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 This is for our information and not for publication.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.

(9955) J. A. K. asks: 1. In your issue of March 24, page 258 (9921), you say that the buoyant power of a tank, open at the bottom, decreases as it is sunk deeper into the water, since water enters and compresses the air into a smaller volume. You say that the above is true, since the only point involved is the volume of water displaced. Is it not the weight, instead of the volume, of water displaced that is involved? Would not the difference in buoyancy depend on the comparative difference in density of air and water, at the surface and at a distance below the surface? If the compressibility of water is greater than that of air, would not the buoyancy increase with the descent of the tank? Which has the greater compressibility—water or air? I have no books which will answer this question for me. If the compressibility of water is less, as your statement implies, why does sound travel a greater distance in water than in air? A. The reply to your inquiry regarding the compressibility of water and air is that water is nearly incompressible, and air is compressed to half its volume by an increase of pressure of 15 pounds per square inch. This increase is produced by sinking the box to a depth of 34 feet in water. When the box is 34 feet below the surface, the air will occupy only half the box; the rest will be filled with water, which is of almost the same density as at the surface. Water is compressed only 44 millionths by a pressure of 15 pounds per square inch. The velocity of sound in water is not due to its density. It travels slower in denser substances. Sound travels much faster in iron than in water or air. The velocity of sound is produced by the elasticity of the substance, as well as by the density of the substance. The velocity in any substance varies directly as the square root of the elasticity divided by the square root of the density. See any textbook of physics. 2. In the same issue, page 258 (9928), you say that July is the midsummer month of the southern hemisphere. Is not the sun directly over the Tropic of Capricorn on December 21, and hence is not December the midsummer month of the southern hemisphere? A. The second item to which you call our attention is a slip in the types. The midsummer in the southern hemisphere is at the same time as the winter in the northern hemisphere. Every one knows that fact, and no one will be misled by the error, which was not detected in reading the proof.

(9956) J. P. M. asks: Would you kindly decide this argument: 1. A says you cannot make water hotter than 212 degrees, as it then becomes steam. B says water can be made hotter than 212 degrees. A. Water cannot be heated above its boiling point in an open dish. When the barometer stands at 30 inches, water boils at 212 deg. Fahr. At the sea level the temperature of boiling water fluctuates about 5 degrees, due to changes in the pressure of the atmosphere in storms and fair weather. Water in boilers can be heated above 212 deg., and is always hotter than 212 deg. in steam engine boilers when steam is up. 2. A argues that all watches are the same as far as works are concerned; that is, a $5 watch or $100 one has just the same amount of works. We do not mean quality. B argues that good watches have extra works in them. A. The works of cheap watches are very coarse and rough. Those of fine watches are highly finished, and run with much more perfect regularity. Some watches have more wheels than others. This is a question the nearest watch repairer can settle for you.

(9957) E. P. writes: In your column of the issue of March 24, 1906 (page 257, query 9919), I notice that you put an interval of 5, 6, or 11 years between years having 53 Sundays. In the list of such years you omit the years 1916, 1944, and 1972. Now these leap years will begin with a Saturday and end with a Sunday, having 53 Saturdays and *also* 53 Sundays—the two extra days a leap year has over 52 weeks. Should not these years be included in the list, and the interval placed at 5 or 6 years only? A. By some inadvertence we missed the leap years mentioned by our correspondent from the list of years having 53 Sundays in the present century.

