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 This is for our information, and not for publication.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 Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

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

Minerals sent for examination should be distinctly marked or labeled.

(1) G. W. J.—For 1 inch fall to a mile, the current will be ¾ of a mile per hour. For 16 inches fall, 3 miles per hour.

(2) A. C. asks if the 13th of May, 1847, was in the dark or light of the moon. A. The dark of the moon. New moon on the 14th of May, 1847.

(3) T. C. asks: 1. What is the best known application for the painless extracting of teeth? A. Nitrous oxide or laughing gas is probably the most satisfactory anæsthetic to use for dental purposes. 2. Ayers' formula for making sarsaparilla.

A. Fluid extract of sarsaparilla	3	ounces.
Fluid extract stillingia	3	"
Fluid extract yellow dock	2	"
Fluid extract May apple	2	"
Sugar	1	"
Potassium iodide	90	grains.
Iron iodide	10	"

Mix them.

(4) T. A. S. asks a few recipes for cheap dead white enamels or glazes, to run at a high heat. A. From our back files we take the following:

Cullet	11 lb.
Boracic acid	7 "
Sodium bicarbonate	4 oz.
Phosphate of lime	3 lb. 8 "
Oxide of antimony	2 "

See also article on "Enameling," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 387.

(5) R. R. asks if there is any substance that is attracted to silver, or any instrument for determining its presence. A. We know of no such instrument, and no way of determining its presence except on examination or assay.

(6) C. W. F. desires a recipe for making hair grow on a bald head or beard on a smooth face. A. There is nothing that can make the hair grow when once the hair glands or roots become extinct, but frequently the growth of the hair can be stimulated and encouraged by various mixtures. See answers to queries No. 53 and 78 in SCIENTIFIC AMERICAN, for February 7, 1885.

(7) F. W. H.—Ordinary spring water does not generally contain animalcules. The water of running streams contains some animalcules; standing water in ponds and pools generally has more, and stagnant ponds and pools are usually filled with animalcules.

(8) R. W. F.—You should find on the lamp itself a memorandum of the number of volts required to run it. If you cannot get the information there, you should write the manufacturer, as a six candle power lamp might vary greatly as to the number of volts required to run it.

(9) C. W. McC. writes: Would you please inform me as to whether there is any substance except selenium which, when acted upon by light, will change that light into electricity? Is there any way to change that electricity back to light? A. We think you are mistaken in regard to the properties of selenium. Light merely changes its resistance to the passage of electricity. We know of no other substance that is affected by light to the same extent.

(10) F. I. P. writes: In regard to the Alaska's broken rudder, or a similar case, would it be practicable or possible, when the broken parts are made of metal, to use magnetism to bring and keep them together, until the injury could be fixed or some remedy substituted? A. We think not. It is extremely difficult to construct a temporary device of any kind which would be capable of resisting the action of the waves.

(11) J. R. W. writes: What size wire would you recommend for the primary and secondary coils of an induction coil to be one-half the size of the one described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160? How many feet of tin foil surface would be needed for such a coil? A. Use No. 16 for primary and No. 36 for the secondary. You will probably require about 12 square feet of condenser.

(12) H. W. G.—Use whiting or rouge to polish your nickel plated bicycle.—The puzzle you ask us to solve is a simple one for children's amusement, but would take too much room to explain in these columns.

(13) W. H. asks: What is the cause of the isothermal of 60° extending farther north in the interior than on the western coast of the United States? A. The warm winds of the Pacific coast affecting the temperature on the regions north of the Rocky Mountains.

(14) A. S. H. asks for names of any cheap articles or chemicals procurable in a solid form and readily or quickly solvent in water, that will give water the following colors: 1, a transparent blood red; and 2, a transparent golden brown. A. You can procure from any dealer in chemicals, aniline colors soluble in water for such shades.

(15) E. H. B. writes: 1. I would like a receipt for removing shine from diagonal. A. We know of no way of effectually accomplishing this. 2. I would also like a receipt for making rubber stamps. A. See SUPPLEMENT, No. 83.

(16) M. S. desires a receipt for making varnish for drawings that will set (dry) in a short time. A. Try Canada balsam 1 ounce, spirits of turpentine 2 ounces; mix them together. Before this composition is applied the drawing or print should be sized with a solution of isinglass in water, and when dry apply the varnish with a camel's hair brush.

