off, so that from the most economical points of cut-off, which for an ordinary engine may be from 15 to 30 per cent of the stroke, a saving of from 25 to 50 per cent of the power value of the steam may be made.

(9333) A. C. A. writes: In regard to note 9316, A. F. S., page 164, I think a reason why lightning is so seldom seen in winter is because the condensation is never so rapid as in summer. His own observation shows that the harder the shower, the greater display of lightning. Now to my mind the electricity is produced in the cloud in the same manner as the rain-drop, by cohesion of electrical parthe result of lightning, as if the electric discharge started from the top of the cloud at the same time as a drop of water, it would reach the earth first, as it travels faster. The greatest display of lightning I have ever seen was in June, 1889, when nearly ten inches of rain fell from 1.40 to 2.20 P. M., forty minutes. This was a local shower, did not rain over miles away from my point of observation in any direction, and I think I was in the center of it. There was no wind. The cloud did not move away, but just rained down until there was only a haze left. Even this remained full five hours after the rain ceased. This cloud could not have been electrified by induction from any other, for there was none other; clear sky all about. I observed the cloud at 11.30 A. M. directly overhead, and at 12.30 P. M. it had got quite black and was larger than when first noticed. At 1 o'clock my man and I went to work in a field, half a mile from house. I told the man we were going to get wet from that cloud overhead, and we did. There were about twenty flashes of lightning before any rain reached the ground, for the lightning flashes it would have been continuous. another; they mingle and become one, the instant the  $tw \bullet \mbox{ engines}$  are side by side. The steered like a ship, in some other direction. I have never seen any one who held the same idea as myself in regard to the formation of the electricity in the clouds, and I have asked many. Also have asked people to tell me as nearly as they could the size of a streak of lightning. I saw one strike a stump at least 30 inches in diameter, and the bright streak was breader than the stump. I was about 100 feet away, and looking at the stump at the time. Another time I saw one hit a barn a mile away, and the streak was as broad as a chimney on the house beside the barn, and the chimney was 26 inches wide. I could see the streak and chimney both at the same time; the barn showed fire in half  $\boldsymbol{a}$ minute. I saw one streak hit my wood pile, and it looked as large as a %-inch rod, and snapped like a gun cap, while there was a big crash on the opposite side of the house from the half a second later. This was a sliver from the main discharge, as I have frequently seen a flash divide into several small ones, and one when not over 100 feet from the ground, and the parts went away herizentally, while the main body was vertical. I have always watched the lightning whenever I could, and have seen some queer antics of it. theory of our esteemed correspondent does not reach to the point of explaining the origin of the electricity of the atmosphere. with electricity already present in the atmosphere. There is no difficulty in accounting for the rise of intensity of electrification in the thunder storm. The fact that the air is always in fair and stermy weather alike charged with electricity is more difficult to account for We cannot follow him in the measure of the diameter of a flash of lightning. The great enlargement of a bright line of light in comparison with its real size by irradiation prevents the testimeny of the eye from having much value in the case. The account of the cloudburst, as such heavy showers are commonly but erroneously called, is very interest-

(9334) W. A. H. and others ask: Please tell me the difference between nonlumineus radium and radium (lumineus). I refer to the article in your paper of January 2, namely: "A Home-Made Spinthariscope." light of itself, which can be perceived even the American brewer, they would not fulfill after long effort in the deepest darkness. When this requirements, for the reason that he embe luminous. The willemite is caused to glow thing apart. It was for the purpose of ful-by the radium, which does not of itself glow. filling American requirements that the present that the present been on the wane. Obsolete machinery and This is what is meant by the home-made sphin. Another was written From an examination methods contributed much to the decadence of (Continued on page 260)

thariscope. Prices quoted on chemicals a few weeks ago cannot be relied upon now, since these substances are rising very rapidly in have been decidedly successful in preparing a market value. Purple stains can be removed book of ready reference which the brewing, from type-keys with alcohol if the stains are malting, and auxiliary trades will find useful. aniline.

