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 This is for our information, and not for publication.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.

(594) W. A. R. asks: Is the water on the bottom of a kettle colder than that on top when the water is boiling? A. The water on the bottom is warmest.

(595) W. A. T.—The duties of an electrical engineer involve the planning, erection, and running of electrical installations for lighting, power, propulsion of vehicles and boats, etc. The remuneration varies widely. Positions may be secured with electrical manufacturing companies or at electric light stations, etc. The probability of obtaining a position depends on the man; if willing to begin at the bottom of the ladder, the probability is far greater.

(596) P. B. writes: 1. In copying drawings or plans by the blue print process, does the negative or original drawing have to be made transparent? If so, is castor oil the best? A. Some degree of transparency is required. Castor oil is excellent, and can afterward be removed by soaking and washing the drawing in alcohol. 2. Can you give me instructions for making a dynamo to light two incandescent lamps? I want to use the motor described in the March 17, 1888, number of the SCIENTIFIC AMERICAN, as driving power. Also how many common telegraph batteries will it take to run motor with sufficient speed to run dynamo, the batteries to be about 1 gallon each, and would there be any danger from either of the machines to have them in a room about 15×18 feet? A. Copy the dynamo described in our SUPPLEMENT, No. 600, making it two-thirds the size and using wire two or three numbers smaller. A telegraph battery is quite unsuited for the work. Use forty one-quart bichromate cells. You will work at a great disadvantage in first running a motor and then a dynamo. Primary battery lighting is very expensive; if it must be used, the lamp circuit should be connected directly to the battery without a motor and dynamo intervening. There is no danger from either of the machines.

(597) F. H. asks: 1. Please give me directions for making a dry battery of sufficient power to generate a perceptible electric current. A. Make a jelly with glue, water, and sulphuric acid, fill the vessel, and while hot immerse in it the plates. This will soon polarize; a little bichromate of potash may advantageously be mixed with it. 2. Can a dry battery be attached to an electric belt and be more effective than the solution process of charging an electric belt? A. A dry battery will be less effective than a wet one. 3. How do you detect an electric current, when it has not sufficient strength to be perceptible? A. By a sensitive galvanometer.

(598) J. N. P.—For best Babbitt metal, use 1 part copper, 6 parts tin, 2 parts antimony, by weight. Melt the copper in a crucible, add gradually one-half of the tin, then the antimony, and finish it by adding the balance of the tin. Let the temperature gradually fall as you add the tin; pour in bar moulds of iron.

(599) A. J. R. asks the best way to etch names and designs in steel tools, etc., and the name of some good work on same. A. For etching on cutlery and tools see Notes and Queries, No. 21, April 23, 1887, in SCIENTIFIC AMERICAN. Also for a general treatise on etching, see Spon' "Workshop Receipts," 1st series, which we can mail for $2.

(600) Omega asks (1) for the explosive force of gasoline when vaporized, or have you any book on such a subject in reference to gas engines? A. You will find gas engines treated in the following works: "Clark on the Gas Engine," $2. "Goodeve on the Gas Engine," $1. "MacGregor on the Gas Engine." $3.40. Gasoline mixed with air and exploded would give for an instant quite a high pressure, 50 or 100 pounds to the square inch. 2. Also do you know of any successful burner for burning crude oil under a submerged tubular boiler in a small launch, boiler 44 inches high, 32 inches diameter? A. For petroleum burners address some of our advertisers, builders of steam engines, boilers, etc.

(601) G. M. S. writes: There is a paint made for shingle roofs, of which the principal ingredients are coal tar, gypsum, benzine, and coloring; it is applied cold and dries quickly. A. One barrel coal tar, ten pounds asphaltum, ten pounds ground slate, two gallons dead oil. Add the dead oil after the others have been mixed by aid of heat.

(602) H. W. T. asks for books on etching, gelatine process, etc. A. We can supply you with "Zinc Etching," by Gast, $1.00. "Zincography," by Bock, $1.00. "Photo-Engraving; All about It," $3.00. "Electrotyping," by Urquhart, $2. "Photo-Mechanical Printing Processes," by Burton, $1.50.

(603) J. P. F. writes: I am desirous to get some information in regard to low pressure steam heating. What book can you recommend, treating of this class of work? A. We recommend the following works: Baldwin, "Steam Heating," $2.50; Schuman, "Steam Heating," $1.50, which we supply by mail at prices stated.