(17) N. W. writes: A person owning a house within 250 feet of which a railroad has been laid fears his house may be burned by sparks from locomotives. He has heard of fireproof paint and fireproof tarred gravel roofs. Are there any? Please state if there are any other fireproof roofs than metal and slate. A. There is probably no such thing as an absolutely fireproof paint, although some paints give a moderate degree of protection. The metal slating would be a far better protection.

(18) T. S. asks: What will keep celluloid collars and cuffs in their original whiteness? They turn yellow after being worn a short time. A. A preparation called celluline, made for this purpose, can be purchased from dealers in celluloid articles.

(19) H. H. writes: Could you give me the liquid process for etching on glass? Your process given in SUPPLEMENT, No. 313, cannot be used on stationary articles. The process of which I ask the formula is applied with a pen, and the etching is made without the article being heated. A. There is an article sold as diamond ink, prepared by dissolving ammonium fluoride in water and then mixing it with three times its weight of barium sulphate.

(20) W. E. McA. writes: What is the best material for a stern bearing of a tug boat? Boat has eighteen by eighteen inches engine, shaft 5 inches diameter, wheel 6 feet, and weighs about 1,800 pounds. Shaft has a composition sleeve on it, and runs in a hard composition box, and will only last one season. A. We think there is nothing better than phosphor bronze; possibly the journal bearing is too short.

(21) D. B. asks: How much water and how much land does the earth consist of? A. About ⅔ water, ⅓ land.

(22) J. F. writes: My pipe is one inch diameter, 1,000 feet long. Have a perpendicular head of 60 feet. What power can I get from cold water engine? A. One-tenth horse power.

(23) I. E. L.—You will find full information in "The India Rubber and Gutta Percha Industries, in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249, 251, and 252.

(24) T. H. D. asks the commercial name of the acid used in cleaning steel or iron sheets, and in what proportion the acid and water are mixed; also if there is any danger in the use of it by the inhaling of the fumes. A. Hydrochloric acid 1 part, water 4 parts. No danger.

(25) L. P. O. asks the amount of expansion per lineal foot of brass, iron, and mercury, per degree of heat Fah. A. For 1 degree Fah.: Brass 100 feet expands 0·0125 inch. Iron 100 feet expands 0·008 inch. Mercury expands in bulk from 32° to 212° 0·015=$\frac{15}{1000}$ of its bulk at 32°.

(26) J. G. M. writes: We are using white birch in considerable quantities cut into 6 inch by 12 inch lengths, the latter being the diameter of the round log, and find it almost impossible to prevent it rotting. Kindly inform us of any means whereby we can extract the sap so as to preserve the timber. We have tried drying, both by exposure to the sun and artificial means, and find this wood cracks or splits so as to be useless for our purpose. A. You can accomplish your purpose by boiling the wood in melted paraffine. The manipulation must be continued until all bubbling ceases, when the sap contained in the wood will be entirely replaced by paraffine, and all danger of rotting or cracking will be completely obviated.

(27) E. G. C. desires a formula or recipe for preparing waterproof or marine glue. A. Caoutchouc 1 ounce, genuine] asphaltum 2 ounces, benzol or naphtha q. s. The caoutchouc is first dissolved by digestion and occasional agitation, and the asphaltum gradually added. The solution should have about the consistence of molasses.

(28) J. H.—General Grant's case has been under the consultation of the most eminent specialists in the world, and everything possible in medical science to relieve his sufferings has been done for him. The use of cocaine for his difficulty was recognized in the early stages of the disease, and its application long continued.

(29) H. L.—We know of no institution that issues diplomas upon mere examination. You will have to go through a course of study in some technical institution; when, if found competent in the necessary branches, you may obtain a diploma. If you wish to obtain a license as a steam engineer only, you will have to apply to the local authorities where there are laws authorizing the license system, or to the United States inspectors of your district, who can issue license as an engineer on lake or river steamers.

