Notes and 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 This is for our information and not for publication.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.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
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.

(9818) A. B. wishes to learn more about lunar rainbows. A. Some of the correspondents of our paper who have reported upon lunar rainbows of late seem to be confusing two phenomena which are very unlike and due to entirely different causes—the rainbow and the halo. A rainbow is due to falling rain from a cloud which is on the opposite point of the horizon from the sun or moon at the time. The sun or moon cannot be very high above the horizon and have a long arc of the bow visible, not over 42 deg., at which angle none of the arch would be seen. A rainbow is a half circle at sunrise or sunset. In a primary bow the red is on the outside of the arch. If two bows are seen, the outer one has the red on the inner side of the arch. If a bow is formed by the moonlight at night, the colors are very faint, and very rarely or never can more than three colors be distinguished—red, yellow, and green. Lunar rainbows are not frequent, and one is fortunate to see one. The writer has seen two in forty years. They are doubtless formed more frequently in one's field of vision, but are so faint as to escape notice. Halos, on the other hand, occur frequently, and are seen without any difficulty in the vicinity of both the sun and the moon. The rings of colored light, seen close to the sun and the moon, or nearer than 10 deg., are called coronæ. The smallest halo has 22 deg. radius, or about half that of the primary bow, but it is a ring with the sun or moon in its center. It surrounds, when seen fully, the sun or the moon. A halo of 46 deg. radius and one of 90 deg. radius are also formed. White circles are also seen, which pass through the sun or moon and are parallel to the horizon. Where these circles cross the circle of the halo, we sometimes see so bright a spot of light that it is called a mock sun, or sun dog. Complicated figures are sometimes formed by the crossing of these circles. The halo of 90 deg. is very rarely formed. The writer has never seen but one. Halos are always at a very great height above the earth's surface, so high that water cannot exist, and the halo is formed by refraction and reflection of the light in crystals of ice. They are signs of a storm, since they indicate the saturation of the upper air, and the lower air will soon be affected. These are not discussed very fully in recent meteorologies. The reader is referred to Loomis's "Meteorology" for much interesting matter upon all these subjects.

(9819) F. I. H. asks: When are we closest to the sun—in winter or summer? A. The earth is nearest the sun early in January, and farthest from the sun early in July. This makes the winter warmer in the northern hemisphere and the summer warmer in the southern hemisphere than they would otherwise have been. Similarly, the summers are cooler in the northern hemisphere, and the winters cooler in the southern hemisphere. We in the north have the advantage at present, but in 13,000 years the conditions will be reversed.

(9820) N. W. W. asks for the difference between high and low voltages and for information relative to malleable glass. A. The limit between high and low in voltage for lighting and power is not well defined, and has never been authoritatively fixed. The Edison Company in its direct-current system has a voltage of 220, which is without doubt a low voltage. The engineer to whom you refer fixed the limit of low voltage just above this voltage. The voltage for direct-current trolley service is 500 at the motors. Many would consider this low rather than high. It is without doubt true that no one would call a higher voltage than 500 a low voltage. Anything above 500 in any service is a high voltage. As to the other question, What is a high voltage in a magneto for ignition purposes? we are not able to give this a numerical answer, and have never seen any decision on this point. But it would seem proper to call that a low-voltage magneto which would be used with an induction coil; while a high-voltage magneto would furnish a spark without an induction coil, and might furnish several hundred volts on the break circuit. This we suggest as a possible mode of drawing a line between high and low voltage magnetos, where no settled practice has been followed. Toughened or malleable glass was introduced by a Frenchman some years ago. It could be treated as you describe; but probably none of it can be had now. It had the very bad habit of going all to pieces with an explosion on the slightest scratch or crack being made in it. This glass was made by tempering in a bath of oil, just as the Rupert drops are made in a water bath, and it was in the same strained condition, ready to fly into bits whenever a line of fracture was started. It truly was tough, but it had other qualities which were not to be endured. We have seen these lamp chimneys thrown as you describe. Had they cracked, they would have gone into a million pieces all around the room. It would not be nice to see a pitcher of water or a fruit dish of preserves suddenly disappear in dust mixed with the contents of the former dish. Nor would it be safe for the eyes to have the lamp chimney perform a similar trick as one sat reading by it.

