Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3860) A. T. S. asks: 1. In transferring pictures from paper to wood for re-engraving by the mode described in Moore's Universal Assistant, page 547, I find that it destroys the colored inks, leaving the paper plain, with nothing to transfer except the black, which seems to work all right. What is the reason, and is there a way to do this? A. You might try the varnish tranferring process. Varnish the block, soak the print in water. While the varnish is still tacky, smoothly rub on the print and let it dry. Then rub off the paper with the wet finger. 2. On page 551 same book, under the heading "To print a picture from the print itself," what form of potassa is meant? I could not make it work with caustic potassa. Does it need any particular kind of ink? I used common printer's ink. A. Use lithographer's ink. Caustic potash is meant. To three parts solid tartaric acid use one part caustic potash. In our SUPPLEMENTS you will find many processes of photographic reproduction described. These are the most reliable and generally used methods. Photography is also extensively used to reproduce a picture on the block for engraving.

(3861) E. H. says: My radiating steam coil showed some new feature—new to me. Having occasion to open valve under supply tank, the steam with condensed water, instead of blowing out, went direct back into boiler, making a roaring noise. There was 5 pounds pressure at the time. Can you explain? A. Your boiler had a partial vacuum instead of a pressure of 5 pounds. Your gauge must have been out of order. Boilers used for low pressure heating with a closed return circulation often have a vacuum when the steam goes down, because the condensation is greater than the supply from the boiler. 2. An inch pipe set vertically filled with water, will give how much pressure at bottom, height 60 feet? A. The pressure at bottom of pipe will be 25·8 pounds per square inch.

(3862) W. W.—The article to which you refer states that the roots of *Abrus precatorius* "afford licorice, which is extracted in the same manner as that from the true Spanish licorice plant, the *Glycyrrhiza glabra*." The Spanish method of making extract of licorice is as follows The roots of the *G. glabra*, after having been dug up, thoroughly cleaned, and half dried by exposure to the air, are cut into small pieces, and boiled in water till the liquid is saturated. The decoction is then allowed to rest, and, after the dregs have subsided, is decanted, and evaporated to the proper consistency. The extract, thus prepared, is formed into rolls from five to six inches long by an inch in diameter, which are dried in the air.

(3863) S. B. asks: 1. What is the rule for determining the increase of speed or force of discharge from the nozzle of a pipe, in accordance with its decrease in diameter, from the main pipe? A. The relative height of a jet from a nozzle increases with its size, with the same pressure at the butt. When a pipe or hose intervenes, the relative height depends upon the friction in the main pipe and hose, and also upon the kind of surface on the inside of the hose. The subject is fully explained, with tables of loss of head by friction, and the height of jets for given pressures, in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 791, 792. Also in Ellis' work on "Fire Streams," $1.50 mailed. 2. Is air in motion, *i. e.*, wind, colder than when at rest, comparatively? A. Air in motion is not necessarily colder than when at rest, but has more power to absorb or carry away heat from the body by convection, or by a more commonly expressed term, wiping the heat away. It also greatly assists evaporation of moisture from the body, with consequent chilling.

(3864) T. J. H.—If, as you say, you have a great deal of leisure time at your disposal, and wish to study pharmacy, we would advise you to make an arrangement with some pharmacist of your town whereby you can spend a few hours a day in his store to obtain practice and instruction. Good books for you to read would be the "United States Dispensatory" and "Parish's Practical Pharmacy." We can furnish you with the former at $8.00 and the latter at $6.00.

(3865) J. H. D. writes: 1. Is acetate of soda a costly product? A. No. 2. After having absorbed water, does it generate a great degree of heat? A. No. 3. Can it be used more than once? A. Yes. 4. Does it evolve a gas while generating heat, and if so, what kind? A. No gas is evolved. The action of acetate of soda (sodium acetate) is based on the doctrine of latent heat. The salt, if heated, dissolves in its water of crystallization. In the heating process it becomes warm enough for use in foot warmers, etc. Then, as the temperature falls a little, the salt again solidifies, and gives off its latent heat of fusion, thus prolonging the period of usefulness.