(30) W. W.—The telescopes of surveying instruments, except in some special cases, are the same as the ordinary terrestrial telescopes or spy-glasses in their optical construction. It is necessary that the crosswires be put exactly in the focus of both object glass and eyepiece. Their magnifying power is from 10 to 25 times. Orifice at eye end three-sixteenths to one-quarter inch. Bright brass castings cost in New York 20 to 30 cents per pound, according to quality.

(31) P. D.—Creosote or kreosote is the oil of tar. It is made by distilling tar, and sold by all druggists. The effect of coal tar on the skin is due to the kreosote in the tar, and you should not use too much.—A "ringing engine" is an ordinary pile driver worked by a number of men lifting the ram a few feet, the main rope being spliced to a number of ropes at the end, so that each man has a separate end.

(32) C. H. writes: Please tell me how to prevent geared wind wheels from twisting edgeways to the wind. I have a 16 foot wheel with both journal boxes on main shaft in front of gear. Would it be better to place one behind pinion (which is in center of vane axis)? If not, why? A. Swing the guide wing or tail toward the edge of the mill that works to windward. The edging to windward is caused by the transmission of power if bevel gearing is used. Altering the position of boxes will not help. 2. Does burning bones destroy their virtue as a fertilizer? If so, how can I dissolve them cheaply? A. Do not burn bone for fertilizer. Grind or crush it fine. It requires no solvent.

(33) S. R. W.—The fire companies of New York clean their hose by fastening a small wooden box on the mouth of the nearest hydrant, partially open the hydrant, and pass the hose through the box. This cleans the hose as fast as the men can pull it through. This of course would not be sufficient care to take of leather hose, which occasionally requires frequent treatment with currier's stuffing.

(34) H. O. W. asks about the stamping and enameling of tin boxes. A. The stamping is done before the boxes are made up. The sheet tin is printed in the same manner as on paper, with varnish colors that are very tough. Special machinery is used in making the boxes, which preserves the printed figures from blemish.

(35) F. C. C. writes: I have a small upright boiler that does not make steam enough, and I would like to know if it would answer to put a coil of pipe around the inside of fire box, which is 14x10 inches, connecting at top and bottom, and can I use gasoline for making steam with, using two or three burners? Is there enough heat to reach top of flues, which will be eighteen inches from burners? A. You will have difficulty in putting a coil in the fire box that would materially add to the steam generating surface without encroaching upon the fire space. Better make a closure around the boiler with brick or sheet iron, and place the outlet to smoke pipe at the bottom. This will make the shell a heating surface. Crude petroleum is cheaper than gasoline under boilers, and is much used.

(36) A. B. D. asks if there is any way to granulate soft solder, similar to the granulated spelter sold in the trade. A. You can make solder into shot by pouring the solder through a sheet iron pan that is perforated with small holes, held several feet above a tub of water; at the same time shaking the pan a little to more perfectly break up the streams of flowing metal.

(37) M. A. W.—The economy of a generator should be indicated by the number of pounds of water evaporated under a given pressure per pound of coal. This ranges from 10 to 12 pounds in best boilers. The economy in horse power should be developed in the engine where from 20 to 30 pounds of water in steam, per hour, represents the range of present steam practice. It requires the same number of units of heat for generating steam, without regard to temperature of generating surfaces.

(38) E. E. F.—The drying of sapling timber is difficult under any circumstance. We recommend you to dry it in the bark, and in as long pieces as possible. Put it in a small drying room or steam box, and turn steam directly upon the wood, so as to heat it thoroughly. Keep steam on for one or two days. Then turn steam into the drying coil, and keep up the heat, with no open steam, in the drying room for a day, when you will find the sap thoroughly cooked and the wood without cracks. Then bark and cut.

(39) E. E. asks what to use and how to dye woolen cloth a dark brown. A. Work the goods for two hours at a boiling heat in 2 pounds of catechu. (The catechu is prepared by dissolving 1 pound of catechu in 7 or 8 gallons of boiling water; when complete solution is effected, add 2 ounces of copper sulphate, stir, and it is ready for use.) Then work at a boiling heat for an hour with 8 ounces potassium bichromate and 2 ounces tartar; next work for an hour in 2 pounds fustic and 8 ounces cudbear; wash and dry. For a deeper shade or a more chocolate hue, add 4 ounces logwood to the cudbear. See also the receipts given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 163.

