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Notes & Queries

A. K. B. will find a recipe for solder for gun barrels on p. 353, vol. 27.—R. S. will find that galvanizing wrought iron is described on p. 346, vol. 31.—A. J. and others will find directions for etching on glass on p. 409, vol. 31.—S. J. F. will find directions for modeling in clay, wax, etc., on p. 58, vol. 24.—S. N. will find directions for making gravel walks on p. 50, vol. 32.—R. J. will find directions for filling and polishing black walnut work on pp. 315, vol. 30, and 347, vol. 31.

(1) W. O. H. says: A friend claims that, if a balloon could be made so as to sustain the pressure from the outside, and the air were pumped out so as to form a vacuum on the inside, that it would rise. I claim that it would not. Who is right? A. Your friend.

(2) A. J. S. says: Are you aware of any one who has ever actually discovered perpetual motion? If it has not yet been discovered or revealed, do you really believe that perpetual motion, pure and simple, would be of any pecuniary advantage to its discoverer? A. No one has ever discovered perpetual motion. You can judge of the probability of such a discovery if you bear in mind that the principle involved is the same as when one tries to lift oneself in a tub, by pulling at the handles. Some of the perpetual motion inventors put cog wheels or levers between their hands and the tub handles. But the result is the same. It is always a perpetual no go. No reward has been offered.

(3) G. L. L. says: What use, if any, can be made of old photographic collodion? A. If the solvents have not already evaporated, and the solution contains no volatile acids, the ether and alcohol may be readily removed by subjecting the solution to distillation in a glass retort over a water bath, with a very gentle heat. The solution, however, should not be allowed to evaporate to dryness.

(4) H. M. asks: How can I bleach shellac? A. By filtration of the solution over animal charcoal.

What are the average weights of a cubic inch of copper and tin, respectively? A. Copper about 0.32 lb., tin about 0.217 lb.

How is the inside area of a cylinder found? A. To find the surface of a cylinder: (circumference of base x altitude) + twice the area of base. To find solid contents: Area of base x altitude.

(5) A. S. asks: Is there any solvent besides cyanide of potassium, for sulphide of copper? A. The sulphide of copper dissolves readily in strong aqua fortis (nitric acid) on application of heat.

(6) H. B. C. asks: What kind of a solution should I make to plate with tin, having tin as a positive electrode? A. Electro-metallurgists consider the sulphate to be the best solution for this purpose; but the reduction of tin by galvanism cannot be considered an advantageous process. The best method for tinning metallic surfaces is that of immersing them in a bath of molten tin, the surface of which is kept free from oxide by means of a layer of chloride of ammonium (sal ammoniac). An even and regular coating of the metal is thus obtained speedily and with little trouble.

(7) M. S. asks: 1. Are the oxygen and hydrogen, used in stereopticons, dangerous? A. They are explosive only when mixed and ignited. 2. Of what color are the screens that are used for the same purpose? A. White. 3. Are they painted or varnished? A. When intended to remain stationary, they are occasionally covered with an even coating of whitening with a little size.

(8) C. T. S. asks: What process will make ordinary white quartz crystals, resembling amethyst? A. Take borax 5 parts, saltpeter 5 parts, pearl ash or fixed alkaline salt, purified with niter, 33 parts, pure white sand, cleansed by washing, 57 parts. First reduce the sand in a glass or flint mortar to a fine powder, then add the other ingredients and grind them well together. To 10 lbs. of the above add 1 1/2 ozs. of manganese oxide and 1 drachm of zaffre. Melt in a small clay crucible, and cover the surface of the crystal by immersion.

(9) H. asks: Of what size, and of what cheap material, should a hot air balloon be made to raise a weight of 150 lbs.? A. A closely woven variety of light cambric is best for this purpose. It is not customary (where the proper material is used) in this style of balloon to use any varnish whatever. If the case requires it, however, a light solution of boiled linseed oil in turpentine may be used.

(10) G. W. N. asks: Which is the positive pole and which the negative, in a battery? A. In all forms of battery, the binding screw attached to the zinc plate is always negative, and the connection of the opposing element, whether it be copper, carbon, or platinum, is always positive. If a small mariner's compass be placed immediately under a copper wire running north and south, (that is, parallel with the needle of the compass when in a state of rest and not subject to any disturbing influence), over which a current is passing from north to south, the needle of the instrument will immediately be deflected, its north pole moving to the east, and its south pole to the west. If the current be reversed, the needle will move in the opposite direction.