(3866) G. O. S. writes: 1. In regard to the dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600: According to the author, it is an eight-light dynamo; could it not be used on one light of 8 times the power? A. The dynamo may be run in the manner proposed. 2. What changes, if any, would be necessary to use it for plating purposes, and would it work well as a plater? A. For changes required to convert the dynamo into an electroplating dynamo we refer you to SUPPLEMENT, No. 793. 3. Can you inform me where I can get a book which teaches all about brazing, the blowpipe, etc.? A. You will find instructions on brazing and soldering in SUPPLEMENT, Nos. 20 and 187.

(3867) J. C. C. asks: 1. Is there any theory as to why the sun and moon appear larger near the horizon than elsewhere? A. The theory of the apparent enlargement of the sun and moon at the horizon is that their light passes a greater distance through the atmosphere than at higher elevations. This causes an increased refraction, tending to enlarge the solar and lunar image, and acting as a great spherical lens at a near distance at noon and a greater distance at the horizon. 2. Why is there no dew on the morning of a cloudy night? A. Dew is caused by the radiation of heat into space during clear nights. This is prevented by clouds, which act as a great blanket, tending to retard radiation. The cold earth surface induces condensation from the moist air in the form of dew, much as an ice pitcher condenses the moisture of the air upon its cold surface. 3. Is it true that there has recently been discovered an element lighter than hydrogen? A. No.

(3868) C. Y. says: An argument arose as to the value of a silver dollar, that is, the intrinsic value of the component parts at the time of issue. A. The present value of the silver dollar is 73·8 cents in gold, the price of pure silver bullion being 95½ cents per ounce in gold. There are 371¼ grains of pure silver in a dollar, the ounce being 480 grains. The quotation of silver bullion at 1·292 per ounce is based on the value of the pure silver in a dollar.

(3869) T. T. asks: Can you inform me how to clean the slime and filth from a waste pipe that carries off soapy water from a wash sink? It is 1¼ inch iron gas pipe and cannot be got at, only at the inlet and outlet. Is there a chemical that will do the work? A. If the pipe is entirely closed, there is no chemical that will open it, but if there is still an opening through it, a hot solution of lye poured into the pipe may clear it out. This preparation comes in pound packages and can be bought at any grocery. If the pipe is closed, and you could work a wire through so as to run in the lye, it might do the business. True caustic potash is far superior to the "lye" sold in the groceries. The name "caustic potash" is often printed on the labels of packages of caustic soda. You must get the real potash at the drug stores.

(3870) H. C. W. asks: How to braze band saws, with fine brass wire, and hot tongs, the best kind of acid, and how to place the wire between the joints, how hot to get the tongs so as not to burn the saws? A. Use the thinnest sheet brass or silver, about No. 30 wire gauge, for brazing band saws with hot tongs. Scarf the broken ends ¼ to ⅜ inch back and lap ½ an inch with a slip of the thin brass or silver between, well boraxed by rubbing the borax on the surfaces and add a little powdered borax to make sure. Fix the ends of the saw in a forked frame or block of wood by clamps in its proper position, so that it can easily be gripped by the tongs. Make the jaws of the tongs so that they will close fairly upon all parts of the lap. Heat to a bright cherry red and apply quickly and carefully; hold until the solder is fused; squirt a little water between the jaws to set the joint, when the tongs can be taken off. The extra thickness made by the lap should be carefully filed to gauge thickness, and if a kink is made, it may be straightened by hammering on a face-block.

(3871) G. R. F. writes: The following is a way to wind the uncovered wire on the secondary coil in an induction bobbin by hand, as not all amateurs have the opportunity of using a lathe, according to Hopkins' "Experimental Science," and which I found easy enough. Procure cotton thread a little thicker than the size of the wire, winding it together with the wire on the spool, taking care that the thread and wire do not get twisted together, but run on the spool one parallel to the other, so that the cotton thread will always keep the two adjacent wire spirals on the spool separate. A little crank made of three pieces of wood, to turn the bobbin, will do for the lathe. I used to dip the cotton, before using it, in varnish or shellac.

(3872) F. W. S. asks (1) if an oil atomizer will do for soldering as well as a gas blowpipe. A. An oil atomizer is not suitable for an ordinary blowpipe; there is no control over the blowpipe flame. 2. If brass can be soldered to cast iron, and what is the best solution to use? A. Brass can only be soldered to cast iron by first cleaning and tinning the cast iron surface, which must be made clean and slightly rough with a file and tinned with a copper, using sal ammoniac on the copper and iron with pure tin. If the iron is large, it should be heated other than by the copper.