(40) F. J. K. asks a recipe for a harness polish of black, say of bluish tint. A. 4 ounces glue, 1½ pints vinegar, 2 ounces gum arabic, ½ pint black ink, 2 drachms isinglass. Break the glue in pieces, put it in a basin, and pour over it about a pint of the vinegar; let it stand until it becomes perfectly soft. Put the gum in another vessel, with the ink, till it is perfectly dissolved; melt the isinglass in as much water as will cover it, which may be easily done by placing the cup containing it near the fire about an hour before you want to use it. To mix them, pour the remaining vinegar with the softened glue into a sand pan upon a gentle fire, stirring it until it is perfectly dissolved, that it may not burn the bottom, being careful not to let it reach the boiling point—about 180° Fah. is the best heat. Next add the gum, let it arrive at about the same heat again; add the isinglass. Take from the fire, and pour it off for use. To use it, put as much as is required in a saucer; heat it sufficiently to make it fluid, and apply a thin coat with a piece of dry sponge; if the article is dried quickly, either in the sun or by fire, it will have the better polish.

(41) C. D. N.—On a perfect track the only difference between the draught of a small and a large wheel is the amount of friction on the axle divided by the semi-diameter of the wheels; which makes a very small difference of draught in favor of the large wheel. On a soft road this small difference is increased by the greater depression of the smaller wheel into the road surface for equal loads; which brings the leverage to bear slightly in favor of the large wheel. The distance of the horse from the axle also has a slight bearing upon the size of the wheel. The angle of the draught being greater for the small wheels tends to lift the forward wheels from the ground and thereby lessen their traction. The greater distance of the horse from the wheels lessens this angle, and thereby slightly increases the traction. With wheels having a semi-diameter equal to the height of the hame hook, there can be no difference theoretically in the draught, whether the traces are long or short. Other points in the rig may make a difference.

(42) F. W. D. asks the meaning of "cut-off" in a steam engine. A. Cut-off may mean the appliance by which the engine is regulated, or may apply to the style of engine; or in connection with the part of the stroke at which the cut-off of steam takes place.

(43) H. E. asks: What preparation is used in making good grafting wax? A. Take 4 ounces pitch, 4 ounces resin, 2 ounces hog's lard, and 2 ounces beeswax; put them all together into a pipkin, and dissolve them over a slow fire, and it will form an excellent grafting wax.

(44) N. W. writes: Being 100 feet from a 20 ton manure heap and 500 feet from a cemetery, how deep should one sink a drilled or bored well to be sure of pure water? Is water freed from sewage impurities by boiling? How long will water stand in an open barrel in summer without deteriorating? A. This depends entirely upon what direction the subterranean water channel is running. In case the general drainage of the district is toward the well, it should be so sunk and incased as to avoid the nuisance and to meet a deep water stratum, and too much care cannot be used under such circumstances. Contaminated water is improved by boiling, which destroys the living sources of danger (the microbes). In a clean oak barrel, water for drinking should be renewed every day, if open to the air. If the barrel is bunged tight, the water will be good for several days.

(45) E. E. W.—Water in an inverted siphon as you describe will seek an exact level when not under motion as in discharging a stream. It will deliver a stream at any point below the level, in quantity governed by the friction of the water in the pipe and area of aperture.

(46) M. B. B.—We have seen a glass boiler and engine, the result of much labor and the genius of a professional glass blower. It was practically a failure. We could not give encouraging advice for a successful construction. It is safe not to do it.

(47) H. G. S. writes: What dimensions ought the steam ports to have of a cylinder of 6 inches stroke and 3½ inches bore? How much lap and lead and what throw must the eccentric have? Of what diameter should the crank shaft be? Are the dimensions of the cylinder proportioned right, and what power will it have with 80 pounds of steam? A. For your engine, make the steam ports ⅝ x 2½ inches; exhaust port ¾ x 2½ inches; $\frac{21}{64}$ inch lap, ⅛ inch lead, 1 inch throw, 1¼ inch crank shaft; proportions of cylinder good. At a speed of 100 revolutions per minute you will have about 2 horse power.

