

the coal gives out. An elaborate investigation of the action of electric light circuits ends in a set of rules and restrictions for the electric light engineer so stringent and complicated that it would effectually check all disturbances by frightening off a contractor altogether, and a three-wire system would be rendered impossible. However the author recognises that the best remedy lies in the telephone engineer's own hands.

The book concludes with a reprint of a paper by Mr. J. J. Carthy on Inductive Disturbances in Telephone Circuits.

The general style of the book is good and intelligible, and the diagrams clear and new, the old familiar text-book pictures being rigidly excluded. The arrangement into chapters and headings is carefully done, though in the endeavour to make each one complete some repetition is unavoidable. The reason of the omission of an index at the end is hard to understand, as its use in a book intended to be kept is undoubted, and the insertion of the title of the book on every page instead of that of the chapter does not mend matters. As the author states, the mathematical processes have been mostly omitted, or inserted as footnotes. But the few that are found in the latter place might just as well have been left out. For instance, to quote Lord Kelvin's somewhat complicated formula for the current density at any point in a conductor is not so useful as a reference to his original paper would have been, and the formula is not used to obtain any result. Immediately after this follows a remarkable *proof* that $dN/dt = E$. The use of the term "volume" for "current" is needlessly unscientific, but in general the terminology is accurate and consistent. That comprehensive but dangerous word, "retardation" is used with careful explanation of the component parts of its cause, though in one or two places it is loosely employed for "inductance," or "capacity," with consequent inaccuracy.

To sum up, it will be found a useful and very readable book, giving information not otherwise easily obtainable, and both practical men and students will find it repay careful reading.

FRANCIS G. BAILY.

MODERN PURE GEOMETRY.

An Elementary Treatise on Modern Pure Geometry. By R. Lachlan, M.A. (Macmillan, 1893.)

BY a recent regulation for the Cambridge Mathematical Tripos provision is made for the introduction of a paper on "Pure Geometry": this to include, in addition to Euclid, the simple properties of lines and circles, the elementary properties of conic sections treated geometrically, for which a place has already been found, such questions as may be treated by inversion, reciprocation, and by harmonics. It has been for some time a reproach that pure geometry has not occupied a more prominent position in the University curriculum. The University has never lacked able geometers, and amongst the present generation our author has won for himself a good name. He has put together an excellent manual complete enough to meet present wants, and doubtless in subsequent editions he will bring the present work even more up to date than it is. Some of our best text-books are overloaded with

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corollaries and much other matter which it is difficult for the student to retain clearly in his mind. Mr. Lachlan appears to us to have steered a most judicious course, and avoided overloading his book in this way. Mr. Pinto (in "Lothair") speaking of the limited range of the English language (which, however, he admitted to be expressive), said it consists of four words. If this be so, the word we should select to characterise Mr. Lachlan's essay is that it is "charming." It treats of the subject in sixteen chapters, in which, after devoting the first three to an introduction, measurement of geometrical magnitudes and fundamental metrical propositions, he starts from harmonic ranges and pencils, and carries the student at once to the theory of involution. He then discusses properties of the triangle (giving an account here of the recent additions to this branch of the subject, from which we infer that it has at length got a footing in the University) and of rectilinear figures. The reader then has laid before him a clear account of the theories of perspective, of similar figures (previously introduced to English readers in Casey's "Sequel"), and of reciprocation. The properties of the circle are discussed under the heads of the circle as a figure by itself, and then in relation to one or more circles. In this division of the subject our author gives account of his own discoveries and of the many interesting additions contributed by Mr. A. Larmor. In two remaining chapters the theories of inversion and of cross ratio are unfolded. The treatment in the text is strictly confined to the line and circle. We believe that a further volume extending the methods herein employed to the conic sections is in course of preparation. A few slips have caught our eye, viz. p. 53, ex. 4; § 97 ex.; p. 55, ex. 7; § 116; § 262; § 268, and one or two other easily corrected mistakes. In such a mass of mathematical work there may well be others. References are given to the sources whence many of the questions are taken. We note that an oversight, which we have had occasion to point out twice before in NATURE in reviewing the late Dr. Casey's "Sequel," is perpetuated here. On pp. 68, 71, a question is cited from a "Trin. Coll., 1889" paper, whereas it was given many years previously in the *Educational Times* (Feb., 1865, and April), and was then by a correspondent carried back to Steiner (Crelle, vol. liii.). The figures illustrate the text very clearly, and there is a full index at the end.

OUR BOOK SHELF.

An Analytical Index to the Works of the late John Gould, F.R.S. By R. Bowdler Sharpe, LL.D. With a Biographical Memoir and Portrait. (London: Henry Sotheran and Co., 1893.)

THE compiler of the present work mentions in the preface that the need for it was originally suggested in the course of a discussion between Lord Wharnclyffe and Lord Walsingham as to some ornithological question. They decided to refer to one of Gould's plates, but could not readily find the volume in which the figure was given. It occurred to both of them that "such a difficulty would not arise if there existed a complete 'Index' to all the folio works issued by Gould," and Lord Wharnclyffe asked Mr. Bowdler Sharpe whether he would undertake the preparation of the kind of volume that was wanted. As Messrs. Sotheran were willing to publish an "Index," Mr. Sharpe set about the task, hoping to be