(3873) H. B. L. asks whether or not there is a metal or composition that is black all through. Can phosphor bronze be made black? A. Black is due to the incapacity for reflecting light. No metal can be said to be truly black. Bronze is not black, and cannot be made really black except by some superficial treatment. Unpolished planed cast iron is often nearly black, owing to graphitic carbon contained in it.

(3874) J. E. A. writes: What is the best poison for poisoning wolves? I have been using strychnine, with poor success; they detect the poison, and will not eat meat that contains it. A. Strychnine is the generally accepted poison. You may not conceal it properly. Insert it in gashes or within lumps of meat, so that the meat will be eaten without the bitter taste being perceived.

(3875) A. M. writes: I see large amounts of celery which do not appear to be whitened in the usual manner by blanching, but is white all over as if by some bleaching process. Please can you inform me through next paper what is that process? A. No process is used beyond the ordinary blanching by covering with earth. Boards are sometimes placed roof fashion over the tops. The variety of the celery may have something to do with it. There is what is known as self-bleaching white plume celery, which gives very white stalks.

(3876) C. S. B. asks: How are torpedoes made? Such as used by children on the 4th of July. A. By inclosing a little fulminate of mercury mixed with gravel in tissue paper twisted up as nearly spherical as possible.

(3877) M. L. M. asks: How many horse power would an 18 foot overshot wheel give with 50 miner's inch of water running on it? Also what would 100 miner's inch of water running on it give? A. 2½ horse power and 5¼ horse power.

(3878) F. G. B. asks: Will you please tell in your answers to correspondents of a simple method for determining whether water from a driven well is fit for drinking and cooking purposes, and can be used in a steam boiler to run an engine without injury to the boiler? A. There is no simple way. If the water is placed in a glass and some white sugar is dropped into it and all is left at rest, the appearance of a colored deposit near the little pile of sugar is supposed to indicate a bad water. But the water can be bad without this happening. For boilers the addition of three volumes of alcohol should produce no precipitate (calcium sulphate), and on boiling no precipitate should appear (carbonates). These tests are also far from complete.

(3879) H. M. W. asks: 1. Is it possible to burn water? That is, to decompose it into inflammable gases so suddenly that it might be said to burn. If so, how is it done? A. Water can only be decomposed into hydrogen (inflammable) and oxygen (non-inflammable). Burning, in general terms, is the combination of an inflammable with a non-inflammable gas. Therefore water cannot be burned. Its decomposition is the exact opposite of burning. 2. Are there any furnaces where a temperature of 3,000° Fah. is attained? A. Undoubtedly this temperature is attained in many blast furnaces. It is probably vastly exceeded in the electric arc, and in oxyhydrogen gas furnaces.

(3880) H. W. B. writes: A crew can row at the rate of 12 miles per hour in still water. It takes them 7 hours to row up a stream a certain distance, and 5 hours to go down a certain distance; at what rate does the stream flow? A. Let x=rate of stream. Then from the conditions of the problem we have: $7(12-x)=5(12+x)$, and solving $x=2$ (miles per hour).

(3881) B. H. says: Please explain through your columns your reason for answer to query 3690. I would also like to hear opinions from people who have used the cure. A. Singeing is now used in barber shops, and as a source of income any new fad is favored, even if a bald head gets burned. We have no experience.

(3882) G. M. asks (1) how to make a small balloon rise in the air. A. By filling it with coal gas or with hydrogen. 2. Will common gasoline do? A. No. 3. Will a pump be needed to pump the gas into the balloon? A. If the balloon is of India rubber, pumping is needed to cause it to expand; but with ordinary cloth balloons no pumping is needed, the pressure in an ordinary gas main sufficing.

(3883) G. V. says: I have a grain crusher with two cast iron rollers. They have a few small holes, air holes I would call them. Of course grain when passing between the rollers is not crushed when opposite the holes. Is there a composition or cement they can be filled with? A. There is no cement that will stand the wear. Drill holes a little larger than the blow holes, fit iron plugs that will drive snug to the bottom, wetting the plug with a solution of sal ammoniac in water. Finish the top of the plugs even with the surface of the cylinder.