(604) P. F. F. asks if there is any kind of liquid that will clean the hands after dyeing cotton goods. A. It depends on the dye; as a rule, whatever you use will affect the skin. Acids or alkalies will destroy many mineral dyes; organic colors are not easily removed. Washing with alcohol is sometimes effectual.

(605) A. L. T. says: 1. I have made a simple electric motor as described about a year ago in the SCIENTIFIC AMERICAN, and with eight bichromate cells it runs two sewing machines. Now I wish to apply the motor to a lathe which I now run by foot power. The lathe is back-geared and screw-cutting, and I do light work only on it. Is the motor of sufficient power to do the work either with the back gears or simple turning, provided I have enough electro-motive force? A. The motor is of sufficient power to do the average work of a foot lathe, but it is not large enough to do all the work that can be done upon a lathe by the foot, as it is able to develop only about one-eighth horse power, whereas a man by extra exertion can momentarily develop one horse power. 2. Would it be possible to increase the power of the motor, by a larger amount of wire on the field magnets or making the field magnets larger and putting on double amount of wire? As the armature was quite difficult to make, I would like in some way to make a more powerful motor (if this is not strong enough to run the lathe), using the armature which I have already made. A. The change of the field magnet would not improve the motor. By increasing your battery power and running your motor a little faster, and reducing the speed by proper gearing, you will be able to run your lathe. 3. I am thinking of getting storage batteries to do the work. How many would I need? (I think they are each 2 volts E. M. F.) A. About 8 cells. 4. Would it be safe to charge them from an arc light circuit (the circuit is a divided one with about 6½ amperes, and of course I would have a switch and ammeter as recommended by the electric light company). A. Yes; but they should be placed in a shunt. 5. Do you know how many amperes the motor requires, and also how much it would stand without burning out the armature? A. If the armature and field magnet of the motor are connected up in parallel, the motor will bear a current of about 16 amperes. 6. Could I safely put it in a shunt of an arc light circuit, although the storage batteries would be better, as I could only get direct power at night? A. Yes.

(606) J. W. D. asks (1) if the shafts of the glass disks in an induction Wimshurst electric machine could be made in one piece, passing from one support to the other, and with holes made in the glass for it to pass through. Would it hinder the making of electricity? A. The shaft of a Wimshurst machine must necessarily be made in two pieces, because the glass disks must revolve in opposite directions. You could make the central part of the rod, upon which the tubular shafts are supported, of insulating material, and allow the rod to run straight through the machine, if desirable. 2. Would it be safe to make the holes in the glass by making a pile of wet clay in the center, making a hole in the clay the size desired down to the glass, and pouring in melted lead, or would it crack the glass? A. Your proposed method of making holes in glass would be unsuccessful—it would break the glass. To cut a hole through a plate of glass, employ a copper tube arranged to run in a wooden guide, and supply the tube with a mixture of rather coarse emery and water while it is revolved by means of a drill bow or by attachment to a hand drill.

(607) D. W. writes: In making simple electric motor I have placed a piece of brass tubing on a hard rubber cylinder for a commutator. Now, will that work, or should it have been of copper tubing? A. Copper is better than brass for a commutator. 2. In winding the field magnets I commenced to wind from the inside instead of the outside. Will you please tell me how to connect the wires? A. Connect corresponding ends of the wires of the field magnet. You can readily test the magnet to see whether the current passes in the right direction through both legs of the magnet, by holding an ordinary pocket compass near one pole and then near the other. One pole should indicate north polarity and the other south. 3. Is there any way of making a battery in the shape of a wooden box divided into small sections, and coated with something to prevent leakage or destruction by the acid? A. A battery cell can be made of wood, but it is apt to check and leak. Asphalt forms a good acid-proof coating for wood.

(608) W. L. writes: I work in a flock mill where it is very dusty. The flock or stock is about the size and weight of coarse sawdust. Could the stock be taken up by a fan and run into an air tight room where the dust could settle and not be lost? A. The dust in the room may be removed by an exhaust fan and thrown into a room lined with muslin on frames, so arranged as to make a space of two or three feet all around. The dust to be injected within the muslin room allowing the air to escape through the muslin to the outer space. The dust will gradually accumulate on the inside of the muslin and choke the ventilation, when the fan may be stopped and the dust whipped off by striking the muslin from the outside. This will save the dust. If it is not wanted for flock, it can be precipitated under water by high speed blower and dried in cakes for paper stock or other uses. If the whole flock and dust is to be removed together, a Sturtevant exhaust blower should be used and connected with a much larger muslin room than for the floating dust alone.

