.

(11) H. W. P. asks: 1. How can I construct a celestial eyepiece for a telescope with a 2 inch achromatic objective, of 20 inches focal length, that will magnify 100 diameters? A. Make the proper combination of two lenses, as we have already described, and give it a focus of $\frac{1}{5}$ foot or $2\frac{2}{5}$ inches, as the focal length of the objective divided by that of the eyepiece is equal to the magnifying power. 2. What is the composition of speculum metals, for reflector mirrors? A. Use 66 per cent copper and 34 of tin, or 7 parts copper, 3 zinc, and 4 tin, or 2 lbs. copper and 14 ozs. tin. 3. Is there any work published giving information as to the grinding and polishing of lenses? A. You will find an article on this subject in Ure's "Dictionary of Arts and Manufactures," under the head of "Grinding Optical Glasses." Also read the article "Glass;" it probably contains all you want to know.

(12) J. G. says: We find that we cannot make dry cellars in Louisiana. Will it do to sink a watertight tank 25 or 30 feet into the earth? Would the air become foul at the bottom? A. Tanks, of not too great a diameter, with plank bottoms and with proper cribwork bracing, might be built and used for cellars as you suggest; but if they are to be employed for the storage of fruit, proper means of ventilation would have to be provided. A box tube extending to the bottom and provided at top with a hood, arranged with a vane to open always towards the windward, would utilize the force of the wind for this purpose. After the air is fully changed, the tube could be closed with a valve, when the air confined below would gradually become of the temperature of the earth at that depth.

Our jail being of poor brickwork, prisoners often break out. Would this be a remedy: Build up at single brick wall within the present wall, leaving open space of 6 or 8 inches, and fill this space with dry sand up to the roof? Could any one pass out through the wall till all the sand from above had run out? A. Your plan is an ingenious one, and might answer if the walls were well anchored together. An entirely new wall, however, of stone work, consisting of large stones laid on good cement, would be far preferable if you could accomplish its erection.

(13) H. F. S. asks: 1. Would tungstate of soda do for saturating a rug, to prevent ignition by sparks from a wood fire? A. Yes. 2. How strong should the solution be? A. Dissolve as much as you can of tungstate of soda in hot water sufficient for the rug.

(14) S. W. asks: How do practical opticians give the final adjustment to microscope objectives which are composed of superposed lenses? With two lenses there is no difficulty, as there is only one distance to determine; but with three the trouble is greatly augmented, owing to the innumerable changes which may be made in the distances with that number of lenses. I have tried various formulas, some as published and others original, but I have not found one by use of which I could take an arbitrary distance for two of the lenses, and finding by trial the best position for the other. A. This is a subject on which it is utterly impossible to give satisfactory written explanations; it has been the great problem of such men as Lister, Hartnack, Tolle, Wenham, etc., and to which they devoted a great part of their lives. But you must consider that you can never take an arbitrary distance of two of the lenses and make it all right with the addition of a third; the distances are all determined by the curvature of each lens.

(15) F. G. says: Please describe the process of charging electro-magnets. A. Electro-magnets are charged by surrounding them with helices of copper wire and then passing a strong current from a battery through the helices. Artificial magnets of steel are charged by rubbing them with a powerful permanent or charged electro-magnet, commencing at the center and passing to the ends several times in succession. Care must be taken to use the same end of the charging magnet for one half of the new magnet, and the opposite end for the other half.

(16) J. L. T. asks: 1. What are the elements of a Hill battery? How are they put together, and what exciting liquid is used? A. Copper and zinc. The copper plate, to which is soldered an insulated copper wire, is placed at the bottom of a jar of water in which a little sulphate of zinc has been dissolved. A zinc casting is then suspended from the top of the jar so that it just dips below the surface of the water, after which a handful of sulphate of copper crystals is dropped in and the battery is ready for action. None of the copper crystals should be left in the zinc; care, also, must be taken to keep the blue line from quite reaching the latter. A wire from the zinc and the insulated wire from the copper plate form the terminals. 2. What is a Lockwood battery? A. Same as the Hill, with the exception that a long spiral copper wire is substituted for a copper plate in the latter. 3. How was House's battery made? A. We believe there is no such battery in use. House originally used the Grove battery to work his printing instrument. 4. I often see the diameter of wire given in decimals of an inch. How may this be reduced to the regular gage? A. The diameter of the different gage wires is arbitrary. What is called the Birmingham gage is used in England and, less extensively, in this country, but it varies with the different manufacturers, as no authorized standard has been made. More exact information is therefore conveyed by simply stating the diameter in inches. An American gage was introduced a few years ago, and is much used; with this gage the numbers run in a geometrical ratio. See p. 363, vol. 28. 5. Am I right in making a condenser as follows? I take a strip of silk, to which I stick tissue paper with varnish, and (with varnish) fasten tinfoil to both sides of the silk and paper, covering the sides to within an inch of the edges. I fold this with another piece of varnished silk to prevent metallic contact. After all is folded, must this tinfoil be made part of the primary current of a Rhumkorff coil? A. Yes, but the alternate tinfoil strips must be connected together so that, in reality, there are two large tinfoil surfaces. These are connected to opposite sides of the break in the primary circuit, one to each.

