

graphs cannot possibly refer to bodies falling in a vacuum seems to be shown by the sentence: "Take a piece of cork in one hand and a bullet in the other, and drop these two objects at the same moment from the same height." A. The article which you quote from the Encyclopædia Britannica was written by Prof. Ball, Astronomer Royal of Ireland at the time he wrote it. It is hardly likely that he was in error on so simple a matter as the fall of a cork and a bullet from the hand to the ground. Have you tried it for yourself? Had you done so, you could hardly have written the letter to us. The experiment is simple. So are others given by Prof. Ball. Try them till you are convinced that it is the matter of the earth which draws bodies down to its surface, and that the rate of fall is not dependent upon the weight or the density of the body falling. This was demonstrated by Galileo at the Leaning Tower of Pisa before the immortal demonstration of the law of gravitation by Newton. The paragraphs you refer to have no dependence upon the other fact that the lightest and heaviest bodies fall alike in a vacuum. They refer to the fact that all moderately heavy bodies fall practically alike through the air. Very light things are retarded enough by the air to have their rate of fall changed by the resistance of the medium through which they are falling.

(10183) H. M. asks: 1. Why are the guns on battleships not larger than 45 caliber, 12-inch? Is it because they are strong enough, or because an ordinary ship is unable to carry larger guns? A. 45 calibers is found to be the maximum length which can be used to advantage for the 12-inch gun. The greater length would prove cumbersome, and necessitate larger turrets to accommodate the greater weight back of the trunnions. 2. By what formula is the displacement of ships known before they are launched? A. The displacement of ships is found by calculating the cubical bulk of the ship below the water-line. 3. Would it be possible to build torpedo boats of say 400 tons with a speed of 45 knots? A. In the present state of the art it would be impossible to build a hull of 400 tons displacement which would float horse-power necessary to give a speed of 45 knots. The "Viper," a torpedo boat of slightly over 400 tons, holds the record for speed of slightly over 36 knots an hour. The horse-power increases as more than the cube of the speed, and hence the weight of the engines to give a propeller thrust suitable for a speed of 45 knots would be altogether prohibitive. 4. a. A description of the 21-inch torpedo in use in the United States navy. A. The United States 21-inch torpedo was described in the SCIENTIFIC AMERICAN of January 6, 1906. b. A description of the 45-centimeter torpedo in use in the German navy. A. We are not aware that any data regarding the German 45-centimeter torpedo have been made public. 5. Is there any work giving complete statistics of all rapid-fire guns in use in the large navies? A. Brassey's Naval Annual gives full statistics. 6. Please put an article in your paper that treats of the new ships now building in England, i. e., "Dreadnought," "armed cruiser," "Orion," T. B. destroyer "Afridi," and the special type torpedo boat that is intended to make 36 knots per hour. A. The "Dreadnought" was illustrated and described in the issue of the SCIENTIFIC AMERICAN of August 25, 1906. We have no data respecting the other vessels mentioned.

(10184) E. R. asks: Will you please state in your query column how many revolutions the earth makes in 365 days? A. The earth makes 366 revolutions on its axis in 365 solar days. One rotation of the earth on its axis is completed when a star which was due south last night is to-night in the same position. Since the earth is also moving in an orbit around the sun, the star seems to reach the south point about four minutes earlier each night than it did the previous night. The earth must turn on its axis about four minutes of time more to bring the sun to the same place day by day. This extra time constitutes the difference in length between the solar and the sidereal day, and in a year causes that there shall be one sidereal day more than there are solar days. There are 365 solar days and 366 sidereal days in each year. The sidereal day is the true measure of the rotation of the earth on its axis with reference to a star or to a fixed point in absolute space.

(10185) H. B. C. asks. 1. Why is it that a light, when put into a 110-volt circuit, will not short-circuit the current, while a piece of small copper wire of about the same length as the filament of the lamp, when placed in the same position, will immediately short-circuit? I have found it to be a fact that when an incandescent light's globe breaks, the filament does the same as the piece of copper wire, provided, of course, that the current is on. Do I not, therefore, have reason for thinking that the air has something to do with this? A. When the globe of an incandescent lamp breaks, the hot filament is instantly burned by the oxygen of the air just as any other piece of carbon would be. The current is not short-circuited by the filament. The flash of light which is seen is due to the chemical action of burning the filament, and not to any electrical action. When the circuit is bridged by a short copper wire, the resistance of the copper wire is small and a large flow of amperes takes place, which heats and melts

and also burns the copper. This is what is meant by a "short circuit." 2. How may a small, practical, 110-volt current electric heater be made? Is not German silver wire the best for this purpose? A. If you want an electrical heater which may be attached to a lamp socket, wind about 200 to 220 ohms of fine German silver wire on porcelain tubes and mount in some convenient fashion. SUPPLEMENT 1112, price 10 cents, contains valuable data concerning electrical heaters. 3. What is the smallest size of wire allowed by the Fire Underwriters' Association for wiring building with 110-volt current? I have been using what is known as No. 14 rubber-covered for my outside, and No. 14 weather-proof for my inside wiring. In this am I meeting the requirements or not? A. No. 14 wire is allowed by the Underwriters to carry 12 amperes in rubber insulation, and 16 amperes in other insulations. 4. Do wires necessarily need to be soldered in joining them to make them more electrically and mechanically perfect? A. In good work wires are always soldered at junctions to other wires. No other connection is allowed.