(9821) G. J. B. says: Some time ago the American gave the receipt how to make a hektograph. Please give the formula. A. The hektograph, or copying pad, is very useful in copying writing or drawings when only a limited number of copies is required. A practical hektograph may be prepared according to the following directions: Soak an ounce of gelatine overnight in enough cold water to cover it well, taking care that all the gelatine is swelled. Prepare a salt water bath by dissolving 2 ounces of common salt in 1 pint of water. Heat 6 or 7 ounces of pure glycerine over the salt water bath to a temperature of 200 deg. F. Pour off from the gelatine all the water remaining unabsorbed and add the gelatine to the hot glycerine. Continue the heating for an hour, carefully stirring the mixture occasionally, avoiding as much as possible the formation of bubbles or froth. Finally add 20 drops of oil of cloves to prevent decomposition. The composition is now ready for pouring into the vessel designed to hold it while in use. This vessel may be made especially for the purpose, or a shallow cake tin may be used. After the tin is filled with the composition it must be placed in a level position, in a cool place, free from dust, and allowed to remain for at least five hours. To prepare the pad for use it is necessary to pass a wet sponge lightly over the face of the gelatine and allow it to nearly dry before taking the first copy. If this precaution is neglected the face of the pad will be ruined by the first transfer. The writing or drawing to be copied must be made with hektograph ink, using a new steel pen. After the writing becomes dry it is placed face down on the pad and rubbed gently on the back to insure the perfect contact of every part. After remaining on the pad for about a minute remove the original and proceed to take the copies by placing the paper on the pad and removing it therefrom, always beginning at the corner. After taking the desired number of copies, or when the impression is exhausted, the pad is to be washed lightly with a sponge wet in cold water. The pad is then allowed to dry before being used again. The washing is unnecessary when the pad is left unused for two or three days, as the ink will be absorbed so as not to interfere with making a new transfer. The pad unavoidably wastes away in use. If its surface should become uneven or should it be injured in any way, it can be restored by reheating it over the salt water bath and allowing it to cool as before described. Failure in making the hektograph results from either of the following causes: Inattention to the instructions; insufficient heating of the composition; the use of too much glycerine, which prevents gelatinization. The obvious remedy for the last difficulty is to use less glycerine or more gelatine.

(9822) A. J. C. asks how to transfer prints to wood. A. First varnish the wood once with white, hard varnish, then cut off the margins of the print, which should be on unsized paper. Wet the back of it with a sponge and water, using enough water to saturate the paper, but not so as to be watery on the printed side. Then, with a flat camel's hair brush, give it a coat of transfer (alcohol) varnish on the printed side, and apply it immediately, varnished side downward, on the wood, placing a sheet of paper on it and pressing it down evenly with the hand till every part adheres. After standing a short time, gently rub away the back of the print with the fingers, till nothing but a thin pulp remains. It may require being wetted again, before all that will come (or rather ought to come) off is removed. Great care is required in this operation, that the design or printed side be not disturbed. When this is done and quite dry, give the work a coat of white hard varnish, and it will appear as if printed on the wood.

(9823) P. M. B. asks for solders for nickel. A. For fine or high-grade nickel: Three parts of yellow brass, 1 part of sterling silver. For low-grade nickel: Fifteen parts of yellow brass, 5 parts of sterling silver, 4 parts of zinc (pure or plate zinc). Melt the brass and silver with borax for a flux, and add the zinc in small pieces, stir with an iron rod, pour into a slab mold, and cool slowly, when it can be rolled thin for cutting.

(9824) C. L. L. asks how to amalgamate zincs. A. This is accomplished in several ways: 1. By dipping the zinc in dilute sulphuric acid and then dipping the end of it into a small quantity of mercury, after rubbing the surface with a brush. 2. Dissolve 1 pound of mercury in 5 pounds of nitro-muriatic acid (nitric acid 1 part, muriatic acid 3 parts). Heat the solution gently to hasten the action. When a complete solution of the mercury is effected, add 5 pounds more of nitro-muriatic acid. The solution should be applied with a brush, as immersing the zinc in it is wasteful. 3. To the bichromate solution commonly used in batteries, add to every pint of solution 1 drachm of bisulphate of mercury or a similar amount of nitrate of mercury (mercury dissolved in nitric acid). By employing this method, the amalgamation of the zincs is maintained continuously after the first amalgamation, which must be accomplished by method 1 or 2. 4. In the Bunsen, Grove, or Fuller battery the amalgamation may be accomplished by placing a small quantity of mercury in the cells containing the zincs. 5. Place a little mercury in a saucer with some dilute sulphuric acid. Dip the zincs into dilute acid. Then with a little strip of zinc or galvanized iron touch the mercury under the acid and rub it on the zinc. This will transfer a little to the surface, and a few minutes' rubbing will make the zincs as bright as silver. A very small globule of mercury is enough for a single plate.

