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 This is for our information and not for publication.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.

(9865) W. S. asks: 1. Why is twilight so much longer in England than in Spain or North Africa? Is it true that the period of twilight increases as we approach the poles, and if so, what is the cause of the increase? A. Twilight lasts till the sun is about 18 deg. below the horizon in the evening at any place. The sun in the torrid zone descends vertically in setting, and the duration of twilight is least in this region of the earth. The sun traverses 18 deg. in 1 hour and 12 minutes, which consequently is the shortest duration of twilight in the torrid zone all the year. The path of the sun makes the least angle with the horizon in the northern hemisphere in the summer, and hence a longer time is required to bring the sun 18 deg. below the horizon. Twilight then lasts about 2 hours in latitude 40 deg. north. On the Arctic circle the sun at the summer solstice just touches the northern horizon, and daylight lasts through the 24 hours. There is no night. At the north pole twilight is about 2½ months, or from the middle of January to March 22, when day begins. Duration of twilight can be calculated for any latitude at the sea level by trigonometry. At high altitudes above the sea twilight is said to be of shorter duration than at lower altitudes, due probably to the clearness of the air from dust. We have seen it stated that it is not more than twenty minutes at Quito. 2. Is there any means of determining the voltage and amperage of a current after passing through a Ruhmkorff's coil? Could you give approximately an idea of the voltage and amperage of a current which has passed through a coil that yields a spark of six inches, and that is worked by seven Grove cells (ordinary size)? A. The voltage required to force an electric discharge through air has been determined for various conditions. It is found to be different between needle points from what it is between balls. It varies also with the size of the balls. Between sharp points about 20,000 volts are represented in a spark one inch long, while for six inches about 72,000 volts are required. These voltages have been determined by experiments with alternating currents. With direct currents also many tests have been made, using batteries giving enormous pressures. 3. When lamps are lighted by electricity from alternate-current dynamos, how is it that the light appears constant and does not seem to flicker? I suppose commutators cannot be used with continuous-current dynamos. In the alternate-current machine does not the current enter the lamp alternately by opposite wires? A. An alternating current is the result of an alternating electromotive force, which is conceived to start from zero and rise to its highest point of voltage, then to fall through zero to a point as far below zero as it rose above zero, after which it returns to zero, thus making a cycle of changes. The polarity of the current is reversed while the E. M. F. is below zero. The fluctuation of lamps is not visible under such a current, because the changes are more rapid than the eye can take note of. The shortest interval of time the eye can note is about a tenth of a second, while the alternating current passes through 30 to 60 cycles per second. A commutator can be used with a continuous-current dynamo whose voltage is not too high and current is low enough. The transformation of a direct to an alternating current is usually made by a rotary converter or a motor dynamo. We furnish Sloane's "Electrician's Handy Book," which discusses all such matters, for $3.50 by mail.

(9866) C. O. B. writes: I send you this letter with inclosed salt formation, in the hope that I may get some explanation, published or otherwise, as to its cause. A. You inclose a very nice crystal of common salt, which is known in chemistry as sodium chloride. If you will dissolve some table salt in water and set the dish in a quiet place, such crystals will begin to form as soon as the solution becomes saturated by the evaporation of water. The crystal of common salt is a cube when it is formed without interference. Sometimes little baskets of crystals form, and float on the surface of the water, and are very beautiful when seen under a magnifying glass. The repetition of such experiments is very instructive and entertaining to the young people of a family.

(9867) J. E. W. asks: 1. If at the equator a hole 2 feet wide pierced the earth through its center, and a ball a half inch in diameter were dropped into the hole, I figure that in about nine and one half seconds, and at a depth of about 1,440 feet the ball would impinge against the east side of the hole, because at that depth the earth would be revolving a little over one-tenth of an inch slower than at the surface; and from that point down to the center the continually decreasing speed of revolution would cause the ball to press continually against the east side. Supposing, now, that there were neither air nor friction to retard the ball, would it acquire the same velocity as if it could have fallen without touching the side; and would it rise again to the opposite surface of the earth? A. The best experiments to determine the easterly deviation of falling balls, according to Prof. Young in his "College Astronomy," showed from 160 trials, a deviation of 1.12 inches in a fall of 520 into a mine. If a ball were dropped into a hole in the earth it would in time come against the side of the tube and roll down to the center of the earth and pass some distance beyond the center. How far no one can tell, since it depends entirely upon the degree of friction upon the sides of the hole. It could not rise as far as it had fallen, since it could not pass the center with the full velocity due to free fall. 2. If the earth were a hollow sphere inclosing a vacuum, and a rock fell from the inner side, would it not gradually assume a convolute course till it reached a point where its increasing momentum would equal the earth's decreasing attraction, and at that point begin to revolve in a circular orbit? If so, at what depth would this occur? A. If the earth were a hollow shell a rock which had become detached from its interior surface could not fall at all. A body anywhere within such a shell is equally attracted in all directions and has no weight. This is usually demonstrated in text books of mechanics. 3. In such a sphere a ball falling from either pole would go to the center direct and rise again to the opposite pole; but if as in the case of the earth, the poles themselves had a slight rotatory motion in space, would not the ball be gradually deflected into a circular orbit? A. A ball falling along the polar axis of the earth would not be deviated at all in the time required to fall from the surface to the center of the earth, since the deviation of the pole is very slow and very small.

NEW BOOKS, ETC.

DYNAMO, MOTOR, AND SWITCHBOARD CIRCUITS. By W. R. Bowker, C.E. New York: D. Van Nostrand Company, 1904. 8vo.; pp. 120. Price, $2.25 net.

The present work is not intended as a theoretical textbook, but is intended as a practical handbook for electrical engineers and artisans. The diagrams are conspicuous by their great clarity.

THE TEMPERATURE-ENTROPY DIAGRAM. By Charles W. Berry. New York: John Wiley & Sons, 1905. 12mo.; pp. 134. Price, $1.25.

Students of thermodynamics will value this treatise by an instructor in mechanical engineering at the Massachusetts Institute of Technology. The subject is dealt with mathematically with the aid of diagrams It will prove a valuable addition to the literature of the subject.

CONCRETE. Edited by John Black. London: John Dicks. New York: Industrial Publication Company. N. D. 16mo.; pp. 94. Price, 20 cents.

ARTIFICIAL STONE, ETC. Edited by John Black. London: John Dicks. New York: Industrial Publication Company. N. D. 16mo.; pp. 92. Price, 20 cents.

THE DELUGE AND ITS CAUSE. By Isaac Newton Vail. Pasadena, Cal. N. D. 16mo.; pp. 133.

METALLURGIA DELL' ORO. By Emilio Cortese. Milan: Ulrico Hoepli, 1904. 32mo.; pp. 262.

METALLI PREZIOSI. By Antonio Linone. Milan: Ulrico Hoepli, 1901. 32mo.; pp. 315.

INDEX OF INVENTIONS

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