comprehension. In all of this work on alternating-current apparatus the assumption that the electro-motive force and the currents follow simple sine curves is made; and, while the error in the assumption may or may not affect conclusions as to the types of action that occur, yet it must vitiate any attempt to deduce absolute values. Up to the present the subject of alternating currents has been singularly barren of experiments, while quite a number of problems have been solved by analytical and graphical methods. It is well known that a great many effects are not taken into account in the ordinary treatment, but the value of these outside effects has not been determined. The full discussion of these papers has not reached this side of the ocean: what has reached us is interesting and important, and will be given when the rest of it arrives.

BOOK-REVIEWS.

Chambers's Encyclopædia. New ed. Vol. I. A to Beaufort. Philadelphia, Lippincott. 8°. $3.

THE original issue of this work was completed twenty years ago, and few works of the kind have enjoyed an equal popularity, or rendered better service to the mass of readers. It is, of course, not to be compared in elaborateness with the *Britannica*, the articles in which are often in the form of lengthy treatises; but for non-professional readers, who do not wish to make a special study of the various branches of knowledge, but seek for general information on all subjects that arise in reading and conversation, this work has proved very valuable. The progress of events, however, and the increase of knowledge in almost every branch, have necessitated a new edition, the publication of which has now been begun. Many articles have been rewritten, and others partially so, while all have been subjected to a careful scrutiny by competent hands; and the result, so far as we have examined the work, seems to be excellent. Considerable attention has been given to American subjects, the more important of which have been treated by American writers; and their articles have been copyrighted in the United States by the J. B. Lippincott Company of Philadelphia, who publish the encyclopædia in this country. There is an article, however, on Americanisms in language, by an Englishman, Mr. Grant Allen, which contains some great mistakes. Thus, he says that "the speech and writing of the uncultivated classes diverge increasingly from the pure literary English standard;" the fact being that the language of the uncultivated Americans tends increasingly towards the literary standard, owing to the influence of the public schools and the growing taste for good reading. But most of the articles on American subjects are very good. One of the most difficult tasks in preparing an encyclopædia is to allot the right proportion of space to the various subjects treated, and in this respect the editors of this work have been quite successful. If the remaining volumes are up to the standard of the first, the encyclopædia will deserve and receive a renewal of the favor it has hitherto enjoyed.

Familiar Animals and their Wild Kindred. By JOHN MONTEITH. Cincinnati and New York, Van Antwerp, Bragg, & Co. 16°.

THE idea of presenting school-readers for youthful scholars, treating of familiar topics in natural science, is not a new one, but it is a thoroughly good one. The writer well remembers the permanent interest in every thing pertaining to natural history engendered in him by the use of the Wilson series of readers in years gone by. Such reading-exercises have been improved since that time, however, though there is still room for improvement. In no way, in the hands of a good teacher, can a child's powers and aptitude for self-observation be better stimulated than by well-prepared reading-exercises treating of the familiar forms of life. The knowledge imparted in such exercises should be accurate and comprehensible, but scarcely less important is the manner in which it is presented. A description that leaves nothing for the child himself to find out, no conclusions for him to draw, is of but secondary value. His faculties for thinking and observing, not his memory, need the most training.

The present school-reader, for that is what it is, meets fairly well these requirements, and, taking it all in all, merits commendation. It is intended for children of the third-reader grade, or say from eight to ten years of age, and is not only interesting, but instructive to them. The habits and anecdotes of the domestic and other familiar animals and their wild kindred are presented in pleasing shape. The material is largely adapted from known writers, or drawn from such authorities as Mivart, and is reliable. The engravings are good. Only mammals are treated of, and nowhere is the erroneous impression corrected that the word 'animals' is synonymous with four-footed mammals.

A Catalogue of Canadian Birds, with Notes on the Distribution of Species. By MONTAGUE CHAMBERLAIN. St. John, J. & A. McMillan. 12°.

THIS is an annotated list of the birds hitherto recorded or observed as residents or visitants of the vast and ill-explored region north of the United States. It is in reality the first attempt of the kind, and can only be looked upon as preliminary; but, though only a preliminary list, it has required labor, and will be very useful for future workers in Canadian ornithology, — a branch which, when we consider the excellent work done by the Canadian entomologists and botanists, has been much neglected in the Dominion. Notwithstanding the future revision which this list must be subject to, the author might have added to its value by tabulations after the manner of Merriam's work. By counting, it is ascertained that the whole number of species and sub-species recorded is nearly five hundred and fifty.

The Story of Creation, a Plain Account of Evolution. By EDWARD CLODD. London and New York, Longmans, Green, & Co. 12°. $1.75.

