

be trisected is quite large. There is no prize to be won for trisecting angles. The matter is well understood by mathematicians, and no longer excites interest even. To "square the circle" one must find the side of a square which has the same area as a given circle. This it is impossible to find. The area of a circle is 3.141592 times the square of the radius. As this number can never be found with exactness, the area of a circle and the side of the equivalent square can never be found with exactness. Any desired degree of approximation can be had by carrying the number given above to a greater or lesser number of decimal places. It has been computed to several hundred figures.

(9592) O. C. S. asks: 1. How nearly can astronomers tell the exact time? A. Time may be determined with ease to the hundredth of a second, and very closely to the thousandth of a second. The position of stars and the bodies of the solar system may be known to the same exactness. 2. How nearly can they tell the time of a coming eclipse? A week ahead? A month ahead? A year ahead? Ten years ahead? A. Eclipses are calculated to any desired time ahead. They occur with regularity in a cycle of 18 years 11-3 days. Hence it is a simple matter to determine the return of any particular eclipse. The tables are given in the nautical almanacs for each year. These books appear several years in advance. 3. Why is it that jewelers' clocks vary so much, even when regulated hourly by electricity transmitted over the telegraph wires? Are all the W. U. T. clocks of any given city set from the same source, and if so why do they vary two or three minutes? A. Clocks which are intended to be kept together will keep together if properly cared for. If any clocks which you know do not do so, it is because somebody does not do his work properly.

(9593) K. A. says: Is there any process by which a piece of ordinary glassware can be heated until malleable without breaking or chipping the body of the article? Is the process expensive, or does it require a special quality of glass, more expensive than ordinary glass? A. Probably any piece of glass can be heated to its melting point without cracking if the heat is applied slowly enough, and broadly enough to heat all portions equally. It is an unequal temperature at different points of the glass which causes cracking by heat. If this is avoided, there is no reason why any kind of glass may not be heated to any degree without breaking. The kind of glass has nothing to do with the matter. The glass must also be cooled very slowly, or it will be very brittle after cooling.

(9594) G. A. H. asks: Would you kindly inform me through your Notes and Queries the following things with regard to the earth: 1. Assuming that the earth's polar radius is thirteen miles shorter than its equatorial radius, the depression for each mile that you go north is approximately ten feet. Why is it not necessary to make allowance for this in running levels? 2. It is stated that the Mississippi flows up hill on account of the centrifugal force of the earth. There are probably places where it does not descend ten feet a mile, but are there any places where it is below sea-level? 3. Is not sea level at the poles about thirteen miles nearer the center of the earth than it is at the equator? A. Sea level is the level of still water on the earth. It takes into consideration all the conditions of the case as to centrifugal force, and any other disturbing cause whatever. This being the definition of a level, it follows that there are no rivers of the earth which run "up hill," as is so often stated in popular periodicals. In surveying for any extensive work, it is necessary to take account of the departure of the surface of the earth from an optical level or plane surface. It is always done in surveying for water works and the like, else the water would not follow the ways laid out for it. It is not true that the earth curves from a level ten feet in any one mile, as you calculate it to do. The curvature is 8 inches for one mile and 32 inches for two miles. It is true, however, that the surface of the earth is 13 miles nearer the center of the earth at the poles than it is at the equator.

(9595) H. B. asks: Can you tell me through your queries and answers column in the SCIENTIFIC AMERICAN where I can find directions for the construction of a small voltmeter and also a small ammeter? A. You will find in the SCIENTIFIC AMERICAN SUPPLEMENT No. 1215, price 10 cents, full plans and working description for making a voltmeter and ammeter.

(9596) A. G. L. asks: Where will I find description and diagrams of an ordinary stock ticker? Where will I find full description and diagrams of a modern telephone switchboard? A. You will find good descriptions of several of the best stock tickers in Mavor's "American Telegraphy," which we can send you for \$5 by mail. Also the diagrams of telephone switchboards in Miller's "American Telephone Practice," which we can furnish you for \$3 by mail.