(9958) B. W. writes: Query 9916, by J. A. R., Scientific American, March 17, 1906, page 238, "Will you account for the universal idea among seafaring men that ice sinks?" Answer: The floating or sinking of ice in water depends upon the relative specific gravity of each. Clean ice will always float in water, until it dissolves into water. Ice may become so loaded with other matter as to cause its specific gravity to be greater than the water beneath it, and it sinks. My business from 1871 to 1878 caused me much travel over the Missouri River, from Springfield, Dakota, on the north to White Cloud, Kansas, on the south, a distance of about one hundred and seventy-five miles, during all seasons of the year. The Missouri River water is dirt thick. The Winnebago Indians call it Ne-shuda (*shuda*, dirt; *Ne*, water), dirtwater. The river's wide valley is a windy country, and clouds of fine sand may be seen almost daily passing over its waters. It is very winding in its course southward, and has a swift current. Ice upon its surface sometimes forms four feet in thickness, and generally sinks when warm weather comes. The thickness of the ice having then been diminished by the heat, and the sand and dirt upon and within the ice remaining intact in weight, the specific gravity of the remaining ice becomes greater than that of the water, and it sinks. The same rule of nature is applicable to account for the sinking of icebergs within southern latitudes. There ice is slowly formed in glaciers, and weighted by sand and stone ground from the rocks and earth during their gradual descent to the ocean, into which they are dropped. As the iceberg journeys southward into warm latitudes and currents the ice is gradually melted, the stones, sand, and dirt remain in their original weight, the specific gravity of the mass becomes greater than that of the water, and what is left of the iceberg sinks beneath the ocean. "The universal idea among seafaring men that ice sinks" is correct under certain conditions. A. The origin of the universal idea cannot be explained by the fact that it is sometimes true in exceptional circumstances. The editor in his boyhood lived near the sea, and also large fresh-water ponds. Every one believed that the ice sank when it disappeared in the spring. The query referred to asks for the origin of that idea, not for an explanation why ice may sink by becoming heavier than water from accretions of foreign matter. That is a very different question. The editor thinks the idea originated from the frequent disappearance of ice in a night during a warm rain, as he has often known it to do. We used sometimes to say it had gone out, sometimes that it sank. Both phrases are in local use. Neither probably is true. The ice disintegrates, or breaks up into prisms and floats in small pieces, so that the surface looks to be entirely composed of water, as it largely is. Seen from a distance one can see no ice. Where has it gone? "It has sunk," say the native and the sailor; while it is really floating just at the surface in small pieces, too small to be seen.

(9959) E. J. writes: I would like you to answer this: I have a core ⅝ inch diameter, 7 inches long, made up of No. 22. The primary is wound with two turns No. 18, secondary ¾ pound No. 36. I wound two layers, one on top of another, then insulated them. I did this all through the coil. I used 4 and 5 volts in the primary, and have been unable to get a spark ⅝ inch long. I made the tinfoil as per sketch. A. A coil made with a primary with only *two turns* of wire will not give a spark at all. It should contain *two layers* of wire. The use of so much insulation between the layers of the secondary is unnecessary, and reduces the spark, since it removes the wire too far from the primary. To say that you "used four and five volts in the primary" means nothing. If you had said you used so many *amperes*, we could then judge the matter. Two or three good cells will give current enough for a little coil such as you describe. Probably a quarter to three-eighths inch is all the spark you can obtain from it. It is better to get a good book like Norrie's "Induction Coils," which we send for $1.00, and follow the directions carefully in building a coil. Time and money will be saved by first finding out what should be done, and afterward doing it.

