graphs cannot possibly refer to bodies falling tence: 'Take a piece of cork in one hand and a bullet in the other, and drop these two ob-
jects at the same moment from the same jects 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 the time he wrote it. It is hardly likely tha he was in error on so simple a matter as th
fall of a cork and a bullet from the hand $t$ the ground. Have you tried it for yourself Had you done so, you could hardly have writ ten the letter to us. The experiment is sim-
ple. So are others given by Prof. Ball. Try them till you are convinced that it is the mat ter of the earth which draws bodies down to
its surface, and that the rate of fall is no its surface, and that the rate of fall is no
dependent upon the weight or the density o dependent upon the weight or the density o
the body falling. This was demonstrated b Galileo at the Leaning Tower of Pisa befor gravitation by Newton. The paragraphs you 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 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 lo advantage for the 12 -inch gun. The greater tate 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 displace-
ment of ships is found by calculating the 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 displace
ment 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 prohibitive. 4. a. A description of the 21 -inch torpedo in use in the United States navy. The United States 21-inch torpedo was de-
scribed in the Scientific American of January 6 , 1906. b. A description of the 45 -centi meter 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 ship armored cruiser- "Orion," T. B. destroyer hat is and the special 36 knots per hour A. The "Dreadnought" was illustrated and described in the issue of the Scientific Ameri
can of August 25, 1906. We have no data especting the other vessels mentioned.
(10184) E. R. asks: Will you please state in your query column how many revoearth 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 each night than it did the previous night. The earth must turn on its axis about four min人. ies 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. T e 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 as the filament of the lamp, when placed in 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, Bave 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 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 copper wire is small and a large flow $\overbrace{o f}$, by a short copper wire, the resistance of the
copper wire is small and a large flow $\overbrace{\text { of }}$
amperes takes place, which heats and melts
and also burns the copper. This is what
meant by a "short circuit." 2. How may small, practical, 110 -volt current electric heater be made? Is not German silver wire the
best for this purpose? A. If you want an lectrical heater which may be attached to a amp socket, wind about 200 to 220 ohms of
ine German silver wire on porcelain tubes and mount in some convenient fashion. Supple ount in some convenient fashion. Supple 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 in-
side wiring. In this am 1 meeting the re side wiring. In this am 1 meeting the re
uirements or not? A. No. 14 wire is allowed quirements or not? A. No. 14 wire is allowed
by the Underwriters to carry 12 amperes in 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 tr wire No other connection is allowed.
(10186) J. C. B. says: 1. In what robable way does Edison expect to utilize cobalt? Can he use the chlorine gas from it motive power? If not, how to use it in 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 hing to attempt to tell what Mr. Edison will robably do, or may be expected to do. We oubt if he tells any one, even if he knows imself, what he expects to do. We may say ive power in chlorine. Wh cobalt, and no mo Edison does not expect to find either of these results in his investigations 2 , In antebellum days here in North Carolina, by rub bing 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
r larger perhaps. I have so done often my or larger perhaps. I have so done often my-
self, 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 we then well known, but do not know if I can myself. troking it on a rail was due to the fact tha he rail was a magnet. If the old experiment annot now be repeated, it is because the presdoes the not a magnet. 3. From what source ow reain dere in iniform saltiness, and 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 wate gained access. The saltness 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 fresh. It became salt by dissolving salt from ber of guns (21) fired in honor of the Presi ent of the United States? Is it by Congre onal enactment? Why 21 and not 13 for 21. guns as a salute for the national flag the President of this or other countries, or the sovereig.
custom.
(10187) O. B. writes: 1. There seems to be an idea that artificial ice does not keep well as natural. Is there any truth in the is not usually as dense as natural ice which orms 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 ty. 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 has not so great cooling power by the cubic hould be equal to a pound of natural ice 2. In winter in the north temperate zone, in hines at sunrise and of the equator, the sun houses that face due south. Has refraction of the sun's rays angllilug to do with that In winter in the north temperate zone, in fact verywhere north of the equator, the sun hines at sumrise and sunset on north sides of of sun's rays anything to do with the fact?" e do not understand the fact to be as you ber, the sun rises in the east and sets in the est 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 quinox. From September 22 till December 22 hic sun moves to the south, tlll on the latter outh of the east point and sets the same dis tance 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 \& Cham berlain, $1906 . \quad 32 \mathrm{mo}$.; pp. 150 Price, $\$ 1$.