There is a boat fastened to a dock by a rope. P. says that a man standing in the boat will not be obliged to exert so much force to pull the boat to the dock, as one who stands in the dock and pulls the boat toward him. N. says the man will have to exert the same amount of force in both cases. Who is right? A. N.

(11) D. A. C. asks: Is there an agent which will bleach or clarify, by burning or fumigation, vegetable substances? I want an agent that will bleach tobacco in the process of curing or drying the plant. Sulphur will do it to a certain extent, but it imparts an odor which injures its market value. A. Tobacco may be readily bleached by means of either sulphurous acid or chlorine; but in the operation it undergoes a partial decomposition, new salts being formed. This destroys the properties for which the tobacco is most valued.

(12) J. H. L. asks: For some time past I have been trying to bleach what is called *cera de Campeche*, a wax made by a large bee near the Pacific coast in the neighborhood of Autlan; it is of a dark yellow color and a strong smell; it becomes quite soft and sticky by working with the hands. How can I do this? A. Beeswax may be bleached by nitric acid; but chlorine, though it destroys the color, cannot be employed for this purpose with advantage, for it was observed by Gay Lussac that a substitution of chlorine for a portion of the hydrogen occurs under these circumstances. When candles made from such wax are burned, irritating vapors of hydrochloric acid are evolved. Beeswax has been commonly bleached by exposing it in thin layers to the action of sunlight for some time. Try the action of a solution of chlorine gas in water, or, what is perhaps less objectionable, a solution of chloride of lime (bleaching powder).

(13) A. P. asks: Is there any magnetic needle or other instrument that will show where to dig for water, and where springs exist? A. There is no such instrument in existence.

(14) C. K. asks: What degree of heat is acted upon and absorbed by a liquid, such as an oxyhydrocarbon oil, contained in an iron or copper vessel of about equal width to its depth, heated by live steam of about 40 lbs. pressure? A. As you fail to state the particular oil in question, we cannot give you its specific heat. The temperature of the oil would, in no case, be higher than the steam or hot water surrounding the vessel containing it. Whether the oil vessel were completely or only in part filled with the oil, the conditions being the same in both cases, the temperature would eventually mark nearly the same degree, although in the former case the expenditure of a larger amount of fuel would be required to accomplish such a result.

(15) J. E. H. asks: Is there any known way by which skippers in smoked meat can be destroyed without injury to the meat? A. Try the action of a small quantity of the iodate of calcium or salicylic acid.

(16) T. W. C. says: I have a friend who uses a process in which a quantity of water must be maintained at a temperature near to but always above the freezing point. To procure this he uses considerable quantities of ice. Could the same effect be economically produced by the Carré freezing apparatus? A. Yes.

(17) A. B. C. and others ask: Which wheel of a truck slips in going around a curve, the inside or the outside one? A. This question is frequently asked by our correspondents, and is very fully answered by a writer in the *Railroad Gazette* as follows: That wheel will slip on which the pressure is the least. For a single truck with an equally distributed load, other things being equal, on a flat track (that is, one in which there is no super-elevation of the outer rail), the inside wheel will slip, for the following reasons: 1. Because the direction of the resultant of the weight and of the centrifugal force is more in the direction of the outer than of the inner wheel. 3. Because, on account of the parallelism of the axles and the play allowed the wheels, the flanges of the latter are against the outer rail and away from the inner one in the passage around the curve, and this is true whatever may be the speed. This brings the point of application of the resultant (corresponding to the loaded point on a beam) nearer the outer than the inner bearing. On a curve, the outer rail of which has been elevated for a given speed, at this speed the resultant above mentioned is perpendicular to the plane of the rails, and hence at that particular speed the first of these causes is inoperative, while the second, remaining in force, causes the inner wheel to slip as before. At any higher speed, the first cause again comes into play, and allows the inner wheel still greater facility for slipping, and the more so the higher the speed. On the other hand, for a speed less than that for which the rail was elevated, the centrifugal force, being diminished, brings the resultant more in the direction of the inner rail than before, and at some speed would make its direction such as to exactly counteract the effect of the second cause, and would thus render the wheels equally liable to slip. At less speeds the outer wheel would slip. In the case of a long train, the wheels at the ends are nearly in the condition of those of a single truck, while those near the middle, being drawn to the inner rail by the action of the forward and rear portions of the train, will sooner come into a condition in which the outer wheels will slip. In this, the coning of the wheels has been considered as a part of the elevation of the outer rail, either increasing or diminishing it as the flanges press against the outer or the inner rail.

