

baffle it, stagger it, or what, to accomplish the best results without back pressure? A. Any form of exhaust chamber in which the force of the exhaust is divided and gradually expanded will deaden the sound. 8. What is the scientific reason for the noise at the end of an exhaust pipe of a gasoline engine? A. The noise of an exhaust is caused by its impact against the outer air. 9. Is there anything gained in radiating surface by having projecting ribs on gasoline engine cylinders? A. Anything that expands the air surface contact with the cylinder is a gain to air cooled cylinders. The ribs accomplish the desired extension of air-cooling surface.

(9450) W. A. K. asks: What books for instruction would you recommend to one who understands only the rudiments of electrical science and wishes to perfect himself in the art? A. The books required for the study of electricity depend entirely upon how you would study. If you would become an educated electrical engineer go to Columbia University and take the course. If that is impossible, you may be able to take a correspondence course at some of the correspondence schools. (The International Schools, at Scranton, Penn., are very large and can furnish you a good opportunity if you are determined to do good work.) It is hardly possible by study by oneself to become an electrician. Contact with machinery, instruments, and men doing the actual work are necessary. There is so much which is not in any book which must be known. You say you wish to "perfect yourself in the art." If that has its usual meaning that you wish simply to learn how to do electrical work, the best way to learn that is to obtain a position in an electrical shop and learn the art of making the apparatus; or in a construction company and learn the art of installing machinery, the line, etc.; or in a station and learn how to operate. There are many lines of learning from which you must choose one according to your means, and possibilities, of which you do not advise us any indications. Lastly, if what you wish to learn is electrical science, you can then begin with books and study either with or without a teacher, though far better with a teacher. You might start with "Swamp's Elementary Lessons," price \$2.00, go on into "Hawkins and Wallis' Dynamo," price \$3.00; take next "Thompson's Dynamo Electric Machinery," price \$7.50, and his other books; follow with "Crocker's Electric Lighting," 2 vols., price \$6.00; after this might come the transmission of power, electric railways, etc. There are books enough to last for many years of study for the man studiously inclined.

(9451) C. H. McC. says: Can you tell me where I can find a description of the apparatus used by Tesla to generate the high tension currents with which he was experimenting a few years ago? I believe he called his machine an "oscillator." If there are any Supplements describing these experiments please let me know the numbers. A. We have published a description of the high frequency coil in our SUPPLEMENT No. 1087, which are will send for ten cents. The United States Electrical Supply Company, Mt. Vernon, N. Y., make the apparatus, both for generating the electricity and for the experiments, thus furnishing a complete outfit which can be relied upon to do the work. These outfits are very highly spoken of.

(9452) O. H. says: Will you kindly inform me what is the best protection against lightning for telephones, viz.: to protect the ringer, coil, and building? Would you advise "dead ends" or ground connection when the phone is disconnected from the main wire? Is the lightning arrester now in use absolute protection? A. Lightning arresters, which will be furnished by the telephone company, are the best protection for telephones from lightning. There can be no such thing as "absolute protection" from lightning. Reasonable protection is all that can be had. The usual lightning arrester works through a grounded wire to the earth. We know of nothing better. Comparatively few instruments are now burned out by lightning.

(9453) H. M. says: You will very greatly oblige me by kindly answering the following questions concerning "The Tesla Thomson High Frequency Coil" as described in SCIENTIFIC AMERICAN SUPPLEMENT No. 1087: 1. Should wire known as magnet wire be used on the primary? on the secondary? A. It is better to use covered or magnet wire as it is commonly called, in winding all induction coils, even when insulated with oil. 2. What kind of insulation should the secondary of the high tension trans. have? Will single cotton covered do? A. High frequency coils are ordinarily insulated with oil. Double cotton covered wire is to be preferred to single covered wire when large differences of potential are to be produced. 3. How many pounds of wire are required for each coil of wire on the high tension transformers? How many pounds will be required for the secondary of the high frequency coil? A. We have not the weight of wire at hand for the coils you intend to make. It is more common to specify the number of turns of wire. You can transform turns to pounds approximately by calculating the length of one turn in the middle layers of the coil and multiplying by the total number of turns. A table for copper wire will give you the number of feet

per pound for any size of wire. 4. Will the increase in length of spark warrant an oil insulation? A. It is not probable that the coil will stand the strain except by oil insulation. Even then the insulation may be punctured frequently, but as soon as the oil closes in again the insulation is restored.

NEW BOOKS, ETC.