(9825) C. J. W. asks for a formula for gluing leather to iron. A. There is a constant inquiry as to the best plan for fastening leather to iron, and there are many recipes for doing it. But probably the simplest mode, and one that will answer in a majority of cases, is the following: To glue leather to iron, paint the iron with some kind of lead color, say white lead and lamp black. When dry, cover with a cement made as follows: Take the best glue, soak it in cold water till soft, then dissolve it in vinegar with a moderate heat, then add one-third of the bulk of white pine turpentine, thoroughly mix, and by means of the vinegar make it of the proper consistency to be spread with a brush, and apply it while hot; draw the leather on quickly, and press it tightly in place. If a pulley, draw the leather round tightly, lap, and clamp.

(9826) S. Y. G. asks how to remove silver nitrate stains in using the wet plate process in photoengraving. A. In the manipulation of the nitrate of silver bath solutions in photography, the operator frequently receives stains of the salt upon his clothing, which are not very attractive in appearance. Stains or marks of any kind made with the above silver solution or bath solution may be promptly removed from the clothing by simply wetting the stain or mark with a solution of bichloride of mercury. The chemical result is the change of the black-looking nitrate of silver into chromate of silver, which is whiter or invisible on the cloth. Bichloride of mercury can be obtained at the drug stores. 2. Sodium sulphite, 1 ounce; chloride of lime, ½ ounce; water, 2 ounces. Mix. Use a nail brush. 3. Dip the fingers into a strong solution of cupric chloride. In about a minute the silver will be converted into a chloride, and may then be washed off with hyposulphate of soda solution. 4. The immediate and repeated application of a very weak solution of cyanide of potassium (accompanied by thorough rinsings in clean water) will generally remove these without injury to the colors.

(9827) C. A. J. asks how to compute the elements of a safety valve. A. Let W = the weight, L = the distance between center of weight and fulcrum in inches, w = weight of lever in pounds, g = distance between center of gravity of lever and fulcrum in inches, l = distance between center of valve and fulcrum in inches, V = weight of valve and spindle, A = area of valve in square inches, P = pressure at which the valve is to blow off, per square inch. Then the weight required to balance a given pressure at any given distance on the lever will be by the formula:

$$W = \left\{ (P \times A) - \left(V + \frac{w \times g}{l} \right) \right\} \times \frac{l}{L}$$

When the weight is at hand and known, and the distance is required, then

$$L = \left\{ (P \times A) - \left(V + \frac{w \times g}{l} \right) \right\} \times \frac{l}{W}$$

The elements between the brackets to be computed first. To obtain the area of the valve, multiply the square of the diameter by 0.7854.

(9828) P. W. T. asks for a starch gloss.

A. Borax	2½ ounces.
Gum arabic	2½ ounces.
Spermaceti	2½ ounces.
Glycerine	6¾ ounces.
Distilled water	2¼ pints.

A few drops of some sweet-scented essence. Add 6 spoonfuls of the gloss to 6¾ ounces boiling starch.

(9829) A. J. asks how to temper gun springs. A. To temper gun springs, heat them evenly to a low red heat in a charcoal fire, and quench them in water with the cold chill off, keeping them immersed until reduced to the temperature of the water. Place an iron pan containing lard oil and tallow, in about equal quantities, over a fire, and place the springs therein, and heat the pan until its contents take fire; then hold the springs in the flames, turning them over and over and dipping them occasionally in the oil to keep them blazing; when the oil adhering to them blazes freely when they are removed from the flames, place them aside to cool off.