(3884) H. M. R. asks: Can you inform me in what shape rye bread is used to clean wall paper? I have seen some work done with it and am anxious to learn how. A. Use the soft inner portion of the bread. It should be applied to the wall with a rolling motion.

(3885) S. C. asks: We have tried, for the removing of typewriting from paper, your suggestion (3533) to M. B. K., in your paper of October 24. All your remedies failed. So could you tell me something else? A. Try javelle water or alcoholic solution of caustic potash. Success is very doubtful.

(3886) C. H. H.—Glass will expand and contract under changes of temperature.

(3887) G. H. W. asks: Which is the more necessary for a mechanical engineer, machine shop practice or foundry practice, where only one can be had? A. Machine shop practice is most essential in the education of a mechanical engineer. Foundry practice not so much so, yet is sometimes a great help as a guide in constructing patterns for machinery.

(3888) E. P. H. asks: Is the lateral pressure greater on a stand pipe 1 foot in diameter filled with water and 100 feet high than on a pipe 1 inch in diameter and same height? A. The pressure is no greater per square inch of surface for a given height, whether the pipe be large or small. The strain tending to rupture or split the pipe increases with the diameter, or is 12 times greater in the large pipe, as above stated.

(3889) C. E. H. says: We would like to ask if you can tell us why the water drawn from our hot water spigot should have a milky white appearance When it is first drawn the discoloration is very marked, but after it is allowed to stand a few minutes it becomes perfectly clear, excepting that at times we can discern small white sediment in the bottom of the vessel. We use Philadelphia city water and our plumbing consists of lead pipe throughout. We have a galvanized iron circulating boiler and we notice that it is only the hot water, that is the water which has passed through this boiler, which is discolored. Can you tell us the cause of the trouble and suggest a remedy? Also would this water be injurious to health if used for cooking purposes? A. The sediment from the hot water faucet may be oxide of zinc, derived from the zinc in the galvanized iron boiler. Clean out the boiler thoroughly, which may stop it. There is some danger of poisoning. The only remedy is to put a copper boiler, tinned upon the inside, in place of the galvanized iron one.

(3890) M. A. R. says: I wish to find out more concerning bismuth than can be found in the encyclopedia, of the commercial value, the supply and demand, both here and abroad, the uses, etc.? A. The supply of bismuth is limited and derived mostly from Germany, with small quantities from England, Norway and Siberia. It is largely used in type metal, and in the arts. Present price $2.40 per pound. It is not yet mined in the United States, although known to exist in Utah, Colorado, Arizona, California, and Alaska. The localities discovered do not assay in paying quantities at present. Books on chemistry treat of the chemical relations only.

(3891) G. H. asks how to construct an armature for electro-plating to fit in the same place of the eight light dynamo as described in SUPPLEMENT, No. 600. I have got the dynamo all complete, including the armature, but I want to make an armature to slip in its place for plating. Please state size of wire, number of coils, number of layers in each coil, number of convolutions in each layer. Would an armature give best results as described in "Experimental Science," page 495? A. The information you require is given in full in SUPPLEMENT, No. 793.

(3892) L. D. asks: 1. Could I make an induction coil by following the instructions in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, if I use No. 36 double silk covered copper magnet wire and wind it straight across instead of using bare wire and winding it in sections? A. You could wind a coil in that way, but it would not be as efficient as one wound in two sections. The silk covered wire is better than bare wire. 2. What kind of wire would be best to use, that is, which will give the best results, bare wire, single or double silk covered, and how should it be wound? A. See answer to No. 1. 3. If I cover each layer of the secondary coil with one or two thicknesses of silk, would it not be as good as varnishing each layer? A. Silk is not as good as varnished paper for this purpose. 4. Would it not be better to make primary coil of four layers instead of two? If not, why? A. Two layers are better than four, as it allows the secondary wire to lie nearer the core and also permits of a greater number of convolutions of the secondary with the same length of wire. 5. If I make an induction coil with four layers of No. 16 wire for primary, and wind on for secondary coil to 3⅜ in. in diameter, No. 36 double silk covered copper magnet wire, straight across, would it give as good results as the one described in SUPPLEMENT, No. 160? A. No; see answer to No. 1. 6. About how large a spark would such a coil give? A. The coil described in the SUPPLEMENT referred to is capable of giving a spark 1½ inches long. 7. Would it do to have the same sized condenser and core in making such a coil? A. Yes. 8. How much wire would I need? How many pounds for primary, and how many for secondary coil? A. About ½ lb. for the primary and 2 lb. for the secondary.