#### NEW BOOKS, ETC.

CASSELL'S POPULAR SCIENCE. Vol. trated. London, Paris, New York, will prove useful to all mechanics and Melbourne. 1903. Square 8vo., GRAPHIC STATICS. With Approx

The book which lies before us comprises a ticles in the warm air that was carried up series of articles well illustrated, and for the into the colder upper air, where the condensa nost part excellently written, describing in tion takes place. Now, if the rain-drop was simple, terse language the scientific causes of formed by cohesion of water particles until it the phenomena which play an important part in the phenomena which play an important particles that the phenomena which play an important play are important play an important play are important the result of rapid condensation, and rain not are a few of the more suggestive titles of these articles. Since this is but the first volume, it is hardly fair to call attention to several topics which, in our opinion, should have been discussed, since they may find a place in subsequent volumes. Among these topics we may, however, be permitted to suggest those of "Bessemer Steel," "Aerial Navigation," "the Telephone," and the "Steam Engine." The subjects which are treated in this volume, however, a very wide range. They include astronomy, natural history, chemistry, electricity, anatomy, and geology. Each article, so far as we have been able to judge, gives a very comprehensive view of the particular subject which it discusses. The book shows what can be done in the way of treating science popularly and yet accurately.

GENERAL ZOOLOGY. Practical, Systematic, and Comparative. Being a Revision and Rearrangement of Orton's Comparative Zoology. New York: erican Book Company. N. D. 12mo. Pp. 512. Price \$1.80.

The present textbook is suited to the needs and they were close, not over ten seconds of the general student, who wishes to learn apart. When the rain began we started for the principal facts and theories of zoology, and interpretation of analyses, the stability of shelter, but lost all sense of direction, as the thus to obtain a fairly comprehensive idea of masonry dams, flow of water through the pipes, shelter, but lost all sense of direction, as the thus to obtain a fairly comprehensive idea of rain was so thick we could not see, and but the science. To this end it has seemed de- and the general application of mathematics sirable to arrange a course of study, so that dark as night, but the flashes were almost the student may gain by personal observation continuous. The rain fell straight down, no a concrete knowledge of the structure and though some of the practice may be at variwind to drive it. I do not take any stock in activities of animals, and by so doing acquire ance with that of our own country. The formthe idea of electric generation by friction be-isome familiarity with the method of zoologi- ulas and diagrams are particularly to be comtween two clouds, nor by friction between cal investigation, so that he may also obtain a cloud and air currents, because the clouds do knowledge of the relationships of animals as not rub each other, any more than the exhaust expressed in an accepted scheme of classificasteam from one locomotive rubs with that of another; they mingle and become one, the inranged, and the book is illustrated by 379 engravings, many of which are from life. cloud goes with the current of air; is not note particularly an excellent photograph of a beaver at work.

> DIAGRAMMES ET SURFACES THERMODYNAMéditeur. 1903. Pp. 100.

ous chemistry by the ideas of Prof. Gibbs has contains some interesting field experiments constantly increased; and yet, even in its original English form, his work on thermo-dynamics remains comparatively inaccessible. The mon-ograph before, us is a French translation of two treatises on the geometrical representation of thermo-dynamic phenomena by means of diagrams and surfaces. The ideas of Prof. Gibbs have inspired many an interesting experiment for detecting the reactions which occur in thermic meters, by means of diagrams other than the exact figures of Clapenyron. The present work will doubtless find in France fully as welcome a reception as the original met with in English-speaking countries

TABLES AND OTHER DATA FOR ENGINEERS AND BUSINESS MEN. Compiled by F. E. Ferris, D.S. Nashville, Tenn.: University Press. 24mo. Pp. 152. Price 50 cents

An excellent little pocketbook adapted for the vest pocket. The tables are unusually well selected.

AMERICAN HAND BOOK OF THE BREWING, MALTING, AND AUXILIARY TRADES. A Book of Ready Reference for Persons and Auxiliary Trades. Together with Tables, Formulas, Calculations, Bibliography, and Dictionary of Technical Terms. By Robert Wahl, Ph.D., and Max Henius, Ph.D. Second Edition. Chicago: W. C. Keener & Co. 1902. 16mo. Pp. 1,266. Price \$10.

If ever a reference book represented original work, this does. Its editors had no precedent whatever to guide them. To be sure, there are books on bottom fermentation brewing as practised on the continent of Europe; but these are Also, how can purple stains be removed from in German. There are books on top fermentype-keys? A. Non-luminous radium is radium! tation brewing as practised in Great Britain. so low a potency or purity as to give no But even if all these books were available to a mixture of such radium and pulverized wille- ploys neither of the two systems mentioned nite is examined in the dark, it is found to exclusively. The American brewing industry is a

of its contents we are convinced that the work the industry. It has, therefore, been the aim is all that its authors desired it to be. They MANUAL OF SCREW CUTTING. By William

Simpson. Wollaston, Mass.: Published by the Author. 18mo. Pp. 72. Price 40 cents. Wollaston, Mass.: Pub-

This little manual deals with screws, screw Edited by Alexander S. Galt. Illus- cutting, and other mechanical powers. Ιt

> GRAPHIC STATICS. With Applications Trusses, Beams, and Arches. By Jerome Sondericker, B.S., C.E. New York: John Wiley & Sons. 1903. 8vo. Pp. 137, three folding plates. Price \$2.