(609) J. R. asks: 1. Could a magnet be affected by a bar of steel completely inclosed in a brass cylinder one-sixteenth of an inch thick? A. Yes. Brass is not an insulator of magnetism. 2. From what distance would a magnet with a face two inches by one-half inch attract particles of steel? A. Theoretically, it would affect particles of steel at almost any distance. The distance through which a magnet is able to move particles of steel depends, of course, upon the size of the particles and the strength of the magnet.

(610) O. O. O. writes: Please tell me what I can do to increase the power of my battery, a Leclanche prism of three jars or cells. I have added new sal-ammoniac and zincs, but the power is no better. What is the right amount of sal-ammoniac to use? The carbons and prisms look all right; how can I test them? Is soft or rain water necessary? Will water that has been boiled do? Does too much sal-ammoniac decrease the power of the battery? A. Use a saturated solution of sal-ammoniac in your battery. Soft water is preferable for dissolving the sal-ammoniac, but any water will answer. If your battery has been long in use, it is possible that the prisms are exhausted and new ones may be required. Your zincs should be clean and well amalgamated.

(611) C. K. writes: Twice I think I have read in the SCIENTIFIC AMERICAN that an emulsion of oil and gum tragacanth can be made. Will you kindly let me know how it can be done, also if it would be water-soluble? An extract firm claims to have a soluble oil of lemon, and I think it must be made on the above plan. If this is so, it would save bottlers quite a sum every year for cologne spirits, as we use from 8 to 16 ounces alcohol for each ounce oil. A. An emulsion is properly a mixture of oil or other liquid with another liquid in which it is insoluble, but in which it is kept in suspension. The role of gum tragacanth or similar substances in emulsions is not to render the oil soluble, but to thicken the water, so that it will hold the oil in suspension in small globules, or vesicles. We do not know anything about the oil of lemons you refer to, but if truly soluble, it is doubtless not an emulsion.

(612) J. D. L. asks the best method of coating iron water pipes so that they will not rust, the coating not to render the water unsuitable for drinking. A. There is no way of coating the inside of water pipe in an amateur way that is satisfactory. Coal tar and asphalt are much used by the manufacturers of pipe, which are applied by dipping the heated pipe into a trough of melted tar and asphalt, mixed to make a tough coating. Such pipe will flavor the water for awhile, but makes the next best substitute for galvanizing. The galvanized or zinc coated pipe is the best and most durable pipe now in use for conveying cold water.

(613) O. F. P.—Chilled castings can only be softened by annealing for from two to eight hours, according to size or depth of chill, at a red heat. Pack the castings in pulverized charcoal and fine ashes closely in an iron box, heat slowly to a red heat in any convenient fire with enough fire to last several hours. Cover the whole with ashes or cinders, so as to continue the heat the required time and gradually cool.

(614) J. T. asks how to kill weeds on a cinder running track. A. Sprinkle the track with strong solution of soda or bleaching powder in water. Salt is also efficacious if applied thickly enough.

(615) C. H. T. asks: What is best—the most durable—to paint galvanized iron with? A. If a heavy under coat is required, use a metallic paint in boiled oil, dry well, and rub smooth before putting on the gilding coat.

(616) F. D. S.—We do not recommend petroleum for ordinary hot water heater, or for house heating, nor for any steam generating furnace where it cannot have a constant personal supervision. Its use for fuel without steam under pressure for atomizing has not yet proved a success. For the methods of application see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 403, 623, 624.

(617) G. McL.—For illustrated descriptions of incubators, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54, 425, 380.

(618) G. S. & Co.—The iron putty used for steam joints is made by mixing dry 2 parts of a good metallic paint, 1 part litharge, 3 parts fine iron borings sifted, or for close joints, iron filings. Add boiled linseed oil and mix to the consistence of stiff putty.

(619) H. G. asks why he cannot make quicksilver amalgam stick to glass so as to silver it. A. We presume your manipulation is defective. Lay a piece of tin foil (not lead foil) on a smooth flat surface and pour mercury over it to a depth of one-sixteenth or one-eighth inch. Slide the perfectly clean glass plate over it, with its advancing edge just below the surface of the mercury, so as to bring a new surface of amalgam against the glass. Then leave the glass for awhile under pressure, as of a few books, and finally place it on edge to drain.

