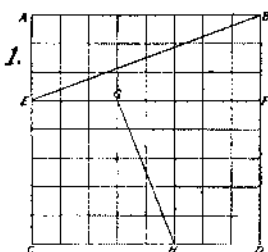
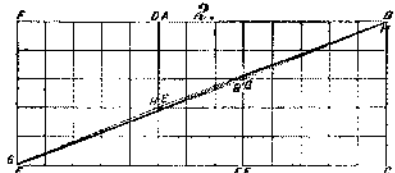


It has been traveling around for an unknown period of time, and has been shown up as often as it appears. The SCIENTIFIC AMERICAN had it a generation ago. Still, apparently, there are a host of intelligent people who have never seen the exposure. Hence we will give it, not following the usual mode of treatment, but giving our own explanation of the falsity of the proposition. This is not a puzzle, for a puzzle should have a rational solution, and this thing has no such solution. It is a trick, to make the false seem true. The proper attitude of mind toward it is to seek for the reason of its falsity, since it cannot be true. Only one of our correspondents even suggests that it cannot be true. When you see a juggler perform an impossible thing, such as cutting a man's head off, pulling a great quantity of dry goods out of a hat, or doing the curious box trick, you do not immediately demand that all these shall be accepted as realities; on the contrary you seek the method of the deception. That is the right attitude of mind toward a physical impossibility, and is applicable here. Perhaps the easiest way to show the falsity of the question under discussion, is to draw a figure 5x13, divide it into squares and draw a diagonal line across the figure as in Fig. 2.



Our Fig. 1 shows the square of 8 inches divided for the purpose of the puzzle. Draw the perpendiculars as shown and the points HE and BG do not fall at the corners of squares. They cannot. Yet the so-called solution which all our correspondents send us, shows the same thing—that the lines EG, BF, AE, BF, which should be 3 inches long, are more than 3 inches long. In every figure



this is so. You should be sharper than to draw a figure like that and send it to us if you are to convict us of error. There is an error, but you are in error. The diagonal of your long figure, 5 x 13, must be a straight line, if you are correct, but the four pieces of paper when put together do not give a long straight diagonal, as any one can see who will put the pieces together, then use his eyes and look for himself. If your eyes will not show it to you, take a straight ruler and it will disclose the truth for you. The long, sloping line of the pieces of paper is not straight. The four pieces of paper do not cover the area which they seem to cover. There is a long, narrow strip in the center which is not covered. The area of this strip is just one square inch, the square inch which you careless ones think you gain. If you do not make money with any more reality than you gain area of paper in this trick you will never be rich. You put your rulers on and draw a long straight line sweeping from one corner of the 5 x 13 figure quite across to the other corner, and say "There it is, I have made 64 square inches into 65 square inches." Great act! But you have not. Now turn to the square of 8 inches on a side, our Fig. 1. The line BE slopes 3 inches in 8, or  $\frac{3}{8}$  of an inch in 1 inch. The line GH slopes 2 inches in 5 inches, or  $\frac{2}{5}$  of an inch in 1 inch. And you ask us to believe that a line whose slope is  $\frac{3}{8}$  should form a straight line with one whose slope is  $\frac{2}{5}$ . We cannot do it. The reason anyone is deceived is that the pieces are rarely cut with a high degree of accuracy. They are often cut out of thin paper, and will not lie flat. When they are put together they seem to cover the space as well as could be expected and so the deception takes effect. If the trick were approached from the other side, that is, cut the pieces from the piece which is 5 x 13, and put upon a square carefully drawn to be 8 x 8, the pieces would then more than cover the square figure and deception would not be so easy.

(9679) B. B. asks: Which part of a wagon wheel, when traveling on the road, goes the fastest, the top or the bottom? A. All parts of a wagon wheel go along the road with the same speed, the same as the horse moves. So too all parts of the wheel turn around the axle with the same angular speed, that is, every point which is at the same distance from the center moves with the same speed, but each point moves with a speed which is proportional to its distance from the center of the axle. The center line of the wheel does not rotate at all. There are other motions of the parts of a wheel which are discussed in Queries 9622 and 9635; also in the correspondence column of Vol. 92, No. 25, to which we would refer you. We can send you these numbers for thirty cents.

## NEW BOOKS, ETC.

**SPANISH-ENGLISH DICTIONARY OF MINING TERMS.** By Frederick Lucas. London: The Technological Institute, 1904. 12mo.; pp. 78. Price, \$2.

This little dictionary will be found a handy companion by all mining men operating in South America. It has been compiled by a well-known technical translator of London—a man who has had a great deal of experience in translating mining literature—and it will be found very complete and serviceable as a handy pocket dictionary of mining terms.

**NATURE STUDY WITH COMMON THINGS.** By M. H. Carter. New York: American Book Company, 1904. 12mo.; pp. 150. Price, 60 cents.

This book, by an instructor in the Department of Elementary Science of the New York Training School for Teachers, is intended to serve as an elementary laboratory manual and guide for young pupils, the object being to introduce them to, and give them practice in, the method of procedure in laboratory investigations. All the principal fruits and vegetables are illustrated as a whole and in section, and a lesson is devoted to each. These lessons are suitable for children of from four to six years of age. It is believed that they will successfully solve the problem of an adequate training in elementary laboratory methods. Only the simplest apparatus is necessary in pursuing this laboratory course.