This book is the outgrowth of an extended experience in teaching graphic statics at the Massachusetts Institute of Technology. While it deals specifically with problems encountered in building construction, it should be found serviceable to engineers and engineering studstrength of materials, including beam stresses and deflections, as these subjects are common-ly presented. The whole matter of graphic statics is a most important one in view of our modern system of building construction, and the book before us is a most thorough and excellent treatise on the subject.

WATER SUPPLY. A Student's Handbook on the Conditions Governing the Se-lection of Sources and the Distribution of Water. By Reginald E. Middleton. London: Charles Griffen & Co., Ltd. Philadelphia: J. B. Lippincott Company. 1903. 8vo. Pp. 168.

This is an excellent book for engineering students, as it sets forth in a compact manner the general scientific principles on which the subject is based, and serving as an introduction to larger and more technical works. Special prominence has, therefore, been given to such questions as the quality of the water, the to the subject. The book will prove of interest to those for whom it was written, even mended.

THE SUGAR CANE IN EGYPT. By Walter Tiemann. Altrincham, near Man-chester, England: International Sugar Journal. 1903. 16mo. Pp. 75, 16 plates. Price \$2.

The British occupation of Egypt, which dates from 1882, has been followed by remarkable progress, as the wonderful development of the IQUES. Par J. W. Gibbs. Traduction agricultural interests bear witness. While the de M. G. Roy, Chef des Travaux de technical and mechanical conditions in the fac-Physique à l'Université de Dijon. teries of the colonial sugar industry have made Avec une introduction de M. B. great strides in progress, the materia prima, Brunhes, Professor à l'Université the sugar cane itself, has in most countries de Clermont. Série Physico-Mather remained subject to the old primitive methods matique Scientia. Paris: C. Naud, of culture. The object of the present work is to outline the present methods, and to show The influence exercised on contemporane- how improvements can be made. The book

> THE LOCALIZATION OF FAULTS IN ELECTRIC LIGHT AND POWER MAINS. By F. Charles Raphael. London: The Electrician Printing and Publishing Company, Ltd. New York: D. Van Nostrand Company. N. D. 8vo. Pp. 205. Price \$3 net.

> The subject of the localization of faults in electric mains is a most important one and it appears to have been a rather neglected part of electrical engineering. Methods are  $c \bullet \mathrm{nstantly}$  changing, and the very latest are described in this second and revised edition. The author justly says that since the publication of the first edition, considerable progress has been made in the art of cable making and cable laying, and increased practice and experience have led to a nearer approach to perfection. This book should be in the hands •f all practical electrical engineers.

> ACETYLENE GAS. How to Make and Use It. By Cyril N. Turner. London: Percival Marshall & Co. N. D. 18mo. Pp. 62. Price 20 cents.

The author states that the inventor of the Connected with the Brewing, Malting, process was either an American, Willson, or Henri Meissan, the celebrated French chemist. We have never heard Mr. Willson's claim to the invention disputed. He certainly has everything very tangible in the patent line. This little book will prove of interest to ama-

> GENERAL DATA ON THOMSON RECORDING WATTMETERS. Schenectady, N. Y.: General Electric Company. 16mo: Pp. 217.

> All whe are interested in selling current will be glad of the present volume. It is filled with tables and diagrams.

> THE TECHNOLOGY OF SUGAR. By John Geddes McIntosh. London: Scott, Greenwood & Co. New York: D. Van Nostrand Company. 1903. 8vo. Pp. 408. Price \$4.50.

of the author to show the most modern metheds empleyed in this industry. There are a large number of books on sugar making, but there is ample room for the present book, which deals with the classification of sugar, beet sugar, cane sugar, sugar refining, and the se lection of sugars. All who are in any way identified with the sugar industry should have a copy of this book.

THE HOME MECHANIC. By John Wright. New York: E. P. Dutton & Co. 1903. 8vo. Pp. 435. Price \$3.50 net.