(3893) C. E. B. asks: Who is the greatest electrical inventor? I say that Sir Wm. Thomson is the greatest, and H. says that Edison is the greatest, and T. says that Prof. Elihu Thomson. Now, which of these three great men have the most inventions that they have made by their individual selves. Also please answer the following: H. and T. say that the core of a magnet has electricity in it. I say it is magnetism, and not electricity. Please inform us on the matter. A. It

is manifestly out of the question for the editor of Notes and Queries to decide as to the comparative greatness of these men. They are each great in their way, and they differ so much in their respective lines of investigation as to render a comparison impossible. In regard to the magnet question, you are both right. The magnet core becomes magnetic when the current passes around the bobbin, and the current also induces a momentary current in the iron of the core when the circuit is closed; also when it is opened. The current thus induced, however, is not useful, but detrimental.

(3894) G. R. R. writes: I want to make two bells for a line three blocks long, ground wire at each end, No. 16 line wire galvanized. What will be the best, one coil or two to each bell What number wire and how many feet to the coil, to be used with a push button? A. Use a U-magnet with two bobbins. No. 24 magnet wire will answer. You will require 125 feet on each magnet. While No. 16 wire will answer for the line, No. 12 would be preferable, as it offers only half the resistance.

(3895) B. H. F. writes: I would like to know how much wire, iron, etc., it will take to make a small dynamo for shocking purpose? A. Make a magneto using a compound permanent U-magnet for a field magnet. Use a U-electro magnet for an armature. It should be wound with about 500 feet of No. 36 copper magnet wire.

(3896) J. S. asks: 1. In a telegraph sounder for a line of 500 ft., how much and what size wire will the magnets need, and the height and diameter of magnets? A. Use about 125 ft. of No. 24 magnet wire, make the cores of ⅜ iron, each 1½ in. long. The diameters will be about 1¼ in. 2. Should Norway iron be used for armature and core, and size of core? A. It would be best, although common American iron will answer if well annealed. 3. Will brass or copper do for the contact points on key in place of platinum? A. Yes; but either will soon corrode.

(3897) R. H. M. writes: Allow me to add my mite to the storage battery. Inclosed find sample of punching. The lead is 1-18 in. thick, sizes are 2 by 4⅛, and when punched and filled with red lead they are folded to make 2 by 2 in., four plates to the cell, six cells to the box, ten boxes to the battery, connected to a roller. Charge in multiple arc, discharge in series, and by little switches on the multiple side of the roller I can have any number of large cells. Prefer large plunging cell to charge with. Gravity gave me too much trouble. What do you think of the style of punching? A. The sheets of lead are punched so as to tubulate them on the outside. This form of plate is effective, but not new. The best practice is to charge storage batteries in series.

(3898) A. H. H. writes: About two or three years ago I tried to run our sewing machine by electricity, constructed three large plunge batteries with two gallon cells, used a ⅛ h. p. C. & C. battery motor. They ran the machine powerfully at first, but run down in about three hours, using six pounds bichromate soda and 2½ qts. sulphuric acid. Expense about twenty-five cents an hour. For the last year I have used two small storage cells, charged by eight Gethius' gravity batteries in series. They remain in connection with the storage cells (in house cellar), from which wires run up to the sewing room above. There has been plenty of power at all times to run sewing machine, and for experiments, running a medical coil with resistance between, etc. The gravities have not been recharged, and now at the end of the year there is plenty of blue vitriol and zinc in the jars. The only trouble is there is copper deposited on the bottom of the porous cells, which I do not know how to get rid of. The expense has not been one cent a day, unless the porous cells are spoiling from the deposition of copper. A. Both storage and primary batteries have done remarkably well. You could remove the copper by means of nitric acid, but the cost would probably be as great as that of new porous cells.