(9597) J. G. D. asks: 1. How much and what size wire will be required for a generator to ring through 50,000 ohms? How much for the bell? A. The generator for ringing through 50,000 ohms will require 1,200 to 1,500 ohms of No. 36 B. & S. silk-covered magnet wire, and the bell will require about

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Early dividends are provided by "tapping to death" 400 of the 600 trees we originally plant to each acre, and the 200 trees remaining for permanent yield will produce every year at least two pounds of rubber each, at a net profit of 60 cents a pound. These statistics are vouched for by the Government reports of the United States and Great Britain—the most reliable sources of information in the world.

This means, on your five-share investment, a permanent and certain income of \$1,200 a year, or \$2,400 a year on 10 shares. Or, better still, 25 shares will yield you \$6,000 a year. A single share can be secured on the same advantageous basis.

No such opportunity as this to secure a permanent annual income has ever before been offered to people of moderate means.

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If you do not promptly take advantage of this remarkable final offer, you will be too late to share the profits enjoyed by the hundreds of fortunate shareholders scattered throughout the country. Probably some one of them is your good friend or acquaintance.

Every possible safeguard surrounds this investment. The State Street Trust Co. of Boston holds the title to our property in Mexico as trustee. We agree to deposit with them the money paid in for shares, and we file with them the sworn statements as to the development of the property. This company also acts as registrar of our stock. You are fully protected from loss in case of death or in case of lapse of payment, and we grant you a suspension of payments for 90 days any time you may wish. Furthermore, we agree to loan you money on your shares.

We can prove to you that the five shares in this investment, paid for in small monthly installments, will bring you an average return of twenty-five per cent. on your money during the period of payment, and will then bring you \$100 a month for more than a lifetime. This opens the door for yourself, not to wealth, but to what is better, a competency for future years, when perhaps you will not be able to earn it. Payments of \$4.00 per month the first two years and smaller payments thereafter will secure you one share.

Our literature explains our plan fully and concisely, and proves every statement. We will hurry it to you immediately on request, thus assuring you a possibility of securing shares before it is too late. This is absolutely the last call. The large demand for Mutual Rubber shares has made this final announcement necessary.

Mutual Rubber Production Company
188 Milk Street, Boston, Mass.

1,000 ohms of No. 30 wire. 2. Could you refer me to an electrical book on dynamo design with formula for designing machines? The formula to be easy to work out by a person of average intelligence. Also a book with resistance of all sizes of wire. A. The fullest and plainest book on dynamo design is Wiener's, which we can send you for \$3. Swoope's "Elementary Lessons in Electricity," price \$2, contains a wire table giving all the usual data for all sizes of wire.

NEW BOOKS, ETC.

DECENNIAL PUBLICATIONS OF THE UNIVERSITY OF CHICAGO. Studies in General Physiology. By Jacques Loeb. 2 Vols. Chicago: The University of Chicago Press, 1905. Octavo, pp. 782.

In these two splendidly printed volumes, Prof. Loeb has collected his numerous papers on General Physiology—a subject with which his name has been intimately associated for many years. Particularly noteworthy in this collection is the proof of Prof. Loeb's theory that the heliotropism of animals is identical with that of plants, that, in other words, a moth flies to a flame for the same reason that a plant turns its leaves to the rays of the sun. Other subjects that find a place in the volumes are "Instinct and Will in Animals," "Physiological Effects of Lack of Oxygen," "Experiments on Cleavage," "The Development of Fish Embryos with Suppressed Circulation," "The Influence of Light on the Development of Organs in Animals," "Experiments on Artificial Parthenogenesis."

MODERN ELECTRICITY. A Practical Working Encyclopedia. A Manual of Theories, Principles, and Applications. By James Henry, M.E., and Karel J. Hora, M.Sc. Chicago: Laird & Lee, 1904. 16mo.; pp. 355; 150 illustrations. Price, cloth, \$1; leather, \$1.50.