(620) C. F. K. asks for an article to use for repairing mirrors or silvering looking glasses where they have been scratched, or the quicksilver has been scraped off. A. Place some quicksilver on a piece of broken looking glass. Then with a knife you can slide off a piece of amalgam and transfer it to the other glass, which should be placed in a horizontal position. See preceding query.

(621) N. K. H. writes: I want to build a furnace of brick, one where the fire will be next to the wall. What is the best to use—lime, cement, or fire clay? A. Use fire brick only, and lay with fire clay mixed with equal parts of finely ground fire brick. You can buy material for the fire mortar already mixed, through the fire brick trade.

(622) B. C. asks for some way of turning brass black so it will not rub off. A. For black, blue, or steel color on brass, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 535.

(623) T. G. R. asks: If I get a blacksmith to make me the magnets for the Desprez galvanometer, will common tool steel do, or does it require to be the finest steel, and what width would it require to be, and would the magnets require to be hardened all through or only on the ends? A. Tool steel, or even some kinds of machinery steel, will answer for the magnet. It is sufficient to harden the steel at the ends. 2. Is the tapering spring (secured to block on the base) of steel or spring brass? A. The spring may be of either steel or brass. 3. Will angle plates do, made of either steel or brass? A. They should be made of brass. 4. Should the No. 40 silk-covered copper wire be single, double, or triple covered, and about how many layers should there be to make the right thickness? A. A quantity of single covered wire will answer; six or eight layers of the wire will be sufficient. 5. Should the upper hook be connected to the outside end of the coil or the inside end? A. It is immaterial which end of the coil is connected with the hook. 6. Should one each of the mica plates be on the top of coil and the other underneath the top, or should both be on the top? A. You might place one mica plate within the coil and the other on top. 7. Also how to find the focus of mirror? A. Hold the mirror in front of an open window and reflect the light upon the window casing. Move the mirror back and forth until an image of the objects outside of the window appear on the mirror. The distance between the mirror and the casing will be the focus of the mirror.

(624) E. J. E. asks: Can you give receipt for making a plain cotton, woolen cloth or fine chamois skin water proof, and still have it retain its natural softness? A. Try treatment with paraffine applied hot, and worked in with a hot iron.

(625) W. M. C. asks whether fresh water on narrow beaches is filtered salt, or how it comes. Why does the water in wells on beaches rise and fall with the tide, and when the salt water breaks over the beaches into the wells, what becomes of the salt, as they immediately freshen? A. The fresh water springs on beaches are derived from sources independent of the sea water; any salt water that breaks over them sinks quickly into the ground or runs away. They may vary their rate of flow with the tide without any mixing taking place if there is a constant outflow of fresh water, as then it will keep the salt water back under all circumstances.

(626) C. McE. asks: Will you kindly let me know through the SCIENTIFIC AMERICAN if the "Simple Electric Motor," in SCI. AM. SUPPLEMENT, No. 641, can be run by, say, five or six cells of Fuller mercury bichromate battery? Or if the motor can be run by any other battery than one of the plunging type? A. The motor can be run by the Fuller, Bunsen, or Grove battery, but it will require a greater number of cells. If you desire to use the Fuller bichromate battery, use about twenty cells, connecting them ten in series and two in parallel.

(627) H. T. asks: 1. Is the electro-magnet described on page 214 of April 7, 1888, strong enough to deflect the flame of a candle? If so, how many batteries of the Grenet form would be necessary? If not strong enough, would you give size of magnet, with size and amount of wire, and also number of cells of bichromate batteries necessary for the purpose? A. Yes. Use six cells of Grenet battery, having plates 3 by 6. 2. Is a magnet built up of strips of hoop iron preferable to one forged out of soft iron? A. The principal advantage in hoop iron is that the magnet may be constructed without the aid of a blacksmith. 3. What is supposed to be the cause of the so-called para-magnetic phenomena? Is it something aside from ordinary electricity, or what? A. We do not know that this has ever been satisfactorily settled. 4. In the induction coil the length of the spark produced will depend upon the length of wire used in the primary coil, and in the length of wire used in the secondary coil, of the size of the iron core and of the number and dimensions of the batteries used; the question is: What effect is produced on the character of the spark, other than length, such as thickness, intensity, or other quality, by employing different thicknesses (that is, heavier or lighter) of wire in the construction of the primary coil, and also of the secondary coil? A. The intensity and quantity of the secondary current is related in some degree to the sectional area of the wires of the respective coils. When a heavy primary and light secondary coil are employed, a long thin spark will be the result; when a fine primary coil formed of a great length of wire is used in connection with a short, coarse secondary coil, the secondary current will have great quantity and small intensity.