OF book-making on evolution there is yet no end. The present little work, however, presents a claim for recognition, not as an exponent of new views, theories, or facts, — for, as the author very naïvely admits, there is probably not a new idea in it, — but rather as an elementary exposition, a text-book, of the subject. As such, it will hardly find a place on the shelves of either the professed physicist or biologist, save as a fairly good epitome of the materials and methods of evolution in its widest sense. But to him or her who would not decry or accept Darwinism without some knowledge of the subject, and that fashion is happily subsiding, the work can be heartily commended. The author, while treating his subject in a scientific manner, has endeavored to make his book popularly readable; and he has succeeded fairly well, though the compression of so vast a subject into one small volume could hardly fail to produce a text-book-like concentration that will deter the mental dyspeptic. More than half the volume is made up of descriptive matter, both physical and biological, of the earth and the universe: the remainder is explanatory of their development or evolution, including man psychologically. In other words, as already stated, the author strives to give a brief exposition of the materials and methods of evolution in its widest sense. There are numerous good engravings, and the statements of fact, at least on the biological side, are in general fresh and reliable. The author might very properly modify the paleontological fiction of the thirty by one hundred foot Jurassic monster. It has never existed, for aught that is known, save in the describer's imagination: the figures need reduction one-half.

Practical Physics for Schools. Vol. I. Electricity and Magnetism. By B. STEWART and W. W. H. GEE. New York, Macmillan. 16°. 60 cents.

MOST physicists and many teachers of physics are already familiar with the two volumes on 'Elementary Practical Physics' by Messrs. Stewart and Gee, and nearly all will agree that they constitute an extremely valuable contribution to the facilities now available for the successful prosecution of instruction in physics by laboratory methods. The small volume now under consideration, since the word 'elementary' is omitted from its title, might be assumed to be more pretentious in its plan and execution than the others.

The contrary is the case, however, as it is intended for a lower grade of work. It is, as the titlepage has it, "for schools and the junior students of colleges."

To a considerable extent the book is an abstract, with simplifications, of the second volume of the other series. It is not entirely

so, however, as there are numerous additions, and, what is most notable, the plan of the work in one particular differs radically from that of the larger and more complete volume. The original series from which this is derived is intended to serve as a laboratory guide, and must be used in connection with some good text-book. The present volume is so written as to be available as both a text and a laboratory book, but it will probably be found more useful as a working handbook, and as an adjunct to a well-prepared text. The explanations of principles are invariably good, but not always sufficient, the necessities of the case requiring a degree of condensation sometimes incompatible with great simplicity. In common with the other members of the family to which it belongs, the book has great merit. In the beginning there is an introductory chapter on fundamental measurements and measuring instruments; there is next an excellent chapter on electrostatics, but which will appear to be somewhat long to some American teachers whose ambition seems to be to reach the dynamo-machine in the shortest possible time; then follows a chapter on magnetism; and the remainder of the book is devoted to voltaic electricity, electrical instruments, and measurements. There is an appendix, which, besides some additional practical hints to teacher and pupil, furnishes a price-list of instruments and materials needed for the laboratory and laboratory workshop, and complete plans, drawn to scale, of three recently established school laboratories. These will be of great service to those contemplating such additions to their school equipment; and the book, as a whole, can be strongly recommended to all interested in the advancement of elementary instruction in physics.

Among a few defects of minor importance may be mentioned the strict adherence, peculiar to English authors, to the concave mirror and scale for galvanometer and other purposes, omitting the consideration of the plane mirror and telescope method, which is often much better and much more available than the other. Taken in connection with the other series by the same authors, the title of this volume is unfortunate, and likely to lead to considerable confusion in making orders, references, or quotations.

The New Astronomy. By SAMUEL PIERPONT LANGLEY. Boston, Ticknor. 8°.

"I HAVE written these pages, not for the professional reader, but with the hope of reaching a part of that educated public on whose support he is so often dependent for the means of extending the boundaries of knowledge.

"It is not generally understood that among us not only the support of the government, but with scarcely an exception every new private benefaction, is devoted to 'the Old' Astronomy, which is relatively munificently endowed already; while that which I have here called 'the New,' so fruitful in results of interest and importance, struggles almost unaided.

"We are all glad to know that Urania, who was in the beginning but a poor Chaldean shepherdess, has long since become well-to-do, and dwells now in state. It is far less known than it should be, that she has a younger sister now among us, bearing every mark of her celestial birth, but all unendowed and portionless. It is for the reader's interest in the latter that this book is a plea."