(17) E. T. H. asks: How are the wires arranged in electrical annunciators so that the electricity generated in a few cups is sufficient for all the wires? If they are all joined together, I should think the electric fluid would find the shortest way back to the battery, and so not touch the wires, but pass through their connections. A. Where only a few annunciators are to be worked, they are commonly all supplied by one battery. In other cases, they are divided up and one battery made to work a given number. Every conductor offers some resistance to the passage of the current; and when several circuits are supplied from one battery, the current in each is inversely proportional to its resistance. The proper way, therefore, is to make resistance of all the circuits equal, when supplied from a common battery; the current will then be alike in all.

How are Pharoah's serpents made? A. See p. 347, vol. 28.

(18) S. W. says: My local battery "boils over," leaving a white coating on the top of the inside and all over the outside of the jar. This is a gravity battery. The same thing occurred when

I used a Daniell battery, with the difference that the deposit on the jar was blue. One curious thing about this performance is that the battery always takes advantage of my absence for this performance. I think it prefers a cold dark night, at all events I can never catch it in the act. I have tried kerosene oil, but it still slops over. What is the matter with it? I have no doubt many other operators owe a dirty office or battery closet to the same cause, and would like to learn a remedy through your paper. A. The white deposit is sulphate of zinc. This always appears when a solution reaches its point of saturation; cold water will contain less of the salt than warm, which accounts for the greater amount that is noticeable when the weather is cold. The simplest remedy is to paint the inside of the jar at the top, or warm it and rub with paraffin from the water level to the edge. The solution should also be kept considerably below saturation, by drawing part of it off from time to time and supplying its place with fresh water.

(19) G. P. H. says: I wish to construct a magneto-electric machine for medical purposes, to be operated by a crank. I have seen one in which a small double cylinder was made to revolve with great rapidity. Of what is the double cylinder composed? A. The double cylinders form an electro-magnet. This is composed of two soft iron cores, around which helices, consisting of many convolutions of copper wire, are first wound; the cores are afterwards united by a flat bar of iron. Connection between the helices is so made that the direction of all the windings would be one way if the cores and joining bar were drawn out straight. This is done by connecting the two inner ends of the coils together, when the windings start at like ends of the cores and go in the same direction. One of the outer ends of the coils is then connected directly with the axis to which the magnet is attached and through this to one end of the box, while the opposite, outer end is connected to an insulated ring placed on the same axis. A small piece or segment is cut out of the ring, and a flat spring from the latter leads to the opposite end of the box. One or more permanent magnets placed in front of the electro-magnet charge the latter twice in opposite directions for each revolution, and the electro-magnet, acting inductively, then produces currents of electricity in the surrounding coils.

(20) R. asks: What is the use of the steam pipe from the top of a steam dome on a boiler to the water barrel of the water gage? Is it to keep the water at a certain level? A. It is for the purpose of furnishing dry steam to the gage.

(21) H. M. asks: 1. In using a portable engine with 5 inch cylinder to run an up and down saw, what length of stroke do I require? A. Let the stroke of saw be 6 or 8 inches. You can run the carriage also with a small saw and a high pressure of steam. 2. Does an up and down saw require more power than a circular to do the same work? A. No, less.

(22) A. D. asks: Is there a gain in power, in having the area of the sails of a windmill equal to the whole area of the circle, over the old style of four sails? A. No.