(628) J. G. writes: I have studied chemistry for about six months, picking out the things I could not understand, so as to be enlightened by some friend better posted on the subject. Among my many difficulties the following stands prominently forth: Hydrofluosilicic acid, SiH_2F_6. Is this a chemical molecule? I have consulted four standard authorities; in each I find the formula as given. If chemists are to be believed, how can eight monads satisfy one tetrad? A. You are committing the error of all beginners in interpreting science too rigidly. There are molecular affinities, and this compound is built up from three saturated molecules, HF, HF, and SiF_4. This is proved by the fact that on boiling it is decomposed into hydrofluoric acid, HF, and silicon fluoride, SiF_4.

(629) J. R. asks how twenty-two caliber cartridges are loaded, and how to reload them; want to use shot instead of bullet. A. Fulminate of mercury may be used as a primer, secured in place by gum or glue, and ordinary powder, wads, and shot may be used. There will be very little room for the charge, which must be a light one. The shell is too small for shot, and it will hardly pay to reload them.

(630) O. J. asks whether there exists any waterproof cement, which will unite rubber and porcelain? A. Use bicycle tire cement, or try a mixture of Burgundy pitch or asphalt and gutta percha melted together.

(631) G. M. writes: 1. Referring to the article on capillary force figured and described in SCIENTIFIC AMERICAN of January 19, I would like to ask how high is it possible to raise water in one end of the trough above the other end, and how low it is possible to depress the mercury, and is there any other substance that will show a greater range above and below than water and mercury do in the experiments given? A. Water and mercury will have practically about as high range as any fluids; without being of infinitesimal thickness, one or two inches elevation and depression could be reached. 2. How thick should a cylinder be to withstand a pressure of 650 lb., the cylinder to be 6 inches in diameter, 12 inches long, with the cylinder heads bolted on? The material to be steel. A. 1-10 inch. 3. In the SCIENTIFIC AMERICAN Reference Book, page 119, we read that charcoal will absorb 80 or 90 times its own bulk of some gases. Please name several gases that charcoal will absorb in such quantities? A. Carbonic acid gas, ammonia, and many others. 4. How can the charcoal be quickly discharged of the gases which it absorbs? If by heat, please state about what temperature is necessary to free the char-

coal of the gas, and is there any other way besides using heat? A. By a heat verging on redness. There is no other rapid way of removing the gas. It might be done slowly by absorption by chemicals, such as slaked lime, caustic soda, etc. 5. About how long will it take the charcoal to absorb the gas, and how long to free it of the gas? A. A few seconds to one minute.

(632) J. P. writes: You gave a recipe for artificial honey in SCI. AM., December 8, 1888, page 363, query 26, in that you say 80 grains cream tartar. Please state how many grains to a pound or to an ounce of 16 ounces to the pound? Also, will it keep any length of time with the whites of eggs in it? A. There are 7,000 grains in a pound avoirdupois, or 437½ grains in an ounce. It will not keep well if made with whites of eggs.

(633) J. E. O. writes: Physiologists tell us that an image when received on the retina of the eye is inverted; but few give any satisfactory explanation why we see all images righted. It is claimed by some that the brain receives the image inverted, and our judgment rights it. Will you please give us your opinion? A. The connection between the brain and the outside world cannot be traced. A specific image produced on the retina affects the brain with the sensation of sight; the inversion of the image is immaterial to the question, as the question transcends mechanics or physics.

(634) J. C. M. writes: An aquarium of mine, made of marble and glass, leaks at the joints. Please tell me in the Notes and Queries column of the SCIENTIFIC AMERICAN how to make a cement to mend it with? A. Try litharge and glycerine, or melt in Burgundy pitch and gutta percha cement (see Queries 630 and 641) with a hot iron when the glass and marble are perfectly dry.