(48) T. M. W. writes: I want to know how to rid water of oil when water is condensed from the exhaust. The engine is a 40 horse power Westinghouse, and the water is furnished by two wells, but in the dry season the wells fail, and we propose running the exhaust into large sheet iron or tin vessels, to condense the steam and use water over again. Would the experiment be likely to pay? Will it do to turn the exhaust into the wells to condense it? Would the oil be likely to give trouble in the boiler if the water is not freed from it before using over again? A. Do not put the exhaust into the well under any plea. You can make an air condenser of iron pipe or even of sheet iron or of light galvanized sheet iron pipe, shaded from the sun and exposed to a free circulation of air. Catch the condensed drip in a tank to settle, and skim off the oil. No oil should enter the boiler. It makes cake with the scale, and will settle on the shell, causing a burn. We think that it will be economy to build large cisterns to hold water to be used only when the wells fail.

(49) W. D.—Ice does not sink, but by the action of the warmth of the sun in spring it crystallizes in smaller needles and separates, floating until dissolved. The crystals being small cannot be seen from a distance, thus making the impression that it has sunk.

(50) W. M. B. asks (1) for good receipt walnut stain. A. Mix dragon's blood and lampblack in methylated spirits till you get the color required, and rub it well into the grain of the wood. 2. How can I color glue size like walnut stain. The stain I buy in cans won't mix with the size. A. Take one gallon very thin sized shellac; add 1 pound dry burnt umber, 1 pound dry burnt sienna, and ¼ pound lampblack. Put these articles into a jug, and shake frequently until they are mixed. Apply one coat with a brush. When the work is dry, rub down with fine paper, and apply one coat of shellac or cheap varnish. 3. How can I give pine a beautiful mahogany or lively reddish color? A. Boil ½ pound madder and 2 ounces logwood chips in 1 gallon water, and brush well over while hot. When dry, go over with pearl ash solution, 2 drachms to the quart. By using it strong or weak, the color can be varied at pleasure.

(51) F. C. writes: I have been told that the stems which cigar makers get in stripping Havana tobacco are subjected to a treatment that yields a product containing much of the flavor and aroma of that tobacco, and which is beneficially used on what is called "seed," tobacco for cheaper goods. Can you, and if so will you, inform me what that treatment is? A. An extract of tobacco is made by taking one pound tobacco, generally leaves, 2 pounds spirits (sp. gr. 0·900); digest them in a warm place for some days, express strongly, and again digest in a mixture of 1 pound each of water and spirit (0·900) for twenty-four hours; again press out the liquor, and evaporate the strained and mixed liquors in a vapor bath at a temperature not exceeding 167° Fah. (75° C.). We see no reason why the foregoing process cannot be applied to the stems referred to by you, although we doubt the general use of stems as you suggest, for they can be more readily made into cheap snuff.

(52) A reader asks how to make paste that will keep in warm weather, and what kind of machinery is necessary, and how to make paste in ten bar-

rel lots. A. The addition of a slight quantity of carbolic acid to the paste will prevent it from decomposing during the warm weather. No special machinery is necessary for the preparation of paste. A large caldron and suitable arrangements for heating, a steam pipe being preferable, are all that is essential.

(53) R. S. asks whether the plant Caltha palustris, grows here in the United States. A. It does; and its proper name according to Gray's Manual is marsh marigold, although frequently designated simply as cowslip. 2. Also a recipe of a good indelible ink—a simple recipe. A. Use the following: 2 parts silver nitrate, 4 parts distilled water, 2½ parts gum arabic, 3 parts soda carbonate crystals, 5 parts liquid ammonia. Dissolve the silver salts in the ammonia, and the gum arabic and soda in the distilled water. The two solutions are then mixed together and slightly warmed, when the whole mixture becomes brown.