(23) J. E. M. says: I am troubled with a chimney which draws pretty well except when the wind is in a certain direction; what arrangement for the top of it will surely prevent the smoking? A. You do not give sufficient data to enable us to judge of the cause of the difficulty. It is usually found, however, that when a chimney smokes during the continuance of a wind in a certain direction, it is caused by its being in close proximity to a higher object, such as the ridge of a roof, or a higher building. The remedy in such case would be to extend the flue to a point sufficiently high to overtop the neighboring more elevated structure. There are other conditions, such as the place of the doors and windows of the apartment from which the flue proceeds, their being open or closed, etc., which should be taken into consideration, but of these we are not informed.

(24) J. B. asks: If a rope 300 feet long when coiled up weighs 100 lbs., will it weigh twice or more than twice as much if suspended from the scales? The argument originated about the ability of aeronauts to cause their balloons to descend by that means. A. It will weigh the same in both cases.

(25) E. A. A. asks: 1. How is Hooke's universal joint made? A. It is the common universal joint. 2. Will it transmit power at nearly right angles? A. You should use two joints to turn a right angle.

(26) J. S. E. asks: A water motor makes a great noise in our buildings, roaring and thumping through the pipes. What can be done so that this noise can be stopped? A. Probably an air vessel on the delivery and discharge pipe, arranged so as to cushion the water, will remedy the trouble.

(27) J. S S. asks: 1. How wide should I make a 20 feet breast wheel under a 12 foot head, to run a circular saw 48 inches in diameter? A. You can calculate it for yourself, on the assumption that the power of the wheel will be from 68 to 70 per cent of that of the water in which it is used. 2. Will cogs with 6 inches face on the side of the wheel, making a circle of 20 feet, be strong enough to run a 48 inch circular saw? A. Yes.

(28) H. H. asks: 1. Given a lathe whose fly wheel is 18 inches in diameter, and crank 1¾ inches long, attached to a treadle worked by foot power, which would give the best result in power and speed (apart from friction), connecting the piston of a small engine direct to the crank to which the treadle is now attached, or to a belt from a 6 inch pulley on main shaft of the engine to a 6 inch pulley on main shaft of lathe, on which the fly wheel is? A. The direct connection would be the best. 2. About what size of cylinder should be used, other parts being in ordinary proportion, for an engine to run a lathe which is easily operated by foot power? What size of boiler is needed? A. Cylinder 1½ by 1½ inches. Boiler, 12 inches in diameter by 18 inches high.

(29) J. A. says: I am making a pond and desire to prevent leakage. Your advice will be appreciated. A. See p. 240, vol. 29, for a full description of the best way of making puddle walls, which will apply in your case. The bottom of your pond may be laid in the same manner as the two first courses in the wall.

(30) Y. F. C. says: 1. I am about to make an induction coil 12 inches long, with heads 7 inches in diameter, and a tube or cylinder of pasteboard, perfectly dry and hard. Will it do? A. Pasteboard saturated with paraffin would answer very well, so also would thin sheets of gutta percha. If the latter are employed, several thicknesses should be used. In the construction of large coils, glass or thick gutta percha tubes are commonly employed for this purpose. 2. In insulating the secondary coils, would you use pure sheet rubber upon each layer? A Pure sheet rubber is good, but would probably be expansive; thin paper saturated with paraffin will answer perfectly well. 3. Should the primary coil be very well insulated from the core, or will the pasteboard of ¼ thickness be sufficient? A. Yes, insulate carefully. A tube ¼ of an inch thick at the ends is sufficient to place between the primary and secondary of a coil 12 inches long; it may even be made less in the middle.

(31) J. H. asks: Can we bring a spring to the house a distance of 260 feet, the fall being about 22 feet, with a slight elbow, and a brook to cross that will make a bow down in the pipe of 2 feet? A. If we understand you, you have a total vertical fall of 22 feet to where the lowest part of the pipe will be, and then a rise of 2 feet to where the water is to be discharged. If this is correct, you have simply to close up the lower end of the pipe, attach a faucet a short distance from the end, and the water will run, notwithstanding the 2 feet rise, whenever you turn the faucet. The pipe should be laid under ground deep enough to avoid freezing. If the spring is higher than the point where you want the water supplied, the water will rise of itself to that point, without regard to the depth it may have to descend below it before reaching it.