(10186) J. C. E. says: 1. In what probable way does Edison expect to utilize cobalt? Can he use the chlorine gas from it as a motive power? If not, how to use it in storage batteries? A. We regret to say that we are not able to answer your inquiry, "In what probable way does Mr. Edison expect to utilize cobalt?" etc. It would be a hazardous thing to attempt to tell what Mr. Edison will probably do, or may be expected to do. We doubt if he tells any one, even if he knows himself, what he expects to do. We may say that there is no chlorine in cobalt, and no motive power in chlorine. We are sure that Mr. Edison does not expect to find either of these results in his investigations. 2. In antebellum days here in North Carolina, by rubbing a pocket knife blade across the points of the old flat strap iron on the railroad track, the blades of the knife so rubbed became highly magnetic, capable of lifting iron or steel objects of considerable weight, a fourpenny nail or larger perhaps. I have so done often myself, but after some forty years cannot say positively I raised anything heavier than a fourpenny nail. Have tried the present T-iron rail repeatedly, with no magnetism resulting at all. Why is this? The magnetic properties were then well known, but do not know if I can now establish the fact by another witness than myself. A. Any magnetizing of a knife by stroking it on a rail was due to the fact that the rail was a magnet. If the old experiment cannot now be repeated, it is because the present rail is not a magnet. 3. From what source does the ocean derive its intense saltiness, and how retain same in uniform strength? A. The salt now in the ocean has been in the past ages washed out of the land or dissolved from beds of salt in the earth to which the water gained access. The saltiness remains, since all the water which evaporates from the ocean is fresh water. The original water was fresh. It became salt by dissolving salt from the earth. 4. Why are the conventional number of guns (21) fired in honor of the President of the United States? Is it by Congressional enactment? Why 21 and not 13 for original in thirteen States? A. The firing of 21 guns as a salute for the national flag, the President of this or other countries, or the sovereigns of foreign states, is an international custom.

(10187) O. B. writes: 1. There seems to be an idea that artificial ice does not keep so well as natural. Is there any truth in the statement? A. Artificial ice frozen rapidly is not usually as dense as natural ice, which forms slowly and rejects the contained air more completely. The air can be seen in a cake of artificial ice in the middle of the cake. When artificial ice melts, it separates into prismatic pieces, because of its less density. These features of artificial ice seem to us to account for the impression that it does not keep as well as natural ice, that is, that it has not so great cooling power by the cubic foot as natural ice. A pound of artificial ice should be equal to a pound of natural ice. 2. In winter in the north temperate zone, in fact everywhere north of the equator, the sun shines at sunrise and sunset on north sides of houses that face due south. Has refraction of the sun's rays anything to do with that fact? A. Your second query reads as follows: "In winter in the north temperate zone, in fact everywhere north of the equator, the sun shines at sunrise and sunset on north sides of houses which face due south. Has refraction of sun's rays anything to do with that?" We do not understand the fact to be as you state it. At the autumnal equinox in September, the sun rises in the east and sets in the west the world over. In that position the sun's rays at rising and setting would glance along the north and south sides of a house which faces south. The same is true at the vernal equinox. From September 22 till December 22 the sun moves to the south, till on the latter date in your latitude it rises about 29 degrees south of the east point and sets the same distance south of the west point. It is obvious that its rays cannot in these positions shine on the north sides of houses which face south. Refraction could not produce any such effect as this. It changes the apparent position of the sun on the horizon about the diameter of the sun, or about a half degree; more exactly, 34 minutes of arc.

NEW BOOKS, ETC.

DICTIONARY OF ENGINEERING IN ENGLISH AND SPANISH. By Andres J. R. V. Garcia. New York: Spon & Chamberlain, 1906. 32mo.; pp. 150. Price, \$1.

The user will find some 3,000 technical terms in this little dictionary. The author provides two indices, one in Spanish and one in English, and the former will be found specially valuable in translating from Spanish into English. The English index has been made as complete as possible without causing it to become too voluminous. The book is well adapted to satisfy the demand for an up-to-date technical dictionary of the terms in general use by engineers using one or the other language.

ILLUSTRATED TECHNICAL DICTIONARY. Vol. I. Compiled by K. Deinhardt and A. Schlomann, Engineers. New York: McGraw Publishing Company, 1906. 16mo.; pp. 403. Price, \$2.