The user will find some 3,000 technical provides two little dictionary. The author 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 well adapted to satisfy the demand for an up-to-date techncal diction of the terms in other language.
llustrated Technical Dictionary. Vol.
I. Compiled by K. Deinhardt and
A. Schlomann, Engineers. New

York: McGraw Publishing Company
this is the first volume of the American edition of a series of technical dictionarie eleven volumes being in contemplation to give successively the industries of electricity, steam, hydraulics, mechanical handling of railways, bridges and structures, metallurgy, archite
ture, and naval construction. The dictionar is published on a new plan, and one that ap-
pears more nearly to meet the numerous requirements of thorough technical work of this character. The main feature is the classifica gether, the reference to any particular subject ether, the reference 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 use ful by engineers and other technical men. The present volume treats of titles used in meta and wood work, drafting and general terms,
machine design, and general machine-shop machine
terms.
Catechism on Producer Gas. By Samuel S. Wyer, M.E. New York: McGraw Publishing Compan
The author utilizes the effective question and answer method for imparting considerable and its manufacture Both the producer ga the answers, 287 in number are concisely and clearly stated. The catechism will doubtless be found useful by engineers as well as nontechnical men interested in this subject.
Directory of the Alumni of Stevens
Institute of Technoloer. Hoboken,
N. J.: Stevens Institute Alumni
Association, 1906. 32 mo ; pp. 132 Price, 50 cents.
This booklet should prove useful not only to the large number of Stevens alumni, but in 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 fol itate 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
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. 16 mo .; pp. 344 .
In this book Mr. Gibson has given us a n everyday life. In spite of the fact that he has avoided the use of technical language, he which have fallen within the scope of his which have fallen within the scope of his
book with a fair amount of thoroughness. book with a fair amount of thoroughness.
Among the more important topics which are discussed may be mentioned electricity in ne icine, electric traction, electric heating and woking, electro-chemistry, electricity from wires, electric measurements, theories of elec wires, electric measurements, theories of elec-
tricity advanced by modern thinkers. The book is excellently printed and well illustrated.
The Management of Electrical Ma Chinery. By Francis B. Crocker, E.
M., Ph.D., and Schuyler S. Wheler,
D.Sc. New York: D. Van Nostrand
Company, 1906. 12mo.; pp. 223 Price, $\$ 1$.
The simple directions and useful hints for dynamos and motors, contained in this book a Drs. Schuyler and Wheeler first appeared as some fifteen years ago. The arrangement is so rately and in proper order, with headings of heavy type to facilitate reference to the sub-
divisions. 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, found of value. The present edition is, of
course, brought up-to-date in all its phases.

Polyphase Clhaents. By Alfred Still. New York: Whittaker \& Co., 1906. 12 mo. ; 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 the literature of the subject. The book reats in a non-mathematical way of the heoretical considerations involved in polyithout the necessary mathematical knowledge thout the necessary mathematical knowledge will find the text and illustrations of value in obtaiming a clear and comprehensive knowldge of the subject. The non-mathematical treatment of polyphase currents has been made possible to a large extent by the author's exensive 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.; Chicago
pp. 62.
pp. 62.
ying and Finishing Hardwood Floors. By Frank G. Odell. New York:
David Williams Company,
1906 . David Williams Company, 1906
12 mo ; 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.
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given of the cost of manufacturing alcohol from farm products and using it in engines. French Flethods of Denaturization constitute the subject of a good article published in Scientific AmERICAN SuppleHow Industrial Alcohol is Made and Used is told very fully and clearly in No. 3, The Most Complete Treatise on the Mo= dern Manufacture of Alcohol, explaining thoroughly the chemical principles which underlie the process without too many wearisome technical phrases, and describing and illustrating all the apparatus required in an alcohol plant is published in cientific AMercan Supplamen 1603 , 604 and 1605. The article is by in Baudry
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