(32) W. B. says: I intend building a fruit preserver, with an upper story to stow the ice in, and a lower floor for fruits. Please give me the best plan of construction to prevent sweating and to regulate temperature. A. See p. 251, vol. 31, for description of an icehouse that will give you all the information you require, if you use the surrounding chamber instead of a lower room to store your fruit, etc. If, however, you prefer the room under the ice, elevate the ice chamber high enough for the purpose by providing a strong frame and heavily timbered floor to sustain the stock of ice, and then construct the surrounding chamber the same as described on the page referred to. A cube of ice of 12 feet will keep, better than one of less size, through an unfavorable season.

(33) M. K. asks: What was Dr. Bradley's method of winding helices with uncovered wire? A. The helices are wound by machinery specially constructed for the purpose, but the process has not been made public.

(34) C. R. asks: 1. How should one totally ignorant of electro-plating proceed to learn enough of the art to do a little amateur dabbling, working alone and where he can get no assistance? A. Better read some elementary work on the subject. Sprague's "Electricity, its Theory, Sources, Sources, and Applications," contains much excellent information for amateurs. 2. Do the solutions deteriorate by being kept in a lead tank, and that for some time? A. As a general thing, no; the solution, however, determines that. 3. What is the proper mode of securing the gold and silver contained in the solutions in a tangible, marketable form? A. Two silver processes are commonly recommended: (1) Add sulphuric acid until all the metal is thrown down, and then melt the precipitate after drying; this is a dangerous one and must be effected in the open air, as poisonous gases are given off. The residue must also be fused by degrees, as the cyanide of silver does not fuse quietly. (2) Evaporate the solution to dryness and fuse till the silver is reduced, and wash off the cyanide of potassium. Gold may be precipitated in the same way. Mix the precipitate with an equal weight of litharge, and fuse. After washing the residue, place it in excess of nitric acid, which will dissolve out any other metals present, and leave the gold pure.

(35) G. H. M. asks: I am running a planer and matcher; it has yellow metal boxes, which trouble us by heating. Can you suggest a remedy? A. We have known of several instances in which boxes lined with Babbitt metal have been substituted, for the kind which you describe, with good results.

(36) J. B. W. says: 1. We have a 26 feet x 44 inches boiler. The brick stack is 49 feet high, and was built for burning wood, for which there is plenty of draft. In burning coal it takes 25 to 30 bushels to run 2 pairs burrs for 10 hours. Would it take less coal to keep the same amount of steam if our stack was built up to 65 feet? A. You do not send sufficient particulars. Possibly your grate, which was suitable for wood, is not well adapted for coal. 2. Would sheet iron do for the addition to the stack? A. Yes. You can ascertain the best hight for your chimney by putting on a sheet metal top and fixing it at the best point for your draft.

(37) C. B. R. asks: What is used to whiten the fire pots of cast iron stoves? A. We believe they are generally kalsomined.

(38) R. L. F. says: A friend of mine, a locomotive engineer, says that a man, before taking charge of a locomotive, should first fire one for 3 years. I say this is not necessary in every case. I have a model engine of my own make, fitted with a link motion for reversing which works very well. I have read and studied steam and the steam engine. Would it be necessary for me to fire 3 years in order to take charge of a locomotive? A. Your friend's statement is generally correct, but there are exceptions to nearly every rule.

(39) H. L. C. asks: Is a steam engine of 1 inch bore large enough to run a small light lathe for turning file handles and chalk line spools of soft wood, supposing the steam to be at 30 lbs. to the inch, and engine to cut off at ¾ stroke? A. You do not send sufficient data, but your engine is rather too small.

(40) G. H. J. asks: Is not a breast wheel the best where the water supply is limited and the fall deep? A. We think it would be a question between this and one of the best turbines.

Is phrenology a genuine science? A. We believe that it is based upon correct principles, but it is as yet not fully developed for lack of data. In these respects, it bears some comparison to the science of weather observation.

(41) R. E. A. asks: 1. Please give me directions for making a paper canoe. A. See p. 163, vol. 27. 2. Please give me a recipe for the paste for paper boats. A. Use a fused mixture of equal parts of pitch and gutta percha. 3. Should the paste on one layer be allowed to dry before putting on another? A. Yes. 4. What is the best waterproof paint for it? A. A solution of asphalt in turpentine. 5. Will thick brown wrapping paper do? A. Such paper will answer, but it is advisable to use thinner paper and a greater number of layers.

(42) T. H. says: Some three years ago a neighbor commenced wearing wire spring garters. After wearing them a few months, her limbs began to have strange feelings, such as occasional numbness and nervous flashings up and down the limbs below the garters; and as she did not like them very well she thought she would not wear them and gave them to her sister. After her sister had worn them a few months, she felt numbness, etc. Was the wire charged with electricity or not? A. We do not see how the garters could be charged with electricity to any greater degree than anything else attached to the person. We hardly think the cause of the trouble is electrical.