**THE EYE, MIND, ENERGY, AND MATTER.** By Chalmers Prentice, M.D. Chicago: Published by the Author. 1905. 12mo.; pp. 131. Price, \$1.50.

Our author regards the human body as a power-house, and disease as perverted function due to too much or too little energy. He gives five good reasons why the eyes are, of all organs of the body, most capable of making an excessive draft on the general fund of nerve-energy. Hence, in scientifically resting the eyes, using "repression" or strain-reserving glasses, we may often conserve energy and re-establish natural functioning. Other interesting theories are advanced, and strong evidence adduced in their support.

**AMERICAN TELEPHONE PRACTICE.** By Kempster B. Miller. New York: McGraw Publishing Company, 1905. 4vo.; pp. 888. Price, \$4.

The fourth edition of this standard work has been greatly enlarged and brought up to date, so that it now covers the telephone practice of to-day completely and accurately. Obsolete methods and equipment are not described, except where they are of exceptional educational or historic value. Complete information is now given regarding the common battery or central energy system, and such objects as trunking between common battery offices, private branch exchange service, measured service, toll switchboard systems, and power plants are here described in detail. Besides numerous cuts of telephone apparatus, the book contains a considerable number of diagrams of complicated circuits, which are more complete than those usually found in such books. As a guide to the student of practical telephony whose experience has been insufficient to make him conversant with all branches of the subject, and also as a reference book for the experienced telephone engineer and operator, this volume will be found invaluable.

**ELEMENTS OF MECHANICS. Forty Lessons for Beginners in Engineering.** By Mansfield Merriman. New York: John Wiley & Sons, 1905. 12mo.; pp. 172. Price, \$1.

Though great advances have been made in the methods of instruction in all branches of applied mechanics during the past forty years, little change has taken place in the manner of presenting the subject of rational mechanics. The field is so great that but a part of it can be introduced in one volume, and the object of this elementary volume is to apply the best methods of applied mechanics to the development of the fundamental principles and methods of rational mechanics. The limited course usually given in engineering colleges is so difficult, and appeals so little to the student's experience, that few fully master it. This book presents the fundamental elements without employing advanced mathematics, the knowledge of plane geometry, elementary algebra, and plane trigonometry only being necessary to read the work with interest and profit. Numerous numerical illustrations are given, queries and problems are stated as exercises for the student, and a system of units is employed with which every boy is acquainted.

**SUCCESSFUL FRUIT CULTURE.** By Samuel T. Maynard, B.Sc. New York: Orange Judd Company, 1905. 12mo.; pp. 274. Price, \$1.

This book forms a practical guide for anyone engaged in the cultivation and propagation of fruits. It contains a summary of the scientific progress made in fruit culture up to the present time, together with the practice of the most successful fruit growers throughout the country. This information is expressed in condensed form and simple language, so that the book is especially of value to a person starting in the business of fruit growing, or to the dweller in the country who wishes to grow a small quantity of fruit for family consumption. The book covers the entire practice of fruit growing, from the starting of the seed to the cutting and marketing of the fruit. The author

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**FERRIC AND HELIOGRAPHIC PROCESSES.** By George E. Brown, F.I.C. New York: Tennant & Ward, 1905. 12mo.; pp. 149. Price, \$1.

The second edition of this work, which has just been issued, contains much information of value especially to draftsmen, engineers, architects, and others who find the reproduction of tracings and drawings an everyday necessity. The book will also be found interesting by amateur photographers who have a taste for experimenting. The processes described are all simple and practical. Among these are the ferro-prussiate, the kallitype, the obertonette, and the uranotype processes. The various heliographic processes are compared in Chapter IX, and other chapters are devoted to the "Preparation of Heliographic Papers" and "An Outfit for Heliographic Printing." Several minor heliographic processes are described, as well as the pellet, or blue line on white ground; the ferro-gallic, or black line on white ground; and the brown line on white ground processes. The chapter on "Printing on Fabrics and in Dyes" will perhaps be found most interesting to the amateur photographer. The book also has useful chapters on Manipulation; Paper and Sizing; Chemicals; and Chemistry.

**SCIENCE AND HYPOTHESIS.** By H. Poincaré. London and New York: Walter Scott Publishing Company, 1905. 12mo.; pp. 244. Price, \$1.50.

This work by an eminent French scientist has been well translated, and thus made available for English readers. It is divided into four parts, which treat of Number and Magnitude; Space; Force; and Nature. The chapters of Part I. are devoted to Mathematical Magnitude and Experiment, and the Nature of Mathematical Reasoning. Those of Part II. deal largely with Space and Geometry. Energy and Thermo-Dynamics, Relative and Absolute Motion, and the Classical Mechanics, are discussed in Part III.; and, finally, Part IV. deals with the Hypothesis and Theories of Modern Physics, the Calculus of Probabilities, Optics and Electricity, and Electro-Dynamics. This book will be found worth reading by all lovers of pure science.

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