(9960) A. N. asks: 1. I am winding the secondary of a 1-inch spark induction coil in four main sections (page 11, Norrie's "Induction Coils"). Would it increase the insulation in each of these sections to wind the wire on in layers, separating each by paraffined paper, or would this heighten the tendency of the spark to jump through it? A. We do not advise you to change the construction of the coil you are making after Norrie's plans. Follow plans closely. Added insulation between layers in secondary is not needed, else Norrie would have said so. You will injure and not improve your coil by putting paper between the layers, because you will separate the layers farther from the primary. The outer layers will be in a very weak magnetic field if you put the paper in as you propose. Follow plans closely. 2. How far will 1-inch spark send a wireless message with the receiver described in Supplement No. 1343? A. A 1-inch spark will send a wireless message a great distance, but not the spark from a coil only capable of making a spark 1 inch long. A great coil with the terminals 1 inch apart will have much more power than a small coil will with its terminals as far apart as it can send a spark. A 1-inch coil might perhaps send a signal one mile over water, and 1,000 feet over land. 3. In regard to ohms, would not a fine wire offer less resistance to a small current than a large current? Therefore, ought not some voltage be given in stating number of ohms resistance? A. The resistance of a wire is entirely independent of the current which is flowing through the wire. An ohm is an ohm without reference to the amperes flowing through the wire. Amperes should not be stated; if they should, all the books would state them. The writers know their subject. 4. If a relay is wound for 100 ohms, does that mean it will work through 10 ohms resistance? A. A 100-ohm relay has 100 ohms of resistance in its coils. It is usual to specify the distances to which relays will operate, rather than the resistances through which they will work. With magneto ringers it is usual to specify the resistance through which they will ring. An 80,000-ohm ringer is one which will ring through that number of ohms. 5. How thick glass will 1-inch spark pierce? A. With a proper condenser a 1-inch spark coil might pierce glass a few thousandths of an inch thick, though we have our doubts about its piercing any thickness of glass. We have never tried it, and no data exist for so small a coil. 6. In X-rays, do you take a photograph of the image on the fluoroscope or through a camera, or just let the shadow fall on the plate? A. With X-rays the shadows cast by dense objects are allowed to fall upon a photographic plate which is wrapped in black paper. No camera is used for making an X-ray picture, or skiagraph. 7. In an induction coil, if there is enough current to jump through air, why does not it jump through the thin insulation? A. Paraffine, shellac, and the rest are better insulators than is the air, so that the spark jumps through air between the terminals of a coil rather than through the insulation in ordinary discharges. Sometimes the insulation is pierced and the coil ruined.

(9961) H. T. asks: The "ion" theory suggested to me the following little experiment. Into a drawn-out piece of hard glass tubing of this form put various salt solutions, such as Na_2SO_4, $MgSO_4$, etc., and a very small drop of mercury, just large enough to act as a sort of movable stopper in the capillary tube. In introducing a current of about 8 volts, I found that the mercury traveled speedily toward the electrode and back again, when the current was reversed. If the experiment was carried on for some time, the mercury "thread" seemed to suffer a strain, and frequently broke in two; polarization of the electrodes may have had something to do with that. Has this experiment been tried before, and is there any reason why the metallic ions might not be the cause of the motion of the mercury? A. The experiment you send us you will find in Hopkins's "Experimental Electro-Chemistry," page 12, which we can send you for $3.00. It was published a good many years ago, we think, first by Wallace Gould Levison, in the American Journal of Science. The direction of migration of the mercury to the negative pole indicates that its ions are electro-positive. The tube used for this experiment need not be capillary.

(9962) A. K. D. asks the advisability of using an electric motor in a barn for threshing purposes, to be run by a gasoline engine about 300 feet away, to which a dynamo is attached. The engine develops 18 horse-power. If a 10-horse-power dynamo were used, what horse-power motor could be successfully used? A. We see no reason why an electric motor could not be used in a barn for threshing or running any farm machinery. The commutator could be protected from dust, and the danger from fire be made so small as not to be considered. A 10-horse-power dynamo should deliver 90 per cent of its power, or 9 horse-power, to the motor.

(9963) C. W. says: Inclosed please find ten cents in stamps in payment for the copy of Scientific American containing your explanation of the so-called puzzle of cutting sixty-four squares to make them sixty-five. I know that you published the correct solution within the last few months, but have mislaid or lost my copy of the paper, so send for one. There are some "wise guys" in this neck of woods who think they can make the extra square out of nothing, and won't believe me until they see your paper. A. The paper you request is Scientific American, vol. 93, No. 2, issue of July 8, 1905. We publish your letter because letters about this old trick, which seems to die hard, have begun to come into our office again. We wish our friends would believe that it is impossible to make 8 times 8 anything but 64. Credulity seems to be easy in the human mind.