(635) F. S. W. asks: How many cubic feet of ordinary illuminating gas are required to equal one ton of ordinary Pennsylvania pea coal for steam, when burned under a boiler? What effect has a gas jet on the iron of the boiler compared with a coal fire? A. 50 to 70 lb. of coal are considered equal to 1,000 cubic feet of gas in heating power. The gas may be burned from long pipes with numerous perforations, preferably arranged with air injector burners, as the least production of lamp black indicates inefficiency. For cost and exact details consult an engineer.

(636) J. C. asks: 1. How to make paper out of rags? A. For paper making we refer you to Davis' work on paper making, $6; Cross, Bevan and Joynson on paper making, $4. 2. Do the clouds move, or is it the earth turning on its axis that gives them the appearance of moving? A. The clouds move, dissolve, and reform again continually; their motion and changes are real.

(637) F. A. asks how wood can be electro-plated with copper? The object I desire to plate is the ebony handle of a surgical knife. A. First rub the wood with hot paraffine; coat it with a thin coating of plumbago, applied with a brush, and then submit it to the regular electro-plating process.

(638) E. W. M. writes: In testing gas meter, there are five cubic feet pass through the test meter, while six cubic feet pass through the meter to be tested; is the meter to be tested 16⅔ per cent fast or 20 per cent fast, or in other words, what is the divisor—five or six? A. The meter is 20 per cent fast. If gas were one dollar a thousand, you would by such a meter pay $1.20 for $1 worth of gas. The correct figure always should represent 100 per cent.

(639) L. S. M. writes: Can you inform me of any acid or other substance which will rapidly putrefy and liquefy the flesh of crustaceans so that it may be removed through a small aperture, and which will not affect the shell in any way? The intention is to preserve the shell intact in its natural color, and I am looking for some way to remove the flesh without disintegrating the shell? A. Try caustic soda solution; you must experiment, using different strengths of solution and various temperatures. You may have trouble from the disintegration of the ligaments connecting the segments. You might try the old receipt of placing them near ant hills, in order that the ants may clean them.

(640) E. LeR. S. asks: In speaking of a mile on land between two points, is there any difference between the English and American mile? A. There is no difference; the distance is 5,280 feet.

(641) W. McB.—If no heat is to be applied to your glass-lined acid vat, we would recommend some such cement as bicycle tire cement. The following is recommended for making wood watertight and proof against sulphate of copper, but not against cyanides:

Burgundy pitch	1,500 parts.
Old gutta percha in fine shreds	250 "
Finely powdered pumice stone	750 "

First melt the gutta percha and mix with the pumice stone and then add the pitch. Apply hot, using a soldering iron. For resisting heat and acids the following is recommended:

Sulphur	100 parts.
Tallow	2 "
Resin	2 "

(642) L. K. S. asks for the names and price of the most complete work on chemistry of glass. Also name of firm supplying such books? A. We can supply you with Feuchtwanger, Water Glass, $5. Shenstone on Glass Blowing, 80 cents. Powell, Chance and Harris on Glass Making, $1.50. The first named is devoted to silicate of soda, and not to glass in general.

(643) J. L. asks for gold size for gilding on wood so as to obtain a bright finish, resembling burnished finish. A. Waterproof gold size is prepared from half a pound of linseed oil with two ounces of gum animi, the latter is reduced to powder and gradually added to the oil while being heated in a flask, stirring after every addition until the whole is dissolved; the mixture is boiled until a small quantity, when taken out, is somewhat thicker than tar, and the whole is strained through a coarse cloth. When used, it must be ground with as much vermilion as will render it opaque, and at the same time be diluted with oil of turpentine, so as to make it work freely with the pencil. This does not give a burnished finish. For burnishing a mixture of American bole, a little wax and parchment size is used. The latter is made by boiling parchment scraps in water. We refer you to "Workshop Receipts," first series, which we can supply free by mail for $2, for a very elaborate account of gilding operations.

(644) T. A. McC. writes: In a tunnel 1,600 feet long will a ten foot pressure of water force out earth and rock that readily dissolves when exposed to the atmosphere, in a few weeks? The tunnel has a total fall of some two feet. A thousand feet of the tunnel is through this shelving rock which readily dissolves when exposed to the atmosphere, and has so caved in that it will not permit the water to pass through. Tunnel is 6×6 feet. By means of a flume we can pour the water in some ten feet above the floor of the tunnel, and we want to know if the water will force its way through and wash out the debris? A. If you can supply a full stream of water at 10 feet head, you can wash the dirt and gravel through the tunnel, if not entirely obstructed. After an opening is obtained, a volume of water will be required to give a velocity of 4 feet per second through the obstructed part for carrying forward the broken stone which would be deposited in the unobstructed part of the tunnel. To remove this, a volume equal to the whole area of the tunnel, or 144 cubic feet of water per second, would be required to entirely clear it from sand, gravel and small broken stones. The large rocks would require other means for removal.

