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 This is for our information and not for publication.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.

(9335) H. B. says: We are a constant reader of your valuable paper, and we would like to know some process for tinning small cast-iron and malleable-iron castings. We have used the following without success: We used for a bath muriatic acid cut down with zinc and added one-third water, but it did not seem to take. After we melted the tin on the furnace, we placed the castings in, without the desired effect. A. You will obtain better results by first cleaning the castings thoroughly in a bath of muriatic acid 2 parts, water 1 part (hot) and scrub free from adhering dirt in hot water. Then dip for a few minutes in the saturated solution of chloride of zinc and water as you describe, with sal ammoniac dissolved in the solution to saturation. Sprinkle a little sal ammoniac on the melted tin, and clear the surface before dipping the castings.

(9336) A. B. writes: One pound of dry wood requires about six pounds of air for combustion. Now if one pound of wood is placed a few inches into the ground and left for decay, a slow combustion takes place, and the same amount of oxygen is required. How is the oxygen supplied? By the air through the pores of the ground, or by other sources, and in what proportion? Of course the wood is getting wet and dry alternately, and is exposed to the chemical action of the surrounding soil. A. Air penetrates the ground to the depth of the subwater surface, and thus aerates our well water. It flows into and out of the surface of the ground with every change of the barometric pressure, and thus supports animal and vegetable life beneath the surface of the earth. By contact with the moisture in the earth, air is absorbed by the water and its constituents separated, and by contact the oxygen unites with the carbon and other constituents of wood and other vegetable matter by slow combustion, while the nitrogen is absorbed by the living vegetation in developing growth. It was long since found by Bunsen that a decomposition of both air and water took place in a small degree in aerated water; the air of which, when freed from water by heat, was found to have oxygen in excess, while the water contained ammonia from the union of the nitrogen of the air and the hydrogen of the water. Thus the constituents of both air and water in the form of moisture, by chemical change of their elements, contribute to the decay of other forms of matter by slow combustion, and to sustain vegetable life by adding the constituents necessary to its growth.

(9337) C. W. W. writes: 1. Owing to long-continued cold weather, many water pipes have frozen. These are iron pipes 1¼ to 2 inches in diameter and buried four feet or over. Could you give me the name of some inexpensive chemical or other means of thawing these pipes? A. The most approved method of thawing water pipes under-ground now is by the electric current. See SCIENTIFIC AMERICAN No. 12, Vol. 90, March 19, 1904, on "Thawing Out Water Pipes" (10 cents mailed). Otherwise a small pipe inserted into the house end of the service pipe with steam pressure has done good work where the service pipe has been straight. There are no chemicals that will do the work. 2. What per cent of the energy in fuel (soft and hard coal, crude oil or gas) is utilized in the most approved steam engines? A. About 20 per cent of the energy of the fuel is now utilized for power in the steam engine. 3. Can you give a formula for a cement suitable to mend rubber boots, coats, or gloves by attaching a piece of the same material over the break or tear? A. Use rubber cement for mending rubber goods. It can be obtained through the rubber trade.

(9338) P. J. T. says: In a certain electric lighting and heating plant three ordinary tubular boilers with outside firing are used. The grates cannot be shaken, neither is a poker ever used to stir up the fire. When it must be cleaned, the live portion is pushed to the rear end, and the remaining ashes pulled out. The live fire is spread evenly over the grates, and covered with a thin layer of nut coal. This soon makes a nice clean fire—to look at—for a short time; but when necessary other thin layers are thrown on, no poking or shaking being done, until a layer of ashes 3 inches or 4 inches thick has formed on the grates. This is the continual practice. I hold the opinion that in this way 10 or 15 per cent of the value of the coal is wasted, in unconsumed gas going up the chimney, more than would be with intelligent and efficient hand firing, where the light in the ashpit would show a clear, bright fire nearly all the time. A. If all the coal is burned by the method described, and the cleaning of the fire is done at the noon hour, we can see no objection to the method of firing, and the actual loss must be found in the good coal in the ashheap, if any. The slicing of the fire at stated times during the day is also a good practice when properly done, so as to pass the ashes through a close grate without wasting coal. Much depends upon the strength of the chimney draft as to which method of firing is practised. There should be no more waste of unconsumed gases by the chimney in either method of firing with nut or buckwheat anthracite coal. With bituminous coal both methods above described are defective.