This is the first volume of the American edition of a series of technical dictionaries prepared by K. Deinhardt and A. Schlomann, eleven volumes being in contemplation to give successively the industries of electricity, steam, hydraulics, mechanical handling of railways, bridges and structures, metallurgy, architecture, and naval construction. The dictionary is published on a new plan, and one that appears more nearly to meet the numerous requirements of thorough technical work of this character. The main feature is the classification whereby related subjects are brought together, the reference to any particular subject being obtained through a general index of the terms for all the languages covered. These are six in number. In addition to the German, English, French, etc., terms, the symbol or illustration of the term is frequently given. The work seems carefully prepared, with few typographical errors, and should be found useful by engineers and other technical men. The present volume treats of titles used in metal and wood work, drafting and general terms, machine design, and general machine-shop terms.

CATECHISM ON PRODUCER GAS. By Samuel S. Wyer, M.E. New York: McGraw Publishing Company, 1906. 24mo.; pp. 42. Price, \$1.

The author utilizes the effective question and answer method for imparting considerable valuable information regarding producer gas and its manufacture. Both the questions and the answers, 287 in number, are concisely and clearly stated. The catechism will doubtless be found useful by engineers as well as non-technical men interested in this subject.

DIRECTORY OF THE ALUMNI OF STEVENS INSTITUTE OF TECHNOLOGY. Hoboken, N. J.: Stevens Institute Alumni Association, 1906. 32mo.; pp. 132. Price, 50 cents.

This booklet should prove useful not only to the large number of Stevens alumni, but in general to any one desiring the services of an engineer or technical man. The first part of the text comprises an alphabetical list of the graduates of the Institute, with reference to the following pages upon which these names will be found. The alphabetical list is followed by a geographical list with county and State divisions and urban subdivisions. This is followed by a geographical list of countries, including foreign residents. The fourth and main subdivision of the book comprises a business directory, in which the alumni are grouped under the various industries in which they are actively engaged.

ELECTRICITY OF TO-DAY. Its Work and its Mysteries. By Charles R. Gibson, A.I.E.E. Philadelphia: J. B. Lippincott Company, 1907. With 39 illustrations. 16mo.; pp. 344.

In this book Mr. Gibson has given us a popular account of electricity as it is applied in everyday life. In spite of the fact that he has avoided the use of technical language, he has been able to discuss the various subjects which have fallen within the scope of his book with a fair amount of thoroughness. Among the more important topics which are discussed may be mentioned electricity in medicine, electric traction, electric heating and cooking, electro-chemistry, electricity from heat, lightning, telegraphing with and without wires, electric measurements, theories of electricity advanced by modern thinkers. The book is excellently printed and well illustrated.

THE MANAGEMENT OF ELECTRICAL MACHINERY. By Francis B. Crocker, E. M., Ph.D., and Schuyler S. Wheeler, D.Sc. New York: D. Van Nostrand Company, 1906. 12mo.; pp. 223. Price, \$1.

The simple directions and useful hints for the management and practical utilization of dynamos and motors contained in this book of Drs. Schuyler and Wheeler first appeared as a series of articles in the Electrical Engineer some fifteen years ago. The arrangement is so that the different subjects are treated separately and in proper order, with headings of heavy type to facilitate reference to the subdivisions. The volume is intended to be simply the basis of a more elaborate treatment of the subject in a future work, but as such will be found of value. The present edition is, of course, brought up-to-date in all its phases.

POLYPHASE CURRENTS. By Alfred Still. New York: Whittaker & Co., 1906. 12mo.; pp. 352. Price, \$2.50.

The use of polyphase alternating currents for the transmission and distribution of electric power is becoming so extended, that the present volume should prove a welcome addition to the literature of the subject. The book treats in a non-mathematical way of the theoretical considerations involved in polyphase work. Practical engineers and students without the necessary mathematical knowledge required for the study of more advanced works will find the text and illustrations of value in obtaining a clear and comprehensive knowledge of the subject. The non-mathematical treatment of polyphase currents has been made possible to a large extent by the author's extensive use of graphical methods.

PERPETUAL CARE IN AMERICAN CEMETERIES. Reprinted from Park and Cemetery and Landscape Gardening, with additions of criticisms, and forms of contracts used by different cemeteries. Chicago: R. J. Haight, 1906. 12mo.; pp. 62.

LAYING AND FINISHING HARDWOOD FLOORS. By Frank G. Odell. New York: David Williams Company, 1906. 12mo.; pp. 50. Price, 50 cents.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending October 16, 1906.

AND EACH BEARING THAT DATE [See note at end of list about copies of these patents.]

Acetylene generator, E. R. Angell	833,148
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Air brake appliance, H. C. Luck	833,534
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