(54) J. H. D. writes: 1. Are the Brush form of armature and arrangement of magnets and commutators equal to the Siemens? They seem more simple. A. The Brush form of machine is very economical and efficient. 2. Why do you not advise small Brush machines to be made by amateurs? Is the armature too hard to make? A. It is a little more difficult to construct. Brush has patented an armature similar to the one suggested by you. It would undoubtedly hold together. 3. Is the Gulcherform of pole piece better than the Brush? A. We think not. 4. Please give law and formulæ of magnetic saturation. A. The maximum current that should be used is a current but little in excess of that for which the magnetism is nearly proportional to the current. 5. Please give formulæ for constructing armatures, so I can tell (at certain speed) what quantity and intensity of current it will give in a proper magnetic field. A. There is no formula for this. 6. What No. of wire should be wound on Trouve's electric motorshown in SUPPLEMENT, No 259, on field magnet and armature? A. It depends entirely on the kind of current you propose using. 7. Is there any advantage of placing field magnets in shunt circuit? If so, what proportion should shunt resistance bear to current? A. A shut wound dynamo is not liable to injury by short circuiting. The resistance of the shunt bears a certain relation to the resistance of the external circuit, and is generally determined by experiment. 8. In what number of the SUPPLEMENT do you publish a description of Siemens' later machines? A. In several numbers. See catalogue.

(55) E. N.—The problem of which you ask solution is an old "catch" question for beginners in algebra, and can only be done by "substitution." We have not room to give the work, but $x=3$ and $y=2$.

(56) A. A. S. asks: 1. Should a telegraph wire one mile long be inclosed in a heavy glass tube? Would it have any effect on the wire in the transmission of messages? A. It might prevent a very slight escape of electricity to the air, and it would probably increase the static charge in the line. 2. If a plate of glass, say 1 inch thick, 4x4 feet, be placed three feet underground, will extreme cold or warm weather affect it in any way? A. At that distance, yes. To reach a stratum of uniform temperature you would be obliged to go much deeper than three feet.

(57) E. R.—We do not think that the English police are all supplied with electric dark lanterns. It is possible that some of them are provided with such lanterns. The lantern is the invention of M. Grouve. We believe it is not for sale in this country.

(58) M. E. asks the cheapest way to bring water to factory from well three-fourths of a mile distant; the water is sometimes four and sometimes eight feet from top of ground; the factory is probably six feet below the top of the well; steam power at factory, none at well. Can we not lay iron pipe, and draw the water to us with an air chamber pump? How much water can we draw this way through an inch diameter (inside) pipe, also inch and a half pipe? A. 1 inch pipe will be useless for a suction pipe for so great a distance; 1½ inch pipe would yield about 1 cubic foot or 7½ gallons per minute, on a 4,000 foot suction with pump at factory; 2 inch pipe would double the volume.

(59) A. J. H. & Co. write: We are using a compound of white glue, refined glycerine, acetic acid, with gamboge for coloring, to form a material for "tableting" stationery and paper. Though very flexible at first it gradually dries hard, and loses its elasticity. Please give us a recipe that will retain elasticity. We do not wish a rubber compound, on account of danger, cost, or objectionable smell of the rubber solvents. A. The makers of the most widely used compound for this purpose keep secret the details of its preparation. We should think your compound a good one, and that possibly you might overcome your trouble by using a trifle more glycerine, or a slightly different kind or treatment of glue.

(60) B. B. writes: The citizens of our town wish to run water pipes, to be used in case of fire, from one end of the town to the other, about three-eighths of a mile. At each end of town is a mill with about a fifty horse power boiler each, and we have thought at said places to have a pump connected with pipe running through streets, with valves and hose connections at proper places. Is the plan a feasible one? If so, please be so kind as to tell us what size pump, pipe, etc. Will use salt water, and have to draw it about one hundred feet. A. For your fire apparatus use a 6 inch cast iron main pipe with hydrants at convenient places. A fire pump with steam cylinder 14x16, costing about $550. A pump at each mill would be worth its cost as an additional means of safety.

(61) A. L. M. writes: I have a engine 2¼ inches by 4 inches. How much power would such engine develop at 400 revolutions per minute, with 80 pounds of steam? What size vertical boiler will it take to supply the above engine? What diameter, height, number of flues, and size of flues? What thickness will shell and flue sheet be? How many feet of heating surface in such boiler? A. Your engine will develop 2¼ horse power. You will require 30 square feet effective heating surface in boiler. Boiler 2 feet diameter, 3½ feet high. Fire box 20 inches diameter, 15 inches high, 32 tubes 1¼, shell ¼ inch, heads five-sixteenths.

