space; polyhedra; the cylinder, cone and sphere, and similar solids. At the end of the book will be found numerical tables, a biographical table, a table of etymologies and an index. The space allotted to the different sections is comparable with their relative importance, and proper emphasis is laid on fundamental ideas such as congruence, symmetry and similarity.

Another very important feature is that the student is consistently stimulated and encouraged to think for himself. Marginal queries are frequently inserted, in order that he may justify the statements in the text; and some of the proofs are given merely in outline for the reader to fill up in detail. On the other hand, figures and hints are given with the more difficult exercises. The appendix to Book iii., and other paragraphs inserted from time to time, ought to be of great help in teaching the student how to acquire the difficult art of proceeding from the unknown to the known by the method of analysis.

In the theory of parallels, the authors adopt Playfair's axiom; and their treatment of ratio is entirely arithmetical. In their opinion the purely geometric treatment is too difficult for the beginner. On this point opinions differ, and will probably continue to do so: at the same time the arithmetical theory is here given in as nearly rigorous a form as the beginner is likely to appreciate. Thus it is properly stated as an assumption that a geometric magnitude may be represented by a number; and the transition from the commensurable to the incommensurable case is made by the classic process of exhaustion. Of course the strict arithmetical theory is at least as hard as the geometrical one, because it involves, besides the assumption above stated, either Dedekind's theory of irrational numbers or something equivalent to it.[1] But there is something to be said in favour of beginning with a provisional theory, admittedly imperfect, o be made more precise later on. It would be easy to add, in a future edition, an appendix giving the strict arithmetical and geometrical theories.

In the discussion of the mensuration of the circle and other similar questions, the authors have avoided an error into which writers who adopt the arithmetical method are very apt to fall. They explicitly state the assumption that the circumference of a circle is the limit of the perimeter of an inscribed or circumscribed regular polygon, and then make use of the proved proposition that if, while approaching their respective limits, two variables have a constant ratio, their limits have that ratio. It is rather curious, by the by, that they omit to prove that the volume of a pyramid is the limit of the sum of the volumes of the usual set of inscribed prisms.

In the text, which is beautifully printed by the Athenæum Press, free use is made of abbreviations. The notation ab for the rectangle contained by the segments denoted by a and b will be objected to by some people; but it really needs no justification, because the analogy which it suggests is too useful to be ignored, and if the student cannot, after due warning, distinguish ab, the area of a rectangle, from ab, the product of two numbers, it is entirely his own fault.

The figures are very good; those on solid geometry have been very carefully drawn, and are nearly as effective as models would be. This is a great help to the beginner: he should bear in mind, however, that he must eventually be able to use a less pictorial figure, or even construct a diagram mentally in cases where an actual figure is too complicated to be useful. We should be rather inclined to suggest beginning with the more pictorial figures, and gradually reducing them to pure diagrams. Between a picture and a diagram there is the same sort of difference as there is between a photograph of an electrometer and a working drawing of the same instrument.

G. B. M.

[1] It may be remarked, in passing, that Euclid's test of the equality of two ratios really amounts to the establishment of the identity of two *Schnitte*, as Dedekind calls them; for if $mA >=< nB$ according as $mC >=< nD$, the series of rational numbers m/n for which $mA > nB$ defines a *Schnitt*, and this is identical with the series for which $mC > nD$.

OUR BOOK SHELF.

An Elementary Course of Mathematics. By H. S. Hall and F. H. Stevens. Pp. ix + 342. (London: Macmillan and Co., Ltd., 1899.)

IN preparing this book the object kept in mind was, as we are told in the preface, to provide in a simple and inexpensive volume a short course of arithmetic, algebra and Euclid specially adapted to the requirements of students who, after leaving school, desire to continue their study of elementary mathematics by partly attending evening classes and partly working privately at home.

To attain the end in view, the compilers, in the first portion on arithmetic, have restricted themselves to simply providing the student with a series of progressive exercises arranged to extend over a winter session of thirty weeks; a few additions, exercises with notes and hints, conclude this portion.

Algebra is next dealt with, and no previous knowledge is here assumed, so that a progressive but elementary course with numerous examples is given, covering the usual ground up to quadratic equations. In the last section on Euclid only the first book is considered. In the case of each proposition a few notes and exercises will help the reader to master this book, while additional theorems and a large set of appropriate examples are added for further practice.

For the purpose for which it is intended, this elementary course is well adapted.

Carvell's Nursery Handbook, with Hints. By J. M. Carvell. Pp. 70. (London: Barber, 1899.)

THE contents of this "Nursery Handbook" are arranged under a number of headings; for instance, "The Nursery," "Sleeping," "Clothing," "Feeding," &c. But in each section the hints given seem to be selected at haphazard; small details in some places are noted, while many points of importance are omitted.

In fact, the book seems too disjointed to be of real value, and the information too scanty to serve as a practical guide. In many instances the directions are so short that without amplification they might easily be misinterpreted.

Chats about the Microscope. By Henry C. Shelley. Pp. 101. (London: The Scientific Press, Ltd., 1899.)

YOUNG naturalists will find in this volume many useful hints on the collection and preparation of common objects for microscopical study, and will be guided to make observations of a number of minute organisms easily obtained.