(3899) W. L. C. asks as to the method of making petrolatum of any desired melting point, that will remain smooth and not becomegranular. By mixing paraffine wax and fluid petrolatum by the aid of heat, a compound is obtained which remains smooth for a week or so. A. Simply melt the two constituents together on a water bath. If this does not give a satisfactory product, try the addition of a little oil of sweet almonds, or even sweet oil or cotton seed oil.

(3900) W. O. D. asks: Why does plunging a red hot iron into a weak gravity battery revive it? A. Any slight revival would be due to the increase of temperature. The chemical status of the battery is unaffected.

(3901) E. O. writes: 1. Referring to electric motor in SUPPLEMENT, No. 641, of April 14, 1888, would it have sufficient power to propel a small boat, say about twelve feet long? A. The motor referred to will run a boat of the length mentioned. 2. What would be the proper size of screw to put into a boat of that size? A. The screw should be a two or three bladed one of eight inches diameter. The motor should be geared by a belt or gearing, so that it will make about four revolutions to one of the screw. 3. Could the power of the motor be increased by adding more cells or would a larger motor have to be made? A. The power of the motor can be increased by adding more cells. 4. What is vulcanite? A. Vulcanite is hard vulcanized rubber. 5. Have you any back SUPPLEMENTS, giving directions for making small electric boats for amateurs? A. Consult SUPPLEMENT, Nos. 362, 558, 706, 786, 815. These do not apply to amateurs only, but will be useful.

(3902) R. E. M. says: I would like to ask through the columns of your valuable paper, Is there any kind of gas gun in practical use? One which uses coal gas as an explosive. Please give a description. A. There are no gas guns in practical use. We doubt if a practical one has been invented.

(3903) F. McK. asks: 1. Would a drum armature used on the simple electric motor be as efficient as the one described? A. Yes. 2. With cast iron field magnets, what would be the E.M.F. and amperage, when used as a dynamo? A. Withoutsome calculation, this would be a matter of conjecture. If wound according to the directions for the motor, it would probably yield a current of two or three amperes, having an E.M.F. of eight or ten volts. 3. Is a battery connected to give 16 volts and 4 amperes, the best arrangement for the motor? Would not a battery giving 8 volts and 8 amperes run it as well? A. If the motor is wound with coarse wire, the latter would be preferable. 4. What is the speed of the motor with eight cells of plunging bichromate plates, six by ten inches? A. About 2,500 revolutions per minute.

(3904) C. Y. writes: In your answer to No. 3725, SCIENTIFIC AMERICAN, December 12, 1891, page 378, you say that an induction coil cannot be used for lighting an incandescent lamp. Will you please state the reason why? Is not the electricity the same as from a dynamo? A. Electric lighting is effected by heat. To secure a sufficiently high temperature in an incandescent lamp to render the carbon filament highly luminous, the filament must be small enough to offer sufficient resistance to the current to cause it to become heated; or, to state the case in another way, the current must be so great as to be incapable of passing through the lamp without heating the carbon filament. The electromotive force of the current from an ordinary induction coil is very great, say from 10,000 volts up, sufficient to carry it through a large number of lamps; but the current is deficient in amperage or quantity, the amperage being infinitesimal, so that the carbon filament forms a comparatively good conductor for it, and is therefore not heated by it.

(3905) C. L. W. writes: 1. I am constructing a simple electric motor after the one described in SCIENTIFIC AMERICAN, of March 17, 1888, and would like to know whether, in the armature core, as my No. 18 wire is in three pieces, the ends must actually be in electrical connection (must they touch)? A. It is not necessary to have the wire of the armature core continuous. 2. Must the ends of the Russian iron actually touch? A. It is not necessary. 3. Will twelve convolutions of Russian iron do for the field magnet? A. Follow the instructions given in the article referred to, or, better, in SUPPLEMENT, No. 641.

(3906) N. E. W. asks: How many h. p. will a spur wheel 95⅝ in. in diameter, 1½ in. pitch, 4½ in. face, 288 revolutions transmit? How many revolutions is the safety limit to run a fly wheel 7 ft. in diameter, 6 armatures, weight about 3,200 lb.? A. The pinion should transmit from 60 to 70 horse power. If the flywheel is soild and of good sound metal, it should be safe at 200 revolutions per minute.