The purpose of Professor Langley's book, as well as the charming style in which it is written, are so well set forth in his brief preface, that we have quoted it entire, as above. Supplemented with the clear statement of the opening pages, that the prime object of the old astronomy has been to tell us *where* the heavenly bodies are, while the new endeavors to tell us *what* they are, the reader has at once a clear idea of the scope and aim of this most interesting book. Though not written for the professional astronomer, none such can read it without interest and profit, even if for nothing more than as an excellent example of how to present his hard facts in a pleasing and attractive dress; while every intelligent reader will be pleased not only with the manner of presentation, but with the matter presented; and so plain and easy is the pathway made, that the unprofessional reader has little idea of the months and years of patient investigation — much of it the author's own — which have made these plain and easy statements possible. Rarely, too, or rather never before in an astronomical work, have engraver and publisher so happily united in giving a literary gem so beautiful an artistic setting. The first chapter especially, on 'Sun-Spots,' is rich in beautiful drawings from the author's own pencil while at Allegheny; and those who recall the wonderful frontispiece of Professor Young's excellent work, 'The Sun,' will desire to feast the eye upon the large number of equally fine drawings in the present work. Printed at the University Press of John Wilson & Son, Cambridge, Mass., and upon paper so heavy that the only drawback is the reader's constant fear that he has turned three or four leaves at once, the whole is a beautiful specimen of the bookmaker's art, and a gem which every educated man should possess.

We can only notice in the briefest way the contents of the eight chapters of the book. The first four are given up to the Sun (and after reading them we think the reader will join with us in a request to the compositor to set this with a capital *S*). Chapter I., under the title of 'Spots on the Sun,' treats of the photosphere, and contains reproductions of those beautiful drawings by the author which we have already mentioned. The second chapter, treating of the chromosphere and corona, naturally draws largely upon government eclipse-reports for its illustrations. While many of the latter cannot lay claim to much artistic excellence, they are useful as illustrating very forcibly the difficulties attending the ordinary attempts to sketch the corona during the two or three minutes of a total eclipse, and the need that photography should supplant most of these except for the telescopic detail of the inner corona, which is too fine for the photographic plate, and for the extreme outer limits, for which the eye is much more sensitive. The interesting drawings of hydrogen-clouds and outbursts above the sun's photosphere are naturally nearly all from the works of Young and Tacchini, who have done so much in this field. Right here, in connection with all the illustrations of the book, we would heartily commend the pains taken to indicate the original author or source of every illustration used, either directly under it or in the text close by. This is a matter in which some careless or unscrupulous authors and editors need a sharp lesson.

Chapters III. and IV. are devoted to the sun's energy, and are the most interesting and instructive in the book. Space will not here allow us to note the exceeding number of interesting features dealt with, and we imagine that the author must have felt overwhelmed in trying to deal at all fully, even in forty-seven pages, with the wealth of important phenomena resulting from the outflow of solar energy. We cannot refrain, however, from noting the author's striking experiment of comparing solar radiation directly with the 'pour' of molten steel from a Bessemer 'converter,' — our hottest known source of artificial radiations on a large scale. The result showed that the solar surface, even after being dimmed by absorption in its own and the terrestrial atmospheres, gave out, foot for foot, at least eighty-seven times as much heat as the surface of molten steel, and was more than five thousand times as bright.

In speaking of the exhaustion of the coal-fields, our source of power, the author gives a striking picture of the fair green England of three hundred years ago as compared with its present smoky skies and soot-blackened surface, where the whole island throbs with the coal-driven engine, and the waters are churned by the swift steamer; and then, in the *rôle* of prophet, he unfolds the future of a few hundred years, when almost certainly the 'all-beholding sun' will send his beams "through rents in the ivy-grown walls of deserted factories, upon silent engines brown with rust, while the mill-hand has gone to other lands, the rivers are clean again, the harbors show only white sails, and England's 'black country' is green once more! To America, too, such a time may come, though at a greatly longer distance." And the fourth chapter closes with the following striking paragraph: —

"Future ages may see the seat of empire transferred to regions of the earth now barren and desolated under intense solar heat, — countries which, for that very cause, will not improbably become the seat of mechanical and thence of political power. Whoever finds the way to make industrially useful the vast sun-power now wasted on the deserts of North Africa or the shores of the Red Sea will effect a greater change in men's affairs than any conqueror in history has done; for he will once more people those waste places with the life that swarmed there in the best days of Carthage and of old Egypt, but under another civilization, where man no longer shall worship the sun as a god, but shall have learned to make it his servant."