(43) F. P. M. and all others who wish to commence studying the steam engine should read Bourne's "Catechism," "Hand Book," and "Recent Improvements in the Steam Engine," and Forney's "Catechism of the Locomotive."

(44) R. H. H. says: I have two patents. The drawing in one is attached to the specification with a blue ribbon, and the other with a red ribbon. A neighbor (another patentee) tells me that the color of the ribbon, which is attached to the seal and connects the specification and drawing together, indicates the extent of novelty of the invention. Can you give an explanation? A. The only significance which we have ever heard attached to the color of ribbon used on patents was that it indicated the temperament of the clerk at the time he was preparing the documents to send out. When he is melancholy and out of sorts, it is said he uses blue; when cheerful and happy, red. We do not vouch for the truth of this, but it is the best reason for the difference of colors used which we have ever heard.

(45) S. S. says: In repairing the bell of 1775, do not drill, cut, or waste the precious metal. Mold it in some infusible material: heat the whole mass (bell and mold) to perfect fusion. When cool you will have the same metal that pealed forth notes of independence in 1775, except that lost by oxidation in the process of fusing.

(46) G. D. says: 1. In No. 14 you speak of iodine and olive oil as a remedy to prevent hair from falling off, but you neglect to state how to use it, namely, how often and how long. A. See answer to J. N., p. 138, present volume. 2. Nine men out of ten, over 30 years old, in Chicago are bald or rapidly becoming so. Is it caused by the climate? A. It is attributable as much to the mode of life of your citizens as to any climatic influence.

(47) M. R. says: I wish to make one quart aqua ammonia. How can I make it? A. Place in a capacious glass flask or retort a quantity of either the carbonate or chloride of ammonia. pour over this a strong solution of potassa in water, and apply heat. A copious evolution of ammonia gas will ensue, which should be conducted by means of properly arranged glass tubes, so as to enter beneath the surface of the water (distilled) which it is desired to saturate with the gas. The water should be kept as cool as possible during the operation, as cold water dissolves the ammonia in much larger quantity than hot water.

(48) I. X. L. asks: Has the temperature of a gas after being condensed any influence on its capacity for absorbing heat when allowed to expand, that is, if we condense a gas to a liquid, would it make any difference if we reduced the temperature of the liquid before allowing the expansion to take place? A. It would. This question has been answered several times before.

(49) E. H. says: You give a recipe for making paraffin varnish. I tried it on a sample of bright steel goods, and it would not dry. What was the cause? A. If the solvent used be pure, and the paraffin (not paraffin oil) good, we do not see how a failure could be possible. The recipe is by no means new.

(50) C. B. B. C. asks: What kind of acid shall we use to put names on iron? A. Coat the iron with paraffin, and write with a needle. Dip the iron in strong nitric acid (aqua fortis).

(51) J. P. O. asks: 1. Can air be forced through spirits of any kind? A. Yes. 2. Will said air retain any of the qualities of the spirits it is forced through? A. Yes. The quantity depends upon the dryness and temperature of the air as well as the alcohol. 3. Is there any way to separate that portion which retains the quality from that which does not? A. If we understand your question, no.

(52) J. N. N says: 1. In your issue of October 9 you say "distilled over soap." Do you mean by that expression that the soap is dissolved in the article to be distilled? A. No. 2. We make soap with potash lye, and harden it with salt, would that be considered soda soap? A. It is commonly so called.

(53) W. G. S. says: I have a tube 4 inches long by 1¾ inches in diameter, ⅛ inch thick. I wish to introduce into the tube the blaze from a spirit lamp. What is the best position for the blaze inside the tube, in order to heat it, and not be interrupted by the in and outflow of air? The tube revolves, and I want to have one end closed, except a small hole in the center. A. Unless both ends of the tube be left open, so as to give free access of air to the flame and outlet for the products of combustion, the flame will soon expire. 2. What is the best metal to make the tube of, in order that the blaze will heat it? A. Copper.

(54) F. B. L. asks: How can I make a pliable waterproof paint for cloth? A. Make a solution of gum rubber in hot naphtha over a water bath. This is the so-called rubber varnish.