(18) W. X. says: I have two 1/4 inch pipes, one glass and the other lead, which I wish to unite so that the joint will be neat and bear the pressure of a column of water fifteen feet in height. In what way can they be best united? A. Use as a solder the following alloy, which fuses below the boiling point of water: Bismuth 2 parts, lead 1 part, tin 1 part.

(19) E. J. F. says: How can I cut fine edgings on paper, such as the borders on valentines or bouquet papers? A. These borders are stamped by a die cut in metal.

(20) H. P. O. asks: Please give me recipes for good and permanent red and black dyes were which I can dye cotton and linen thread? A. IthF

red, use cochineal, lac dye, madder, or logwood with a tin mordant. For black, use logwood or galls with an iron mordant.

How can metal be cemented to glass? A. See p. 27, vol 30.

(21) C. A. F. asks: How can a silk fish line be made waterproof? A. Take 2 parts boiled oil, 1 part gold size, mix, shake well, and it is ready for use. Apply with a piece of flannel, let dry thoroughly, and apply another coat. Use 3 coats in all.

(22) C. S. W. asks: What is the best way of preparing starch for use on linen collars, etc.? A. Wheat starch is generally considered the best. It is made as follows: Steep wheat flour in water for a week, draw the liquor off, and wash the residue on a sieve; drain in perforated boxes, cut up into lumps, and dry in the air or on a stove.

(23) J. D. says: Please give me a recipe for wax for tracing designs in hair lines on zinc with a pen, which will protect the zinc from acid used to etch the design on the metal? A. If you use nitric acid, try a mixture of equal parts of asphaltum, Burgundy pitch, and beeswax; melt them in an earthen pipkin, stir well, and pour into cold water. Use warm.

(24) A. L. H. asks: What is a good method of cleaning tin, copper, brass, etc., without scratching the same? A. On tin, use potash lye and rub with a hard substance. On copper and brass, use spirit of tar.

(25) C. E. G. says: I claim, in arguing the merits of the Keely motor, that water is a spent substance, and cannot again produce power unless the equivalent is laid out on it. A. You are right.

(26) V. H. says: 1. On p. 74, vol. 28, you give correspondent K. W. a varnish for photo paper trays, consisting of a mixture of petroleum naphtha and paraffin. Can the varnish be applied to wooden trays? A. Yes. 2. How many parts of each ingredient should be used? A. Put in paraffin till the petroleum naphtha will dissolve no more.

(27) W. U. asks: What are the rules for calculating the permutations and combinations of numbers? A. The number of permutations of n things = $1 \times 2 \times 3$, etc., $\times (n-1) \times n$. The number of arrangements of m things, taken n in a set, = $m \times (m-1) \times (m-2)$, etc., $\times (m-n+1)$. The number of combinations of m things, taken n in a set = $\frac{m \times (m-1) \times (m-2) \dots \times (m-n+1)}{1 \times 2 \times 3 \dots \times (n-1) \times n}$.

(28) L. H. R. says: I wish to know whether the following conjectures are probable: Scientists, in giving the heights of mountains, clouds, balloons, etc., say they are so many miles above the level of the sea. Is the level of the sea the same all over the surface of the earth? Is the surface of the ocean at each part of the globe at the same distance from the center of the earth? I think it would be so if there were no revolution of the earth around its axis; but since there is, the centrifugal force thereby produced would cause the looser particles (water) of the earth to be heaped up at the equator, making the level of the ocean at this part higher than at parts north and south of it. And further, in my opinion, the water would not only accumulate here, but would accumulate in proportion to its quantity or mass thereby making the Pacific Ocean of higher level than the Atlantic. Is this actually the case? A. If you measure the height of the sea level by its distance from the earth's center, it is not the same everywhere, but is higher under the equator and lower at the poles. This is called the flattening of the earth, and is, in round numbers, 1/290, which means that the polar axis is 1/290 x 8,000, or about 26, miles shorter than the equatorial diameter therefore the ocean's surface at the equator is 13 miles higher than at the poles, and the Mississippi river runs, in a certain sense, actually up hill. The height of the mountains is always estimated from the nearest sea level. There are, besides this, other irregularities in the ocean level, of which we have treated elsewhere in this issue.