3907) J. S. asks: 1. Is the application of electrical power to the propulsion of railroad trains feasible? A. It is thought feasible by several of our great electrical inventors. 2. If so, what hinders the adoption of same? A. The lack of a practical demonstration showing it to be an improvement over the present system. 3. Is it applicable to the propulsion of light trains of mail and express matter? A. Yes. 4. What would probably be the effect of the adoption of this last on the railway mail service? A. It would be impossible to predict.

(3908) G. G. asks: 1. The large size Edison-Lalande battery described in SUPPLEMENT of March 7 is rated at 900 ampere hours. Does this mean that the cell gives a total of 900 amperes in fully exhausting its elements, or that it will keep up a constant flow of one ampere for 900 hours? A. Either would be correct. 2. What is meant by ampere hours? A. The equivalent of one ampere of current for one hour. Thus: one ampere for one hour is one ampere hour, one ampere for two hours is two ampere hours, two amperes for 1 hour is two ampere hours, one-half ampere for four hours is two ampere hours, etc. 3. If an Edison incandescent 2 C. P. lamp is rated resistance 4 ohms, E.M.F. 5 volts, amperes 1¼, how long would above battery run it (if it had sufficient voltage)? A. Divide 900 by 1¼ and you have 720, which is the number of hours your hypothetical battery should run the lamp.

(3909) C. E. W. says: The water in our recently finished cistern is hard and, of course, tastes of the cement. Can you, through your valuable paper, tell me what will make the water soft, and also what will destroy the taste of the cement? A. As to the water now in the cistern, nothing can be done to destroy the taste of the cement or make the water soft, Empty the cistern of its present supply and the water hereafter will be but little, if any, affected by the cement.

(3910) W. A. S. asks: How can I learn engraving? Would I have to commence as an apprentice in an office where engraving is done? Or could I learn from books? How long does it take one to become a fair average engraver? What pay do they receive? A. There are two principal divisions in the art of engraving, both paying well to persons attaining proficiency. Both can be partially learned from books and persistent practice. For wood engraving, we recommend "Hand Book of Wood Engraving," $1 mailed. For copper plate engraving a book on "Practical Instruction in the Art of Letter Engraving," $2 mailed. For etching we have "Lalande on Etching," $3.50 mailed. If you are ingenious and well up in draughting, you can make much progress alone.

(3911) S. A. U. says: A B and C argue on the principles governing the flow in artesian wells. A says that the water from a well will rise as high as the surface of the body of water that furnishes the supply for the artesian well basin if there are no other outlets, B, that it will rise less, owing to gravity and friction. C claims it will rise to a higher point, on account of a small outlet to the great pressure of a large body of water. To illustrate, A says, take a barrel filled with water and attach a hose to a hole in the bottom of the barrel, raise the hose outside of the barrel, and the water will stand as high in the hose as the surface of the water in barrel. B says it will stand lower in the hose, owing to gravity and friction, and C claims the water water rise to a higher point in the hose on account of the great pressure from the large body of water in the barrel. A contends that it is according to the law of gravitation that water will seek its level, that friction does not exist, as the question is, how high the water will rise, not flow; that the surface of two bodies of water connected below the surface will rise to the same level, regardless of their comparative bulk, and if C's position was correct, then was perpetual motion discovered. Who is correct? A. A is correct every time. B would be correct, if the water was discharging at a lower point than the original head, when gravity would make it flow, and friction would retard the flow. C can take lessons from A.

(3912) R. E. F. asks: 1. How to work hard rubber in the manufacture of very small articles in your valuable paper, the SCIENTIFIC AMERICAN. How is it made from rubber? A. The process of preparing rubber for vulcanization, and the various steps in the manufacture of hard rubber articles, would require a description which would be longer than is desirable for these columns; however, the process of preparing the rubber for vulcanization is in brief as follows: The pure gum rubber is macerated with sulphur and a pigment of the required color, and rolled out into sheets. 2. How to form small articles from hard rubber? A. The prepared rubber is pressed into moulds of plaster of Paris or metal and subjected to steam heat under pressure. The time required for vulcanization varies from one to several hours, according to the preparation of the rubber and the temperature to which it is subjected. You will find much on this subject in SUPPLEMENT, Nos. 249, 251 and 252.