(55) N. P. B. asks: With what can I varnish printed paper? A. Use dammar varnish thinned with turpentine. Flow the varnish over the paper. Do not use a brush.

(56) A. C S. asks: 1. Can water glass be mixed with white lead paint? A. It can be readily mixed with the white lead by grinding, etc. 2. Will the mixture be more durable for outside work? A. We do not think it would add anything to the appearance or durability of the paint.

(57) C. T. W. asks: 1. Is there anything I can put in a tooth to kill the nerve? A. If the nerve is exposed, wrap a small pledget of raw cotton around the point of a knitting or darning needle and dip it in creosote; then insert the point with the cotton directly into the hollow of the tooth. The cotton may be left in for a while, covered by a dry piece. Care is needed not to let the creosote drop or run upon the lips or gums, on which it will act as a caustic. 2. Is there any way of loosening the same other than by the use of force? A. We know of no method. Consult a dentist.

(58) R. J. L. asks: Is there a method of making ordinary glue harden rapidly? A. There is nothing that we know of that will give perfect satisfaction in this direction. The addition to glue, when melted, of a small quantity of zinc oxide, plaster of Paris, etc., will cause it to set or harden quickly, but it also greatly deteriorates the adhesive properties of the glue.

(59) O. S. asks: What is the object of filling in between the framework of fireproof safes with cement or concrete? A. The cement, etc., is a very poor conductor of heat. If the filling were metallic, and the safe was subjected to even a comparatively modern degree of heat, owing to the good conductivity of the metal the books and papers contained in the safe would soon be converted into charcoal.

(60) E. S. McC. asks: What black preparation must I use to mark on gold with a pen? A. Use black paint and a brush.

(61) F. J. T. asks: Please inform me of the most economical, practical, and effectual process of evaporation, to condense yeast now in liquid form. A. The process employed in the manufacture of condensed milk would probably be the most economical and effectual method. It consists in boiling the milk in large, airtight boilers from which the air has been exhausted by means of suitable apparatus. The low temperature at which the operation may be conducted under the circumstances prevents the burning and partial decomposition, liable to occur when it is subjected to the ordinary method of distillation.

(62) J. D. says: What makes a good preparation for blacking harness, one that will retain its blackness, and that will not be injurious to leather? A. Ivory black and molasses each 12 ozs, spermaceti oil 4 ozs., good vinegar 4 pints. Mix.

(63) A. D. says: I have a thermometer which has been lying flat for three or four days. I hung it up, when the fluid entirely filled the tube, and it has not yet descended. Please inform me of a remedy. A. It is probably due to the air not having been completely expelled when the instrument was manufactured, or the air may have entered the tube subsequently through some flaw or pinhole. In the former case you had better have the instrument refilled; in the latter, a new tube will be requisite.

(64) A. M. says: Please give me a recipe for coloring gold by acids. I want a rich color. A. Use strong nitric acid, pure. First experiment upon a small piece of gold, until you hit the proper strength of acid and time of exposure.

(65) E. W. C. says: I read that, if I take a small phial and place in it a lump of phosphorus and enough olive oil, previously boiled, to cover the lump, the phosphorus, when the air is admitted, will become luminous. Is this a fact? A. Yes. The bottle should be well shaken just before removing the cork. The faint light observed is due to the phenomena of phosphorescence. There is no perceptible increase of temperature.

(66) E. M. asks: Of what material are stove brick composed? A. Usually of a good variety of fire clay, well burnt. The clay consists principally of the silicates of alumina, lime, and magnesia.

(67) N. S. J. asks: How can I make a desirable cement for leather? A. The following waterproof cement has been highly recommended: Melt together in an iron pot equal parts of common pitch and gutta percha, and stir well. This may be kept liquid under water, or solid, to be re-melted when wanted. It is not attacked by water, and adheres very strongly to leather.