(29) J. C. W. asks: 1. If any one will look steadily for a short time at such an anemometer as is used by the United States Signal Corps, consisting essentially of hollow hemispheres, and will notice the direction in which the cups revolve, he may after a time apparently see the motion reversed, and the cups going in a direction exactly contrary to that in which they really move. A good position to take with reference to the anemometer is about 50 yards from it, and nearly up to the level or horizontal plane in which it moves. No doubt others have noticed the deception, as it is very apparent when once observed. A little perseverance in the effort may perhaps be necessary at first in order to perceive the change as it seems to be. A. This optical delusion has been often observed, and is simply caused by the difficulty of deciding which balls are the nearer. If we take the further off for the nearer, the motion of course appears reversed. The same thing may be observed in some windmills, when looked at by the edge of the arms. 2. Another illusion may be produced by a very simple experiment as follows: Procure a round paper box about two or three inches in diameter, and, if its bottom does not bulge upward in the center, make it do so by pressing it in with the thumbs. Any sized round box of almost any material that is not affected by mercury will doubtless answer the purpose, but the kind mentioned is easily procured in the form of a large pill box or a collar box. After pressing the bottom inwards, as directed, pour into the box about one ounce weight of clean bright quicksilver, and give the box and contents a rotary motion until the quicksilver revolves rapidly around the circumference of the box in the depression caused by the convexity of the bottom and its junction with the perpendicular walls of the box. It is best to lay the box flat on a horizontal table while rotating it; and when the quicksilver seems to be

a revolving ring of liquid metal, let the box rest and watch the motion as the metal subsides. If there is about enough quicksilver to make a complete ring of the size of a goose quill (no precision needed), the liquid metal will seem obviously moving in a direction exactly opposite to its real course so as to deceive almost any beholder. The effect is due to the wavy motion of the quicksilver. A. The observation that the waves in mercury, when running in a rough channel, will propagate in a direction opposite to the current has been made before, but your simple manner of illustrating it deserves commendation.

(30) C. C. K. asks: Is there a south polar star similar to the north polar star? A. The north polar star in the Little Bear is not exactly over the north pole, but at a small distance. At the south pole the nearest star is 10° further off, and is in the constellation Hydra.

How do explorers tell the heights of mountains? A. Explorers as well as aeronauts measure the heights of mountains by means of the barometer, which gives tolerably reliable indications, as the air pressure decreases with the height we ascend. Your way of telling the height of clouds would be good if you only were sure that the cloud you see is the one from which the rain descends.

(31) M. H. R. says: It is a common observation among country people that a new moon is a wet or a dry one, according to the upright or horizontal position of its horns, and also that the moon affects the weather by its rising farther north or south than usual. Are not all of the changes of the moon, as to position in regard to itself or the earth, subject to a natural law, generally speaking, unerring law? A. The position of the horns of the moon depends on the relative position of moon and sun: if immediately after the noon, she shows herself vertically above the setting sun, the horns will be upright; if southward of the sun, the horns will be more nearly horizontal. That the moon affects the weather, causing an atmospheric tide wave as well as an ocean one, is undoubted; but the "unerring law" has not yet been discovered. Let us hope that the continued labors of the Weather Bureau will in time solve this problem, which is quite complex. The course of the moon is repeated, eclipses and all, every 21 years; but we have not the same weather every 21 years, which shows that other influences have to be taken in account, which observations in the future may reveal to us.

(32) J. H. asks: Can anything be added to ink made from nutgalls and sulphate of iron that will cause it to be black when first used, without injury to it? A. Try an addition of logwood.

(33) S. L. L. asks: Has the name carbonic acid recently been changed to carbonic dioxide? If so, why? A. Carbonic oxide is the compound formed by the combination of carbon with one equivalent of oxygen (CO). Carbonic acid is carbon in combination with two equivalents of oxygen (CO2). The former is sometimes called the monoxide, and the latter the dioxide, of carbon.

(34) C. P. asks: I want to know the cheapest and simplest apparatus for compressing air in a receptacle of two quarts capacity. I would like to get the density of five or six atmospheres. A. Use an air pump.

(35) J. S. asks: Will paper keep a number of years, free from damage, even if placed in an airtight lead or glass case? A. If the paper be placed in a perfectly dry glass vessel, which is afterward hermetically sealed, it will be preserved indefinitely, or as long as the glass envelope remains intact.

(36) J. A. asks: Can I use a tin baking pan for a photographing bathing sink without injury to the chemicals? A. No.

(37) H. M. asks: Does the sun's heat shrink or expand seasoned wood? A. The expansion of the woody fibers by heat is more than counterbalanced by the shrinkage due to the consequent evaporation of the moisture and other bodies in the sap cells, therefore the wood, as a whole, shrinks.