(9339) W. A. B. asks: 1. Does the *swing* of a lathe mean the *diameter* or the *radius* of the largest piece of work which can be turned in that lathe? A. The swing of a lathe is the diameter of the largest piece that can be turned. 2. In using an ordinary three-fall tackle, is there anything gained by having the double block on the moving load, or is the direct pull on the free end equalized by the falls? A. In a three-fall tackle, composed of a two and a three sheave block, the two-sheave block should be on the moving load, with the end of the rope in the eye of the block, when with the downward pull the power will be one to five. By reversing the blocks and pulling in the direction of the moving load, using all the sheaves, the power will be one to six; but in hoisting a load with the three-sheave block next to the load, one of the sheaves cannot be used with a down pull, and the power will be one to four. 3. What causes the flash of light when a metal scoop is thrust into ordinary granulated sugar which has become hard from dampness? A. The flash is probably electric, caused by the sudden separation of the crystals of sugar. 4. Will the following gears run, or will there be a deadlock? Shaft No. 1 has a 6-inch gear meshing into a 3-inch gear on shaft No. 2, and also a 3-inch gear meshing into a 6-inch gear on shaft No. 2. A. There will be a deadlock unless one of the gears runs loose on its shaft.

(9340) R. H. G. asks: Am I asking too great a favor in asking you to give me, through the Notes and Queries column, a list of the elements and compounds occurring in sea water, and their percentages? A. Ocean water is not of definite composition. Tarr's Physical Geography places the percentage of pure water in the ocean at between 96 and 97, the remainder being divided between several salts. Common salt is most abundant of these. There is an appreciable amount of magnesium chloride, carbonate of lime, several sulphates, and minute quantities of other substances. Probably some compound of every known element is to be found in ocean water. There are also atmospheric gases dissolved in the water. The range of solid constituents in various oceans is from 3.3 to 3.7 per cent. If more definite numbers were given, they would simply be the analysis of some particular specimen.

(9341) L. M. H. says: Will you kindly explain the following described phenomenon through the SCIENTIFIC AMERICAN for the benefit of several persons interested? There is a large slough about eighteen miles south of Los Angeles, Cal., and about thirty miles from the nearest mountains, and eight miles from San Pedro Bay. Its bottom is perhaps thirty feet above high tide and ten feet below the surface of the surrounding country. In the summer it goes entirely dry, and deep cracks open in the bottom; but in the autumn just before the rains commence, the water begins to rise, and at first may be seen far down in the cracks, and continues to rise until it is several inches deep all over the bottom of the slough. The water does not begin to rise at any exact time in the season, but may vary a month or two in different years. Yet it always puts in its appearance a week or two before the rains commence in either the valley or surrounding mountains, and is regarded by the people of that vicinity as a never-failing sign of rain. A. We cannot venture a positive opinion as to the cause of the action of the water in the slough you describe. It would seem as if the heat of summer were enough to account for the drying up of the bottom, and perhaps the cooling of the autumn in advance of the rains would account for the appearance of the water in the bottom earlier than the rains. Evaporation in summer is more rapid than the inflow of water at the bottom of the slough. As the evaporation decreases in autumn the water begins to accumulate, since the evaporation is less than influx.

(9342) C. M. K. asks: Will you please give directions under Notes and Queries for producing cold artificially in a small way for the purpose of testing a thermometer? A. To test the freezing point of a thermometer, pack it in pounded ice, keeping the tube as far as the freezing mark in the ice. For temperatures lower than this you may make a mixture of 8 parts sodium phosphate and 5 parts hydrochloric acid. A temperature of about zero Fahrenheit can be produced with this mixture.