(68) J. L. W. asks: How are pictures properly transferred to vehicle panels? A. Cover the picture entirely (taking care not to go beyond the outlines) with a slight coat of fixing varnish, then put the picture on the object to be ornamented, being careful to place it properly at once, to avoid spoiling it by moving. The varnish newly applied being too liquid, the picture should be allowed to dry for about ten minutes, and placed on the object to be ornamented, when just damp enough to be adherent; this done, cover the back of the picture with a piece of cloth steeped in water, then, by means of a knife or penholder, rub it all over, so as to fix every part of it; then remove the piece of cloth and rinse the paper with a paint brush steeped in water; at the end of a few minutes the paper will come off, leaving the painting transferred. Care must be taken that the piece of cloth, without being too wet, is sufficiently so for the paper to be entirely saturated. The picture must now be washed with a wet brush, and dried very lightly with some blotting paper. Keep the ornamented article in a warm, dry place, until dry. The polishing varnish should not be applied until the next day, keeping the pictures meanwhile out of the dust. The latter varnish should be applied as lightly as possible. If dark colored objects are to be ornamented, the picture should first be covered with a mixture of white lead and turpentine, following the outlines of the design, and covering it entirely. When this coat is perfectly dry, proceed as above.

(69) T. K. G. asks: Will a mixture of two parts chlorate potassa and one part sulphur answer as a compound for explosive bullets? A. Use chlorate of potash 6 parts, sulphur 1 part.

(70) J. B. W. says: I have industriously sought for a long time to find the genuine article of camphene. I am informed that it is nothing but spirits of turpentine doubly refined, but no one can tell me the exact process of making. I want such an article as used to be made for burning purposes. A. The so-called camphene is ordinary refined spirits of turpentine. In some cases a little alcohol was added to render the flame less smoky.

(71) J. P. N. says: I have noticed two blue flagstones which appeared to have been outside layers in the quarry, each having on them grooves, the hollows of which were about one fourth inch deep, leaving the ridges some two inches apart; but the grooves, instead of being straight, were regularly zigzagged. I can readily see how straight grooves and scratches are made by the action of glaciers; but how can these zigzag grooves be produced? A. It is not certain that the lines are due to the action of the glaciers; they may have been formed in the rock itself.

(72) A. R., Marienbad, Bohemia, says: Let me correct your answer to W. H. W., on p. 138, vol. 33. The addition of a small quantity of cyanide of potassium to a solution of copper will completely discolor it, even in the presence of an excess of ammonia.

(73) F. McC. and others ask such questions as the following: Are the chances favorable for a young man aged 23, with good English education, a strong love for mathematics and the profession of civil engineering, and some knowledge of algebra and geometry, to become a good civil engineer, by spending his evenings in the study of mathematics? If so, what knowledge of mathematics would be necessary before beginning the practice of the profession? A. Our advice to such a young man is to get a position, if possible, with a civil engineer engaged in active work, such as surveying, prospecting, or constructing. No matter how humble the position at first, if the young man has it in him he is pretty sure to rise; and his own experience will tell him what studies he had best pursue.

(74) H. L. C. says: In answer to R. L. S.'s query as to stone arrow heads, you say "that they were used before the discovery of America." I will add that they are used at the present day by the Indians of the Far West, where they use them for shooting game; but the arrowheads are small compared with some of those found in this State. The size of those now in use is from ½x1¼ inches to ¾x1¾ inches; while I have found several in this State as large as 1½x4 inches.

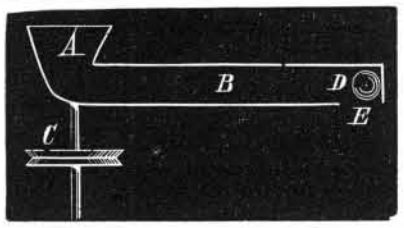
(75) O. C. L. says, in reply to R. H., who asks if it is not unusual for files to be magnetic; I would say that I have often observed it in our own files, but especially in a small punch, which was capable of supporting the weight of a tack. In the case of the punch, it was probably caused by the hammering.

(76) W. E. S. says, in answer to J. H. R. who asks how to make an electro-magnet that will work very slowly: There is really nothing easier than to regulate the ultimate quickness of electro-magnetic action, with a given electromotive force. Everything depends upon the length of the iron core, its thickness, and the adjustment of the armature. For instance, the core of an electro-magnet, which includes not only that portion of the metal which is encased in the helices, but the back connecting piece, may, with a single cell of battery, attract its armature, adjusted to a certain tension, at the rate of 1,000 times per minute: while if we double the length of the core, the armature will be attracted to a bearing, under the same tension and with the same battery, but 500 times per minute. I have a very long electro-magnet which will exert its maximum force but 25 times per minute, while I have another, the core of which is less than 2 inches long, which will attract its armature between 4,000 and 6,000 times per minute. A great deal depends upon the thickness of the iron core; much upon the resistance of the helix; but most upon the length of the core. If I. H. R. will construct an electro-magnet of ½ inch round iron, each limb of which shall be 12 inches long, with a resistance of say 200 ohms of No. 24 wire, I fancy he will have a sufficiently slowly acting apparatus, provided his battery has not too great electro-motive force, and his armature adjustment be proper. Such a magnet could be regulated to exert its maximum force as slowly as 60 times per minute.