There is always room for a practical, simple, and comprehensive treatise upon the applications of electricity to its manifold forms of modern usage. One of the essentials of such a book should be clarity of statement and practicality of text and illustrations. The book before us combines these essentials in marked degree. The student is taken by easy progressive steps through the various chapters, from the standpoint of the beginner to that of the accomplished and advanced electrician. The entire field of electrical engineering is covered, and the whole has been most carefully edited and arranged, with a view to furnishing electricians and mechanics with a thoroughly reliable book of convenient size at a moderate price.

ELEMENTS OF PLANE SURVEYING. (Including Leveling.) By Samuel Marx Barton, Ph.D. Boston: D. C. Heath & Co., 1904. 8vo.; pp. 255. Price, \$1.50.

This work is so arranged that it will be useful as well to a teacher of but little practical experience and to a student who is studying the subject of surveying privately. Many questions that are apt to confuse a student are carefully dealt with, and clearly explained. The author has had experience both in the classroom and in the field, and is, therefore, able to recognize and explain those parts which are troublesome to beginners. The following points are especially dealt with: Careful description of the instruments; explicit directions for making a resurvey in accordance with different data to be had; discussion on the declination of the needle; simple methods of obtaining a true meridian line; suggestive forms for field notes; and many illustrative examples, together with a clear and complete set of tables.

ELECTRICITY IN EVERYDAY LIFE. By Edwin J. Houston, Ph.D. New York: P. F. Collier & Son, 1905. Three volumes; 12mo.; pp. 1,750.

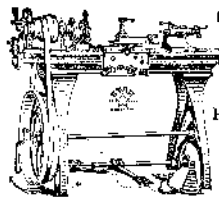
The title is well chosen. Electricity has come to be such a common part of everyday life that no one can afford to be without some knowledge of the subject. Electro-technical phraseology is used in the daily newspapers. We come across electricity in a hundred and one different ways. Newspapers are printed by electricity; telephone, telegraph, automobiles, cars, lights, etc., are electrically operated; in fact, wherever we turn, we find electricity largely used. It is to supply the non-technical man with information upon electricity that this work is written. Very practical explanations are given of all electrical apparatus in daily use, and no man can consider himself well informed without such a knowledge of electricity in this "the electrical age."

THE ORGANIZATION OF CORPORATIONS. By Thomas Conyngton, of the New York Bar. New York: The Ronald Press Company, 1904. 8vo.; pp. 352. Buckram binding, net, \$2.50; prepaid, \$2.70; sheep binding, net, \$3; prepaid, \$3.20.

This book, which discusses some of the many questions which are considered at the time of the organization and incorporation of every company, is by the author of "Corporation Management," and it is published as a companion volume.

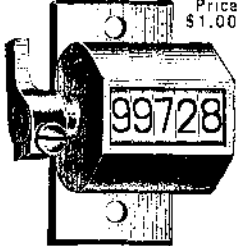
The author states that in writing the book it was his intention to place in convenient form before the reader a manual of reference, which would assist him in refreshing his memory or be of service in obtaining an elementary

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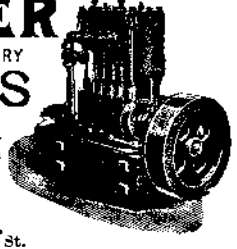
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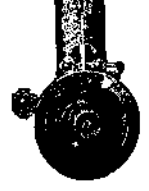


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knowledge of the law and of the practice usually followed in incorporating companies. The book is by no means a comprehensive work on the subject of corporation organization, but it does contain chapters on the principal subjects which are of interest to the incorporators of companies, and as the chapters are concise and logical, the book, as a manual, should, in its own field of usefulness, although perhaps a limited one, be of service to the busy lawyer. The author has in many places made suggestions for the protection of different interests; a chapter being devoted to the protection of minority interests, and another to the protection of inventors at the time of the assignment of their patents to the corporation.

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

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