(9343) A. S. asks: Is decarbonized steel capable of being highly magnetized? Can you give formula for calculating velocity of steam at different pressures? Also what should be the piston-pressure (as compared with boiler pressure) for best results? Will steam at 100 pounds pressure and working at 50 pounds piston-pressure flow as fast with 50 pounds pressure, doing no work? A. Decarbonized steel is capable of being magnetized in the same way as wrought iron. The formula for the blow of steam into the atmosphere is $3.6 \sqrt{h}$ = velocity in feet per second; h is the height in feet of a column of steam of uniform density at any given pressure due to the evaporation of one cubic foot of water. For 100 pounds absolute pressure the proportion is as follows: 62.5 :100 : :270 :432 and 432 × 144 = 62208 feet. Then $3.6 \sqrt{62208}$ = 898 feet per second, the velocity of steam through an orifice at 100 pounds absolute pressure. Steam doing work behind a piston or otherwise cannot flow as fast as when flowing into the atmosphere.

(9344) A. F. G.: Queries to receive attention must be accompanied by the names and addresses of correspondents. You will find formulas for household ammonia in our SUPPLEMENTS 1108, 1208, 1411, and 1430. Price, 10 cents each.

(9345) J. F. W. asks: Will you please answer the following through queries column? What causes the buzzing in a telephone receiver from an electric light dynamo? Would a ground circuit line be affected more than a metallic circuit? How can it be prevented? A. The buzzing in a receiver of a telephone whose line passes near the wire from an electric light dynamo is due to the waves of the electric current from the dynamo. These produce a current in the telephone, and make the same tone which the dynamo current makes. The dynamo is probably an alternating current machine. The remedy is a metallic circuit, with the two wires twisted around each other at frequent intervals. A line with a ground return cannot be cured of the difficulty.

(9346) J. W. N. asks: What is the highest degree of temperature that water may be made? What is the boiling point of grease or fat? A. Water cannot be heated above 212 deg. Fahr. at the sea level when the barometer registers 30 inches. At that temperature it boils and becomes steam. Above the level of the sea the boiling point is lower, and when the barometer falls, the water boils at a lower temperature. We should not suppose grease had any boiling point, since it only boils at all because of contained water. Pure grease would simply rise in temperature till it turns black by overheating. It has then decomposed into carbon and other constituents.

(9347) R. C. says: I write to ask you a few questions with regard to an X-ray inductor that I have made, or rather been trying to make. Put 250 feet No. 18 on primary. About 5 pounds of No. 32 on secondary. Secondary wire is double silk wrapped. Used an iron core solid. Result, ½-inch spark; could not get a bit more. Used four cells Edison primary battery, 150 ampere hours each. What is the trouble? I think the thing should give 4-inch spark anyhow. A. The first error in winding your coil is the use of too much wire in the primary. Two layers of wire are enough. You have nearly 2 ohms in the coil when a small fraction of an ohm is better. A No. 12 wire wound in two layers is the rule for a coil of this size. The iron core should be made of soft iron wire; No. 18 at the largest. The secondary should be of No. 36 wire. You should get Norrie's "Induction Coils," and study it. We sell it for $1. You do not mention a condenser at all.

(9348) A. P. writes: The SCIENTIFIC AMERICAN some time ago decided that an ordinary telephone current is an alternating current. Kindly tell us what a direct current is. By your decision every current in existence is alternating. A. The transmitters now in general use contain carbon, either in granulated form or in older ones as a small ball, and the action of the transmitter depends on the varying conductivity of carbon under pressure. A current of electricity flowing through the transmitter is thus made to vary in intensity by the action of the voice. This current is a fluctuating direct current. Its circuit is completed through the primary of an induction coil. So far as we know, this is never called the telephonic current. The induced current in the secondary of the induction coil flows over the line to the distant receiver. This current is alternating, and is what is ordinarily referred to as the current used in telephoning. It is to this that we referred in the note to which exception is taken. We can quote no higher authority than Miller's "American Telephone Practice," in which he says: "It should be remembered that the current in the primary circuit is an undulating one, and is always in the same direction. The current in the secondary, however, is alternating in character, changing its direction completely with every large fluctuation in the primary current. This latter feature is also productive of better results than would be the case were the current in the line wire of an undulatory character." We do not see how any other view can be taken. An induction coil always gives an alternating current, when the current in the primary is varied in intensity to a considerable degree and the secondary circuit is a closed one. It is true that the old form of telephone used an undulatory current on the line, but these are entirely out of use, unless between houses or rooms in houses where an up-to-date service is not required, or cannot be afforded.