(9830) F. C. U. asks for a varnish for polished metal. A. Take bleached shellac, pounded in a mortar; place the bruised fragments into a bottle of alcohol until some shellac remains undissolved; agitate the bottle and contents frequently and let the whole stand till clear; pour off the clear fluid. This forms the varnish. Warm the metal surface, and coat with a camel hair brush. If not perfectly transparent, warm the varnish before a fire or in an oven until it becomes clear. Common orange shellac answers equally well, and for large surfaces even better, as it is more soluble than the bleached variety, and coats more perfectly, but care must be taken not to use the varnish insufficiently diluted. 2. Digest 1 part of bruised copal in 2 parts of absolute alcohol; but as this varnish dries too quickly, it is preferable to take—

Copal	1 part.
Oil of rosemary	1 part.
Absolute alcohol	2 or 3 parts.

This gives a clear varnish as limpid as water. It should be applied hot, and when dry it will be found hard and durable.

(9831) R. L. N. says: 1. Please explain to me an alternating current, how it is made, and why it is used? A. An alternating current is produced in all dynamos. This is changed into a direct current by the commutator on the armature shaft of direct-current dynamos. There are no dynamos which generate direct currents. The alternating current is now used very widely without changing it into a direct current because it requires a much simpler machine, it can be transmitted to a distance much more easily, and transformed to higher or lower voltages much more cheaply than can the direct current. 2. How fast does smell travel without any air currents, or does it not travel at all? A. We have no data as to the velocity with which odors can diffuse themselves. We do not suppose there is a single velocity, but that different odors are transmitted with different speeds. There is no reason why odoriferous particles should not be diffused through space in the same manner as other gaseous or solid particles. 3. Would this not be a good cause of the Northern Light: Reflection of sun's rays on the northern ice? But if it is really caused by electricity, *how* is it caused? A. It does not seem to us to be probable that the Aurora Borealis is caused by reflected light. One fact against this theory is that the aurora is most common in the winter when the Arctic regions are in the darkness of continual night. There is no sunlight there at that time. There is no other reasonable theory for the aurora except that it is an electrical phenomenon in the higher regions of the atmosphere. 4. I have an electric pocket light, and where the contact point touches the battery there is formed a little black spot on the battery which stopped the current. I had to file it off before the lamp would light. Please tell me what it was and what caused it? A. The heat at the contact point of your battery burned the metal, forming an oxide, which is not a conductor of electricity. Consequently, no current could flow until you had removed the black layer of oxide.

(9832) H. D. F. asks: Please advise through Notes and Queries column if it is advisable to connect lightning rods (by riveting and soldering) to a metal roof at various points, and connecting the roof with the ground through a regular lightning-rod cable, which passes down and is insulated from the side of the building by glass insulators. Is it necessary that these rods be connected together on the roof by a separate metal conductor, and if so, should not the whole system be insulated from the metal roof and sides of the building by some form of insulators? A. Lightning rods should be connected as firmly as possible to all metal work on the roof or upper part of a building. It is well to tie all cables together by cross cables or wires. Glass insulators should not be used, but the rods should be closely connected to the building, and, most important of all, a good moist ground should be provided at the lower end of the rod. We have many times given good plain instructions about lightning rods in Notes and Queries.

(9833) J. H. B. asks: In taking a thin piece of sheet copper or brass and placing a common stitching needle or some other piece of steel on the surface, and in moving a horseshoe magnet under it the needle will follow the magnet; but at the same time the magnet will not attract the copper, or anything of that nature. Now, can you kindly inform me of any thin material, say not over 1-32 or 1-8 of an inch in thickness, that will effectually break the current of magnetism? A. No material can cut off the action of magnetism excepting iron, and this must be thicker than 1-8 inch to do it effectively. Iron acts as a screen for magnetism by furnishing an easier path for the magnetic lines of force than air furnishes.

(9834) T. S. P. asks: Can you inform me whether or not electricity finds in molten brass or copper a better conductor while in this hot fluid state than in the usual hard state, and if a very powerful current of electricity was turned on to a pot of melted brass, would it move the liquid from positive to negative side? A. Melted metals are not as good conductors as they are in the solid condition. All metals have a positive temperature coefficient, which is to say that their electrical resistance increases with rise of temperature. A liquid conductor may be made to move by a powerful current of electricity, but we doubt whether one could see any such motion in a pot of melted brass.