(62) D. W. B. writes: I want to cover my roof with copper or tin. Which will be the cheapest and best? A. There is a large difference in cost in favor of tin. Cistern water from a copper roof is not fit for drinking or cooking; otherwise copper will last 50 to 100 years.

(63) G. D. writes: I have different articles of zinc which are to be colored through dipping in a solution. So far I have tried chloride of antimony; it produces a nice black coating on zinc, but the solution soon becomes weak, and too expensive for the purpose. Have also used a solution of anvil dust, sulphur, arsenic, and muriatic acid; this makes a nice brownish bronze color, is cheap, and will do very well, but as I do not know the proportions of the different ingredients, find it difficult to get the same color, and to work well every time. A. We know of no cheaper way for making good work than the chloride of antimony process that you name. By making a record of the exact proportions by weight of your own cheap process, you may always secure the same color. Haphazard work never gives uniform results in chemical operations as well as in business operations.

(64) J. D. G.—For the breaking stress of white pine timber and joist: Rule.—Multiply the square of the depth by the breadth in inches; and this product by the coefficient 10,840. Divide the last product by the length between bearings in feet multiplied by the depth in inches. The quotient is the breaking weight in pounds.

For the	3″x12″x13 ft.	beam..	30,018 lb.
" "	4″x14″x13 ft.	"	46,690 "
" "	8″x 8″x13 ft.	"	53,366 "
" "	10″x10″x13 ft.	"	83,384 "
" "	12″x12″x13 ft.	"	120,073 "

etc. Safe load about one-tenth of the above.

(65) E. C. desires the best receipt for preserving asparagus; if possible, the method used by the German (Erfurst and Lubeck) canning establishments. A. Cook the vegetables in the usual way in a glass jar if convenient, and when sufficiently cooked hermetically seal in precisely the same way as ordinary preserved fruit, etc., is treated.

(66) J. R. writes: I have 50 gallons grape wine made last fall that is imperfectly fermented. It worked all right for about two weeks, then became still and remains cloudy. What shall I do to induce fermentation? A. If keeping the temperature between 70° and 80° Fah. is not sufficient to induce complete fermentation, add a small quantity of yeast, previously well mixed with some of the liquor, and gently stir in.

(67) L. C. P. asks a formula for a plating (electro) solution, using phosphor-bronze for anodes. A. We do not understand how it can be possible to electrolytically deposit phosphor-bronze. The result of the action of the current would be the decomposition of the alloy.

(68) W. E. H.—We think you could not do not better than to study what has been done in the line of your inquiry. You will find in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54, 380, 425, 437, very interesting illustrated articles on incubators.

(69) G. B.—The simplest galvanic battery consists of a plate of copper and a plate of zinc immersed in dilute sulphuric acid, one part of acid to ten of water. It would be well to amalgamate the zinc by rubbing on it a little mercury after it has been plunged in the acidulated water. For description of other forms of battery consult SUPPLEMENT Nos. 157, 158, 159.

(70) W. J. K.—The medical induction coil does not differ materially from any other. You will find a full description of the induction coil in SUPPLEMENT, No. 160. For medical purposes you should make the coil about three inches in length, an inch and a quarter in diameter, using four layers of No. 24 wire for the primary and about ten or twelve layers of No. 36 wire for the secondary. You will need no condenser. By arranging the bundle of wires so that they may be withdrawn from the coil or inserted therein, you will be able to regulate the secondary current.

(71) C. A. A. writes: Supposing we have a dynamo and circuit complete, with fifteen arc lights in the circuit, now I contend that the last lamp in the circuit produces light at the same instant that the first one does. Am I correct or not? A. The current is supposed to be equal throughout all parts of the circuit, and if the lamps are adjusted exactly alike and the carbons are all under the same conditions, the lamps should all produce a light at the same instant.

(72) M. H.—To succeed in making music by rubbing the rims of partly filled goblets, try wetting your fingers with a little turpentine occasionally.

(73) J. F. R. says: I have some nuts for carriage axles to polish: they are plated with brass to imitate gold; how are those finished, and what is used, They have a smooth, shiny appearance and not show any scratches from the buff wheel. There are felt wheels in the market. Are they any good, or are they no better than a wooden wheel covered with leather? A. Use a felt buff and crocus; or if a fine polish is required, finish with a cotton wheel and rouge.

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