(9349) H. J. L. asks: 1. What amount of moisture does air gather by its being passed or caused to bubble up through water? A. The quantity of moisture that will saturate air when bubbled up through water depends upon the temperature of both air and water. The amount of water required to saturate each cubic foot of air at 62 deg. Fahr. is 6¼ grains. Ordinary dry air, so called, is about 50 per cent of saturation, and contains 3⅛ grains of moisture, and if it leaves the water saturated, it will have absorbed 3⅛ grains per cubic foot of air. This may be increased to four grains at 70 deg. and 5¼ grains at 80 deg. Fahr. 2. Can the dust be removed from air by passing the air through sieves (thin cloth) or water? A. Dust may be removed from air partially by passing slowly through a dry muslin or two thicknesses of cheese cloth, and totally removed if the cloth strainers are wet by sprinkling with water. 3. Will dry cold air, upon mixing with dry warm air, cause any moisture to form? A. So-called dry air in its natural condition is never dry, but contains about 50 per cent of the moisture of saturation, so that it depends entirely upon the relative temperatures and proportions of cold and warm air mixtures required to produce visible vapor. 4. If ordinary outside midwinter air is brought in contact with warm dry air, will any perceptible amount of moisture be formed? A. The same conditions as above stated apply to the admission of cold winter air into warm rooms, as cloud or vapor condensation will entirely depend upon the relative saturation of the air.

(9350) J. N. says: I would esteem it a great favor if you would kindly let me know at your convenience, through the Notes and Query column, how to obtain a green finish on brass goods, resembling verdigris. I think the color is named verde antique. A. For verde antique on brass, wet the articles with dilute acetic acid for a short time, and alternate with a solution of sal ammoniac in water until the desired color is obtained. Or by another method, dip in a solution 1 part permuriate of iron in 2 pints of water until the desired color is obtained. Washing, drying, and brushing or burnishing complete the process.

(9351) H. M. asks: 1. What would the candle power of an incandescent lamp be at 50 volts and 1½ amperes? A. An incandescent lamp will give one candle for from 2½ to 4 watts. Fifty volts and 1½ amperes are 75 watts. The lamp may then give between 20 and 50 candles; perhaps 32 candles would be a good result. 2. Can you tell me the reason why a few cells of batteries that will furnish a spark through 50 feet of wire will not impart the least shock to a person when holding the wires, and a hand power dynamo capable of giving a powerful shock will not make the least spark, and will not give a shock to a person through 3 feet of copper wire. Is it due to the difference in E. M. F. of the batteries and magneto? A. The spark and the shock are due to the self-induction of breaking the circuit of the battery or dynamo. It would require several hundred cells of battery to give a shock directly to one holding the ends of the wires leading from it. If there were cells enough, the voltage of the direct current would send enough current through a man to give a shock. Let the man take the wires in his hands, while connected to the battery; that is, while the current is flowing through them, and pull the circuit open between his hands, and he will get a shock from the self-induction. The same is true of the dynamo. Any voltage up to 110 can give but a feeble shock by touching the poles; but if while holding the wires the circuit is broken between the hands, a shock will be felt. The electromotive force of the current produced on breaking the circuit is much greater than the electromotive force of the current while flowing steadily. 3. Is it known at what voltage an electric current will give a powerful shock to an ordinary man? A. The resistance of the human body is in the neighborhood of 5,000 ohms, as an average. Men differ greatly in this respect. The voltage necessary to force current through a human body therefore differs in the same degree. What will give one man a severe shock will not seriously affect another. Then, too, the shock of the alternating current is worse than that of the direct current. A trolley current has killed persons, we understand. This is 500 volts direct.

(9352) A Reader asks: Please inform me through your paper, if possible, where I can get some light on the subject of the mono-rail system of railroad. The one to which I refer has a name which I remember as the "Mallet" mono-rail. It was discussed in one of the scientific papers, the date of which I do not remember. So far as I recollect, it is a Belgian invention, and patented in that country. Any light that you can throw on this subject will be greatly appreciated by a number of persons interested. A. Queries must always be accompanied by full name and address. The mono-rail system is that with a single rail. It has been illustrated and described in SCIENTIFIC AMERICAN Nos. 33, 141, 420, 476, 513, 584, 640, 911, 991, 992, 1014, 1109, 1125, 1422; 10 cents each, mailed.