(645) W. W. T. writes: I have made a glycerine barometer, using a pint tin can with two necks, in one of which I insert a barometer tube open at both ends, bore 0·25 inch, and in the other a thermometer to make corrections for temperature. All fittings and seams are air tight. While it very often agrees with the signal service barometrical readings, sometimes there is a difference, for which I can find no cause. Please tell me the reason. A. The barometer tube should be closed at the upper end, and should be of such height, about 25 feet, that a vacuum will be left above the fluid. The liquid in the tank should be in some kind of communication with the air. You may insert a tube through the cover of the tin can and tie an India rubber balloon over it. In the SCIENTIFIC AMERICAN of December 25, 1886, you will find described a glycerine barometer.

(646) B. O. L. writes: When the phonograph is talking can it be heard all over the room by the entire audience if the voice talked into it was loud enough, or must a person have ear to receiver in order to hear anything? Can only one hear at a time? A. An ear tube is required. If several are provided, as many persons can listen as there are tubes. It cannot be heard all over the room.

(647) H. S. H. writes: There has been some discussion on the subject of "parks," in a literary club here, at which it was stated the park at Versailles, France, was the largest artificial park in the world. A few of us had some doubts of it, and I write to you as the surest way to settle the question. If Versailles has not the largest park, can you tell me where it is and how many acres it contains? A. The park at Versailles is not remarkable for size, but rather for its water works and buildings. The following are representative parks of the world, with their acreage:

Fontainebleau	21,000 acres.
Boulogne	2,500 "
Vincennes	2,275 "
Windsor	3,800 "
Richmond	2,253 "
Fairmount	2,740 "

(648) C. F. P. asks how to test the purity of drinking water with permanganate of potash. I wish to test an open well for any organic matter which it may contain. A. Dissolve 2 grains permanganate of potash in 10½ ounces distilled water. 10 drops of this represent 1-1000 grain of oxygen. Add it to the water drop by drop until a faint pink color is produced which is permanent. The number of drops per gallon represents the amount of oxygen required to oxidize the organic matter. It should not exceed 0·2 grain per gallon. The test should be executed by a chemist, and at best is a mere approximation and may condemn a water that is perfectly healthy. It has only confirmatory value.

(649) H. McC. writes: An advantage claimed for Mercator's projection reads, "The true shapes of continents are given, although expanded toward the poles. If the last statement is true, the first (in my eyes) cannot be true. Kindly explain. A. It is not strictly true. As the poles are approached the lateral distances become magnified, so that only a general accordance of shape is preserved.

(650) G. F. R. writes: Will you kindly let me know through your paper whether theoretically it would weaken the current passing through a conductor if a magnetic needle is placed under it? A. It would not.

Replies to Enquiries.

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

(403) T. H. DeS.—Radiator, Coal, etc.—1. A steam radiator is more efficient at the higher pressure by the difference in the temperature of the steam at both pressures. 2. The Jellico mountain coal ordinarily has 60 parts fixed carbon, 36 parts volatile matter or gas=to 96 parts combustible in 100. The cannel coal from the Jellico upper bed has 35 parts fixed carbon, 50 parts volatile matter=85 parts combustible in 100. We have no record of any true cannel coal in Alabama. The Cahaba and Corona beds have from 50 to 55 parts fixed carbon to 41 parts volatile matter; or 91 to 96 parts combustible in 100. The nearest to a semi-bituminous or semi-anthracite are: The Deer Creek mines, which have 68 parts fixed carbon and 22 parts volatile, or 90 combustible in 100. The steaming qualities of these coals as compared with Cumberland, 100, are as follows: Jellico 90·7, Cahaba 93·2, Corona 93·0, Deer Creek 89. 3. A direct connection with vertical pump is best and cheapest. A long-stroke crank connection with engine by belt is much used and preferred for constant and heavy work, as for very deep wells. 4. Bones that have grease or carbonaceous matter in them will enrich ordinary coal gas and add to its volume. Gas made from grease or oil is heavier than ordinary coal gas, containing more carbon.

☞ Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

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