The present work deals with carpentry, metal work, repairs, steam engines, and similar subjects. The practice is English, but for that reason it would prove more useful to American readers. Still, however, it is thoroughly practical, and will prove to be a very useful book in the amateur's library.

A QUARTERLY ISSUE OF SMITHSONIAN MISCELLANEOUS COLLECTIONS

The Smithsonian Institution has commenced the publication of a Quarterly Issue of its ents generally. As a preparation the reader Miscellaneous Collections, "designed chiefly to should have a knowledge of statics and the afford a medium for the early publication of the results of researches conducted by the Smithsonian Institution and its bureaus, and especially for the publication of reports of a preliminary nature." The first number of the Quarterly Issue is a double one, and contains seventeen articles, ranging in size  ${\tt fr} {\tt \bullet m}$ 1 page to 73 pages, in addition to interesting and timely notes on the activities of the Institution, its collections, etc., the whole accompanied with fifty-six plates and numerous text figures.

> The scope of the journal is broad, the first issue embedying articles on Mammalogy, Astrophysics, Paleontology, Archeology, Geology, Ornithelegy, Ichthyelegy, Ethnelegy, etc., thus covering a considerable range of scientific subjects.

#### INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending March 15, 1904.

AND EACH BEARING THAT DATE

I See note at end of list about copies of these patents. I

| Adding-machine, W. H. Clark  |                                     |
|--|-------------------------------------|
| Air-braking systems, audible alarm for, J. F. Clark  Air-heater, J. Waterhouse.  Air or other gaseous bodies, compressor fo  H. C. Sergeant  Aluminum suifate, making, H. Spence.  Ammonium nitrate, making, W. Mills  Amusement apparatus, W. S. Reed.  Antiseptic telephone-mouthpicee, English  | 754,847<br>754,726                  |
| Air or other gaseous bodies, compressor fo<br>H. C. Sergeant   | r,<br>. 754,901                     |
| Aluminum sulfate, making, H. Spence<br>Ammonium nitrate, making, W. Mills  | . 754,824<br>. 754,668<br>. 754,698 |
| Amusement apparatus, W. S. Reed<br>Antiseptic telephone-mouthpiece, English  | . 754,698<br>&                      |
| Ten Broeck   | . 754,646<br>. 754,734              |
| Automobile lifting-truck, W. S. Kessler<br>Back-rest, folding, B. B. Billmyer  | . 754,571<br>. 754,536<br>. 754,580 |
| Amusement apparatus, W. S. Reed. Antiseptic telephone-mouthpiece, English Ten Broeck Apparel, wearing, L. S. Altheimer. Automobile lifting-truck, W. S. Kessler. Back-rest, folding, B. B. Billmyer. Bag-belder, Madden & Thompson Bale or package cover, I. Schlichter. Baling-press, T. F. Ormond. Baling-press, T. F. Ormond. Baling-press door-closer, E. Davis. Band-fastener, F. Sedimair. Barrel, F. E. Gage Battery. See galvanic battery. Battery tray, storage, T. A. Edison. Beams, securing strips of wood, etc., to froi S. Davis Bearing, ball, T. H. Duncombe. Bearing, conical roller, J. P. Cowing. Bedclothes-holder, H. Crocker. Bedstead attachment A. B. Shane. Beet-blocking machine, A. R. Mundt. Beit-fastener, I. Jackson. Bicycle-gearing, H. F. Maynes. Bicycle-gearing, H. F. Maynes. Bicycle-gearing, H. F. Maynes. | . 754,580<br>. 754,811              |
| Baling-press, T. F. Ormond   | . 754,493<br>. 754,853              |
| Band-fastener, F. Sedlmair   | . 754,714<br>. 754,923              |
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| Bedclothes-holder, H. Crocker  | . 754,430<br>. 754,615              |
| Beet-blocking machine, A. R. Mundt   | . 754,682                           |
| Belt-fastener, I. Jackson<br>Bib or faucet, C. Peck  | . 754,567<br>. 754,889              |
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|  |                                     |
| etc., F. B. Whitney<br>Binder, loose-leaf, J. L. Hanson  | . 754,628<br>. 754,760              |
| Binder, temporary, J. P. Mentzer<br>Bird-cage, J. A. Quelch  | . 754,791<br>. 754,806              |
| Blasting charges, machine for preparing, F   | . 754,830                           |
| Boll-weevil catcher, S. V. Ivey  Bult See Expansion holt.  | . 754,873                           |
| Bolting-sieve cleaner, C. A. Shultz  Bottle-filling apparatus J. Anderson  | . 754,821<br>. 754,951              |
| Binder and file for pamphlets, books, ledgers etc., F. B. Whitney. Binder, loose-leaf, J. L. Hanson. Binder, temporary, J. P. Mentzer. Bird-cage, J. A. Quelch. Blasting charges, machine for preparing, F. J. Trayssac. Boll-wevell catcher, S. V. Ivey. Bolt. See Expansion bolt. Botting-sieve cleaner, C. A. Shultz. Bottle-filling apparatus, J. Anderson. Bottle-filling machine, E. H. Parker. Bottle-stopper, non-refillable, J. G. Reddick  | 754,602                             |
| 754,607  | 754,608                             |
| Bottles, stopper for preventing refilling, G B. Okey B. Okey Brake-beam, A. Lipschutz Brake-beam, A. Lipschutz Brake-shoe, J. D. Gallagher Brake-shoe and producing same, C. G. Ette Brake-shoe holder, A. M. Pennock Branding implement, oil-burning, G. Fuller. Breastpin safety-catch, J. C. Nordt. Bridge and tailbiece, combination, E. Reacl   | . 754,685<br>. 754,456              |
| Brake-beam, A. Lipschutz   | . 754,456<br>. 754,785<br>. 754,440 |
| Brake-shoe and producing same, C. G. Ette  | 754,921<br>754,604                  |
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| Ruilding ate blocks ennerstus for meking   | . 101,101                           |
| J. Brower Building, etc., blocks, making, J. Brower. Burslar-alarm, N. A. Lyle. Bushing, G. & J. Strehl. Butter-separator, J. Meyrick, Jr. Button and tie, collar, H. L. Blais. Cabinet, kitchen, C. F. Kade.  | . 754,639<br>. 754,640              |
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|  |                                     |
| Cable-clip, J. McFarlane   | 754,548                             |
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| bordering, J. F. Ross  | . 754,941<br>s 754,702              |
| Can-making machine, J. G. & M.   Rehfuss 754.701   | , 754,940                           |
| Can tops and bottoms from forming-dies pneumatic means for removing, J. G. & M. O. Rehfus.  Cans, machine for putting tops and bottoms and J. G. & M. O. Rehfuss.  | ,                                   |
| M. Cong machine for putting tang and bottoms   | 754,704                             |
| Cans preparatory to being fluxed and sol dered, apparatus for heating, J. G. & M.  | 754,700                             |
| dered, apparatus for heating, J. G. & M.   | 754 703                             |
| O. Rehfuss Car-brake, H. E. & M. L. Brown Car-brake, emergency, S. A. Duvall   | 754,703<br>754,419                  |
|  |                                     |
| cock Car brake, passenger, M. Toltz Car counting W. E. Bichards  | 754,603<br>754,829                  |
| Car-coupling, W. F. Richards   | 754,706                             |
| cock Car-coupling, W. E. Richards. Car-coupling attachment, railway, W. Thomburgh Car discharging device, dump, Seaver &   | 754,942                             |