THE PLANETARY SYSTEM. A Study of its Structure and Growth. By Frank Bursley Taylor. Fort Wayne, Indiana: Frank Bursley Taylor; London: C. D. Cazenove & Son, 1903. 12mo.; pp. 278; illustrated. Price \$1.50.

Our author first challenges Newton's theory of the moon's stability, on the ground that, if correct, it should serve as a basis for generalization, and should yield a law for the stability of inner satellites. This it has failed to do. The author then advances a new theory of stability which, he claims, does yield such a general law. The application of this theory accounts for the origin of the asteroids, the separation of the planets into two groups with the asteroids between, the position of the superior planets next outside of the asteroids, the greater masses of the superior planets, and the origin of Saturn's rings. The new hypothesis also leads to interesting explanations of various other facts and phenomena, such as the retrograde satellite systems of Uranus and Neptune, the inclination of the moon's plane to the earth's equator, etc.

SYSTEMATIC FRUITOLOGY. By F. A. Waugh, Professor of Horticulture and Landscape Gardening, Massachusetts Agricultural College. New York: Orange Judd Company, 1903. 8vo.; pp. 300. Price, \$1.

The study and classification of fruits is necessary in order to make possible their more prolific development. Prof. Waugh, in his new book on this subject, gives instructions for the systematic study and classification of our various fruits, which will be of value to tree growers, teachers, and all scientists investigating of this subject. The book treats exhaustively of the methods of describing fruits, of the perplexing system of nomenclature, of the practical and scientific classification of varieties, and of the judging and scientific laboratory study of all kinds of fruits. The book will be found particularly helpful to students who wish to learn more about pathology from practical self-investigation. It will also be of great service to nurserymen and fruit growers, as well as of use as a laboratory guide and manual. Complete instructions regarding the photography of fruits and the keeping of card catalogues of the same are among the valuable features of the book.

DAMPF-SCHNELLBAHNZUG für 120 km. mittlere stündliche Geschwindigkeit (150 Km-St. maximal). Von Dr. Ing. Heinrich Mehlis. Mit 10 Tafeln in Photolithographie. Zweite Auflage. Berlin: Verlag von Georg Siemens, 1904. 12mo.; pp. 105. Price, 25 cents.

NOTES ON ELECTRIC RAILWAY ECONOMICS AND PRELIMINARY ENGINEERING. By W. C. Gotshall, M. Am. Soc. C. E. and Am. Inst. E. E. New York: McGraw Publishing Company, 1903. 8vo.; pp. 252. Price, \$2.

This book is the outcome of a series of lectures which were given by the author at Lehigh University. It treats exclusively of high-speed interurban railways, taking up the subject at the preliminary office investigation of the probable earnings and expenses, and carrying it through track location and construction up to the completion and operation of the road. Detailed statements of costs of operation and their computation for different schedules are given, and the economics of such projects is thoroughly discussed. Full data regarding train resistance are given.

MACHINE DESIGN. By William Ledyard Cathcart, Adjunct Professor of Mechanical Engineering, Columbia University. New York: D. Van Nostrand Company, 1903. 8vo.; pp. 285. Price \$3.

This book, which forms Part I. of the complete work, is devoted entirely to all kinds of fastenings used in machinery. The book is practical in treatment, but the theoretical side of the subject is also fully given for completeness' sake only, since this side of the subject has already been exhaustively covered by able writers. Both scientific analysis and the records of practice are essential to success in the design of machine members, but neither alone is trustworthy, as the former predicts only those stresses which prevail under normal conditions and ignores the over-load, the rough handling, or the slight accidents which the machine may meet, and when meeting which, it should not fail. Practical data show only the proportions which constructors have given in specific cases of stress, and service, and empirical formulae founded upon them may not give the desired results, if the inherent limitations of these formulae be exceeded. The problem of design is one whose many elements vary continually in number, character and magnitude; and, for its solution, theoretical analysis, precedent and the refined judgment of the designer are required.

The work has been prepared with the cooperation of many prominent engineers. Its chap-

ters treat of shrinkage and pressure joints, screw fastenings, riveted joints, and keyed and pin joints. All formulae and figures necessary for an adequate treatment of the subject, as well as a considerable number of illustrations, diagrams, and tables, add to the value of the book as a work of reference for practical engineers.

METALLURGICAL ANALYSIS AND ASSAYING. By W. A. Macleod, B.A., B.Sc., and Charles Walker, F.C.S. London: Charles Griffin & Co., Ltd.; Philadelphia: J. P. Lippincott Company, 1903. 8vo.; pp. 318. Price, \$4.