(9964) S. asks: Will you please state whether or not it is possible for a man to take without killing him 75,000 or 100,000 volts of electricity? A. The killing of a man by electricity does not depend upon the voltage of the current at all, certainly not directly upon the voltage. It is the amperes which destroy life by acting upon the nerve centers. The volts simply determine how many amperes shall flow, if the generator furnishes them. This is according to Ohm's law. Amperes are equal to volts divided by ohms. Ohms are resistance. Volts are pressure and amperes are current. This is just like pressure and quantity in flow of water in pipes, and the friction of the pipe to oppose the flow of the water. Now if a generator is able to furnish a large current at a high pressure the man will be killed by it, but if only a small current can be furnished the man may not be killed. If the resistance of the man is large, say 5,000 ohms, and the voltage moderate, as say 500 volts, only one-tenth of an ampere can flow, and that will not instantly kill, but it will give a smart shock. Voltages such as you name are not usually large except upon long-distance transmission lines, and then they are very dangerous, since the amperes are usually large also. But the small generators and the electrical oscillators which have such high voltages have only minute amperages, and a current from these is insignificant and harmless. From what we have said it is evident that volts do not enter a person, nor travel at all. They simply push the current, electricity, along. Men do not take volts of electricity. Men take amperes, and amperes do the work or damage as the case may be.

NEW BOOKS, ETC.

The Art of Lead Burning. By C. H. Fay. New York: David Williams Company, 1905. 12mo.; pp. 144. Price, $2.

The author justly states that the mystery which has always surrounded the work of the lead burner, like that of all other handicrafts outside of ordinary occupations, dissolves under the light of a full knowledge of the causes and effects that have a bearing upon it. The author has produced a thoroughly practical book which can be used with advantage by the practical mechanic. The greatest field for the lead burner is in the chemical trades. The illustrations are numerous and enlightening.

Lippincott's New Gazetteer. A Complete Gazetteer or Geographical Dictionary of the World. Edited by Angelo Heilprin and Louis Heilprin. Philadelphia and London: J. B. Lippincott Company, 1906. 4to.; pp. 2,053. Price, sheep, $10 net; half morocco, $12.50 net; patent index, 50 cents extra.

A noble book, indispensable in every library, public or private, and will be found useful in any office. This work has been before the public for just half a century. The present edition is not the usual patched-plate book, but is a brand new edition, being printed from new type from cover to cover. This publication is an accurate picture of every corner of the globe in its minutest details as it exists in the twentieth century. Statistics of population, production, mining, manufactures, physical history, exploration, general history, etc., have been gathered from the latest official censuses, domestic and foreign. Each one of its 100,000 notices, varying in length from a single line to thousands of words, speaks for itself. A vast amount of labor has been expended in search of special information not to be found in official reports or the ordinary books of reference.

Technisches und Tägliches Lexikon. By Oscar Klinckfleck. Berlin: Boll & Pickardt, 1906. Pp. 48. Price, 2 marks per installment.

This technical and practical German, English and French dictionary is to be published in some seventeen installments of about 48 pages each. The author's professional and technical experience has enabled him to produce a book which promises to be of great value not only for purposes of translation, but in general technical literature as well. At the present time the first two numbers have been issued. As the title indicates, the book deals principally with technical terms, including those of military, naval, and general scientific parlance, but it will undoubtedly be extremely useful in the discussion and translation of many practical industries and arts, as well.

Ventilation of Buildings. By William G. Snow, S.B., and Thomas Nolan, A.M., M.S. New York: D. Van Nostrand Company, 1906. 32mo.; pp. 83. Price, 50 cents.

Messrs. Snow and Nolan have concisely and clearly defined the essential principles of ventilation in this practical little book. The mechanics of the science have not been gone into, but have been left for another volume in "Science Series." The work deserves wide circulation, particularly among members of boards of health, physicians, and others where time is lacking to go thoroughly into the theory and principle of the subject, and where a practical handbook is a first requisite. It also might well be used in medical and engineering schools where this important subject is not dealt with exclusively as a division of the curriculum.

Steam Turbines. By Carl C. Thomas. New York: John Wiley & Sons, 1906. 8vo.; pp. 287. Price, $3.50.

Prof. Thomas, well known as a member of the faculty of Sibley College, Cornell University, has produced in this book a theoretical work on the subject of the steam turbine of no little value. The book is well illustrated with diagrams and engravings, and treats the difficult subject in a clear and brief manner. It is not a handbook for the use of the untrained, practical engineer, but is of undoubted value as a text book for theoretical study. Prof. Thomas, despite the fact that the development of this particular utilization of steam has been so rapid that many of the problems involved are still to be solved satis-