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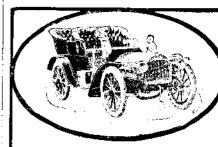
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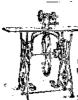
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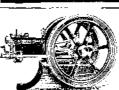
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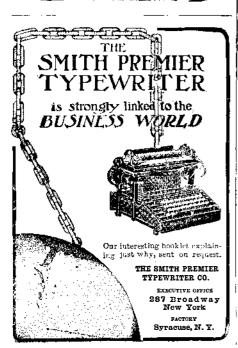
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Co. 10,839

"Lochinvar Old Highland Scotch," for whisky, New York Importation Co. 10,833

"Mape," for syrup, D. P. Ingham. 10,834

"March's Hair Health," for hair and scalp cleanser, J. G. March. 10,834

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"Purity Brand Condensed Milk," for condensed milk, United States Condensed Milk Co. 10,837

"Shamrock Flakette," for handkerchiefs, Acheson Harden & Co. 10,828

"Smith's Tender Joint Shoe," for shoes, C. G. Smith 10,820

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preparation, A. T. Knapp
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Embrocation Co.
"White Star," for gin, H. Gravier
"Wyoming Condensed Milk," for condensed
milk, United States Condensed Milk Co. 10,822 10.838 10,826 10,831 10,835

#### PRINTS.

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