(77) E. D. R. says, in reply to a correspondent who asked: "What is bird pepper?" I enclose a specimen with a small limb of the plant. It grows wild all over Southwestern Texas, and is called by Mexicans and Spaniards *chili colorado* which, translated, means red hot. If you taste the enclosed specimen, you will find the name is a good one. It grows up from the root every year. Where it is abundant, the turkeys and prairie chickens feeding upon it become so saturated that it is impossible to eat them. A. The specimen sent is very similar to the cherry pepper of West Africa, which is eaten by small birds, and is used by the natives to spice their favorite dish, palaver sauce, with.

(78) A. S. says, in reply to E. N., and others, who asked how to remove superfluous hair: *Aurum pigmentum* (sulphuret of arsenic) mixed with slaked lime to the consistence of paste, is used in Europe to remove the beard from the face, without soap or razor.

H. A. P. asks: Where is the deepest mine in the world?—G. W. P. asks: Is there anything that will render wood proof against the action of nitrate of silver, which has been used in sensitizing collodion? I want a solution which will not dissolve in either alcohol or ether. I have used asphalt and beeswax; but as they have to be applied hot, they are not very convenient.—R. F. H. asks: If a ball, D, is dropped in hopper, A, while the square



tube, B, is revolved horizontally at a high rate of speed, by means of shaft and pulley, C, it will be thrown by centrifugal force against the end of the tube. Will it be held there, or will it drop through the opening, E?—H. C. asks: How are the edges of the leaves of a book arranged to show a gold edge when closed, and a red edge when open?

COMMUNICATIONS RECEIVED.

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

On Large and Small Wagon Wheels. By M.G.P.

On Stealing Brains. By E. C.

On Some Curious Properties of the Figure 5. By G. R. B.

On American Grape Vines. By S. F.

Also inquiries and answers from the following:

R. K.—J. C. W.—R. G. S.—E. T. H.—F. J.—H. D.—J. S.—C. E. S.—N. D. T.—G. M.—C. C.—G. A. S.

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 sells pyrometers? What is the price of a good aneroid barometer? Who deals in mica? Who sells theodolites? What does a binocular microscope cost?" 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.]

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8,673.—LAMP CHIMNEY, ETC.—T. B. Atterbury, Pittsburgh, Pa.
8,674.—OIL CLOTHS.—J. Barrett, New York city.
8,675 and 8,676.—CASSIMERES.—F. Bosworth, Providence, R. I.
8,677 to 8,679.—CARPETS.—O. Heinigke, New Utrecht, N. Y.
8,680 to 8,684.—CARPETS.—H. Horan, East Orange, N. J.
8,685.—COOK STOVES.—W. J. Keep, Troy, N. Y.
8,686.—TRIMMING.—S. McLaughlin, Philadelphia, Pa.
8,687.—CARPETS.—E. J. Ney, Dracut, Mass.
8,688.—BUST.—W. Page, New York city.
8,689.—OIL CLOTH.—F. H. Randall, Camden, N. J.
8,690.—COFFIN SCREWS.—C. B. Rogers, West Meriden, Conn.
8,691.—CARPETS.—T. J. Stearns, Boston, Mass.
8,692.—CASSIMERE.—W. A. Walton, Providence, R. I.
8,693.—CARD BORDER.—M. Bolton, Jr. Philadelphia, Pa.
8,694 and 8,695.—BRACKET.—C. Herter, New York city.
8,696 to 8,698.—GASELIERS.—C. Herter, New York city.
8,699.—CHANDELIER.—C. Herter, New York city.
8,700.—LIGHT.—C. Herter, New York city.
8,701.—LAMP.—C. Herter, New York city.
8,702.—WALL POCKETS.—J. C. Lamm, Hopedale, Ill.
8,703.—DESK.—J. S. Morgan, Brooklyn, N. Y.
8,704.—PROVISION SAFE.—F. Northrup, Detroit, Mich.
8,705.—EMBROIDERY.—E. Crisand, New Haven, Conn.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade mark $25
On filing each application for a Patent (17 years) $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30