(38) E. T. D. asks: Which is the most certain and quickest mode of discharging colors from cotton prints and delaines? A. Use chloride of lime.

(39) N. A. B. asks: How can I determine the electromotive force of a galvanic battery? A. To one not familiar with the science of electrical measurements, such determinations may be somewhat problematical. The following method of Poggendorff's, for the measurement of electromotive force, is perhaps the simplest and most comprehensive. In this method the more powerful battery, E, is joined up in circuit with a resistance coil, r; and the other battery, E', and a galvanometer are connected to the same coil, so that both batteries send a current through r in the same direction; by increasing the resistance of r it is easy either to make the current of E overpower that of E', or to obtain such an equilibrium that E shall remain inactive, and no current pass through the galvanometer in either direction. When this is effected, we have the following ratio: As the total resistance of E and r is to the resistance of r, so is the electromotive force of E to that of E', or E/E' = r/(E+r).

Can metallic silver be obtained by heating the nitrate in a crucible? A. Yes, by the addition of a small quantity of borax and resin.

(40) S. R. A. says, in answer to correspondents who ask how to destroy ants: Take a pasteboard box with a good lid, so that it can be made dark; cut a small hole near the bottom, put in about two tablespoonfuls of sugar, and set it away in some dark corner of the cupboard. Allow it to remain two or three days; take a quantity of hot

water in a dish pan. You can guess the rest. Repeat the process until the supply of ants is exhausted. The same bait will last all the summer. Allow the ants to run out at the hole they entered, and then knock them off by striking the box, with the hand, a quick light blow.

(41) J. E. A. says, in answer to several correspondents: The reason why the screws now in use do not utilize the power is because the pitch of the screw doubles from the outside in nearing the shaft half way. If you turn a thread upon a rod a little more than half the altitude deep, then turn it twice to one half the diameter, the pitch will be twice what it was before. If the pitch of the blades of a screw be at a greater angle than 1/4 of a circle, or 45°, it would impede its revolution. If a screw be 24 feet in diameter and the pitch 45° from the outside, then it would be an entire loss of power; if 22 1/2°, there would be loss at all but the outside 6 feet. By setting the pitch in the inside or nearest the shaft, and twisting the blade from the outside to the required pitch, there would be no loss of power. Another principle is that the revolution of the screw and the pressure of the blades against the water would cause the water to flow away from the end of the blade; this would cause the screw to fall back, and not hold what it would naturally gain. This can be easily remedied by having the blade of full width at the end, and turning it over a few inches, making a rim on the back side of the blade: the water will then only flow away backwards from the side, as it should do.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. M. S.—No. 3 is a tannate of gelatin, and will doubtless answer all your requirements. It is probably made by steeping sheet gelatin in a solution of tannin, and then subjecting it to pressure. —F. W. P.—It is mica.

J. H. asks: How is the pretty imitation of pearl in ladies' dress buttons and parasol handles produced on tin or other metallic sheeting?—E. M. asks: How is a dry or magic shampooing powder made?—C. M. K. asks: Are the trimmings called Hamburg edgings made by machinery or by hand?

COMMUNICATIONS RECEIVED.

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

- On the Keely Motor. By W. J. J.
On the Spider's Web. By T. H.
On a Glass Oil Can. By A. B.
On Western Lands and Emigration. By T. E. L.
On Keely Transactions. By G. H.
On Boiler Incrustations. By B. B. S.
On Fishing Sinkers. By P. B. T.
On Large and Small Axes. By T. W. P.
On Gold Coinage. By J. R.
On Bee Culture. By L. E. C.

Also inquiries and answers from the following: J. M. S.—J. C.—W. A. C.—F. W. D.—G. A. D.—M. E.—R. A. C.—J. S. C.—K. W. C.—J. W. M.—G. R. B.—F. N. M.—D. P. H.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells a self-registering device for indicating the flow of water over a weir? Who sells books on aeronautics? Who sells drive well tubes? Whose is the best ice-making process? Whose is the best burglar alarm? Who sells lamp chimney cleaners? Who makes the best rock drills? Where can steatite (soapstone) be bought? All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

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- 8,560.—CARPET.—J. Fisher, New York city.
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SCHEDULE OF PATENT FEES.

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5,050.—T. Kater, Hamilton City, Ont. Pianoforte. Aug-
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5,055.—A. R. Koerber, Berlin, Ont. Reed orchestration.
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5,065.—W. H. Gonne, Chatham, Ont. Sash pulley. Aug-
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