The present volume is intended to meet the requirements of Anglo-Colonial schools of mines; and while we always feel a load which is intended as a textbook for specified courses is hampered, still the present volume appears to be an excellent one. Typographically the work is perfect, and the diagrams are very clear. It is a book which we can recommend to those who wish to study chemistry by themselves.

RAILWAY LEGISLATION IN THE UNITED STATES. By Balthasar Henry Meyer, Ph.D. New York: The Macmillan Company, 1903. 16mo.; pp. 329. Price, \$1.25.

The aim of this volume is to present a condensed analysis of the private and public laws which govern railways in the United States, and of important decisions relating to interstate commerce. The statements and comments are based upon actual analysis, and, in a large part, upon analytical tables of charters and laws enacted in the various States. These tables present so many typographical difficulties, it was not thought expedient to publish them. The author is Professor of Institute of Commerce in the University of Wisconsin. He has performed an exceedingly difficult task, and the book should appeal to all thinking persons.

CASSELL'S POPULAR SCIENCE. Vol. II. Edited by Alexander S. Galt. Illustrated. New York: 1904. Square 8vo.; pp. 556. Price, \$5.

This second volume of Cassell's Popular Science is characterized by the same treatment which we had occasion to note in our review of the first volume. For the most part the subjects are confined to pure science, the reviews of applied science being confined to electricity, photography, and the like. The articles are all of them written with a true regard for scientific accuracy, and are yet couched in such simple language that the man who makes no pretensions to scientific knowledge can readily understand them. Their length, moreover, has been so calculated that they will not fatigue the attention.

RADIO AND RADIO-ACTIVE ELEMENTS. A Popular Account Treated Experimentally. By Leonard A. Levy and Herbert G. Willis. Illustrated. London: Percival Marshall & Co., 1904. 12mo.; pp. 105. Price, 25 cents.

Messrs. Levy and Willis have in this book endeavored to give a popular and yet a scientifically accurate account of radium. The book may be said to accomplish its purpose and to do credit to its authors. It is likely to be of interest to the man in the street. Although a compilation in its way of the writings of Curie, Ramsay, Rutherford, Elster, and Geitel, the book nevertheless presents a certain originality of treatment. In our opinion the work may be commended to those who are interested in something more than the sensational side of radioactive substances.

THE WIDOW'S MITE AND OTHER PSYCHOLOGICAL PHENOMENA. By Dr. L. K. Funk. New York and London: Funk & Wagnalls Company, 1904. 12mo.; pp. 538. Price, \$2.

If anyone expects to find in Dr. Funk's book a scientific exposition of spiritualism, or indeed, anything at all that has not hitherto been known about spiritualism, he will be sadly disappointed. What Dr. Funk has done is to present an impartial account of certain spiritualistic experiences of his, which involved the finding of the Jewish coin, called the "widow's mite," through the spirit of Henry Ward Beecher. Dr. Funk's disclosures are no more remarkable than those of hundreds of other investigators, among them men of the standing of Sir William Crookes, Alfred Russel Wallace, Prof. Hyslop and Prof. James. Dr. Funk himself makes no attempt systematically to explain the values that he saw or claims to have seen, contenting himself simply with a mere statement of facts, from which the reader is left to draw his own conclusions. Besides narrating the story of the "widow's mite," Dr. Funk presents an interesting account of the work of other men. Whatever may be one's opinion of the value of Dr. Funk's inquiry, one cannot fail to be impressed by its earnestness and its fairness.

TASCHENBUCH DER KRIEGSLOPPEN. V. Jahrgang, 1904. Mit teilweiser Benutzung amtlicher Materials. Herausgegeben von B. Weyer, Kapitänleutnant a. D. München: J. F. Lehmann's Verlag, 1904. Pp. 341.

Capt. Weyer's new handbook contains pretty much the same information as last year's volume. We have had occasion to use his reference books more or less frequently ever since their publication, and have found

them in every respect trustworthy and accurate. Indeed, in some ways his little volumes contain information not elsewhere to be found. Notably is this true of the general data pertaining to Russia's Baltic fleet, now in course of construction, to be found in last year's book. The events of the present war have naturally affected Russia's naval position to a marked degree. Capt. Weyer has still listed even those vessels of the Russian navy which have been destroyed; but has clearly indicated their loss, in order that no reader may be misled. It has been impossible to note similar losses in the Japanese navy, because no official reports can be obtained of the damage sustained.

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Overlach

Pyrotechnic signal alarm and burning torch,
J. C. Moore

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Rail joint, J. J. Sulsey

Railway crossing frog, continuous, W. H.
Elliot

Railway rail connection, G. J. Maringer

Railway rail fastener, G. W. Smith

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