(3913) C. H. H. asks: 1. In the process of manufacturing kid leather from sheep skins, it is necessary to remove the animal grease from the skin before it is tanned. Can you inform me of any substance that will do this, and not injure the elasticity of the skin? A. A volatile solvent, such as light naphtha or bisulphide of carbon, is about the best we can recommend. Steam heat, with wringing out, is also employed. 2. Can you inform me of any chemicals that contain the same properties as the yelk of one egg? A. It is supposed that vitellin, the characteristic constituent, is a mixture of albumen and casein. But this is a very incomplete statement, and the yelk of the egg has never yet been synthesized.

(3914) G. A. D. asks: 1. How many molecules of air are supposed to be in a cubic inch of air? In figures and in words (thus 10,000,000 = ten million). A. According to J. Clerk Maxwell, a cube, each of whose edges is 1-4000 millimeter can contain from 60 to 100 millions of molecules of oxygen or nitrogen, virtually of air. Reducing this toone cubic inch, we have 60,000 to 100,000 trillions, a trillion being represented by 1 followed by 18 cipbers. In powers of ten the molecules per cubic inch would be from 6×10^{22} molecules to 10^{23} molecules. 2. How many in a vessel of one cubic inch internal capacity when exhausted to one millionth of an atmosphere? A. One millionth the above amount or 6×10^{16} molecules to 10^{17} molecules. 3. If I take a glass tube sealed at one end, 16½ inches long and 3-8 inch internal diameter, therein place a glass rod 3-16 inch diameter and 15¾ inches long, this rod will naturally displace a certain amount of air molecules. If in this condition I attach the open end of the tube to an air pump and exhaust it to one millimeter of mercury of the barometric gauge attached to air pump, how many molecules will there still be left in the tube? A. From 182×10^{18} to 109×10^{18} or 182 trillions to 109 trillions.

(3915) G. M. A. says: If a gun be charged with powder to drive the ball at the velocity of a mile a minute at the instant the ball is freed from the gun, supposing the gun to be fired while stationary (not the velocity sufficient to carry the ball a mile in distance in a minute, but the rate of a mile a minute at the time it is freed from the gun) if the gun so charged be placed on a train moving at the velocity of a mile a minute, and be fired in the opposite direction from that in which the train is moving, how far will the train and ball be apart at the expiration of one minute, the train continuing to move at the same rate? If the gun is fired in the same direction the train is moving, how far would the ball and train beapart in one minute? Would the ball be in front or behind the train? A. If fired from the rear of the train, the ball would fall vertically to the ground, and in one minute the train would be one mile distant from it. If fired from the front of the train, the ball would strike the ground in advance of the train, at a distance due to its initial velocity and varying according to its height from the ground, which latter datum is not given. As it would presumably reach the earth in less than a second, and not over one hundred feet in advance of the train, after one minute the train would be nearly a mile in advance of the point where it would reach the ground.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

(3794) O. O. E.: I give you a working process for hardening wax for mechanical uses. Melt the wax and add to it hot calcined plaster or any of the ochers previously heated. The amount useddepends upon the quality of the wax. The addition of resin will increase the hardness. This mixture can be cast, wrought with a knife, chisel or a saw, or turned in a lathe. In fact it can be used for a variety of useful purposes.—ALFRED C. POPE.

J. D. F. asks how to dye cloth.—J. F. T. asks (1) for an emulsion of cod liver oil, (2) for a pad for rubber stamps.—C. D. asks how to polish horns.—J. W. L. asks for wood fillers and stains.—T. J. A. asks for practical directions for nickel plating.—W. H. K. Jr., asks for a waterproof glue.—H. C. B. asks how to make rubber stamps.—R. B. asks for a window cleaning compound.—Constant Reader asks for (1) an ink eraser, (2) vanishing ink, (3) hair tonic.—C. E. S. asks for cements to adbere to smooth surfaces.—J. F. D. asks for detailed instructions in electroplating with silver.—F. E. B. asks how to keep cider sweet.—J. B. B. asks how to mix a paint for vessels, and for a waterproof cement.

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column.

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AND EACH BEARING THAT DATE.

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