

sphere. In this sense, the amount of heat intercepted by the earth is so much less than that mentioned as to make the statement misleading. Such blemishes are perhaps slight, and might well be passed over where so much of the work is excellent and well arranged. But a graver charge, and one that will surprise many who take up the book, is the neglect to place Boyle's law in a prominent position. One might go so far as to say that Boyle's law is not even mentioned. It does not occur in the index, and we have not found any reference to it in the text, so that it must be very obscurely expressed; and yet it seems imperative, that to such a fundamental principle great clearness and prominence should be given. We think, too, that the chapter on "atmospheric optics" might well have been omitted. There is nothing peculiar about "atmospheric optics," and if one wanted to know the theory of the rainbow, one would necessarily go to a book on optics, and we should imagine that in the "high schools and colleges" in America, students are taught their optics more thoroughly than is suggested by the sketchy manner in which the subject is here treated.

The most satisfactory chapters of the book are those which describe the winds and the circulation of the atmosphere. The author has closely followed Prof. Ferrel in his general explanation, and his intimate knowledge of the work of this physicist has enabled him to give much valuable information in a succinct and accurate form. Unfortunately, it is precisely in this section of meteorology that some of the views now held are most likely to meet with modification, but the chapters are valuable as presenting in a popular form the present condition of our knowledge. Another special and valuable feature in the book is the collection of results that have been derived from meteorological observations. These results are exhibited both in tabular and graphical form, and always clearly. Whatever may be thought of the value of many of the meteorological observations so persistently and energetically collected, there can be no doubt but through their means many useful facts have been learnt, which it is desirable to make known in the pleasantest manner possible. These results may end only in the knowledge of the climate of the district in which the observations have been made; they may not touch the general principles underlying the science of meteorology understood in its widest sense, but such results have a practical value in many arts and sciences, and it is a praiseworthy task to spread abroad a knowledge of the facts that have been collected, and likewise a grateful task to acknowledge the efforts of those who, like Dr. Waldo, have laboured on behalf of the service of meteorology.

OUR BOOK SHELF.

The Mechanics of Pumping Machinery. By Dr. Julius Weisbach and Prof. Gustav Herrmann. Translated from the second German edition by Karl P. Dahlstrom. Pp. 298. (London: Macmillan and Co., 1897.)

PUMPING operations occupy an important place in engineering works, for they are required for keeping out the water from foundations during construction, for raising water from deep wells, for the disposal of sewage, for the efficient drainage of low-lying lands, and for providing water under pressure for working hydraulic machinery. Accordingly, books explaining the principles

of the various types of pumps, and affording information as to their relative efficiency, are valuable to engineers and contractors who are obliged to have recourse to pumping in their works. This book appears to be intended primarily for the instruction of students attending advanced courses on the mechanics of machinery; but the descriptions and clear illustrations of the different forms of pumps, should prove useful to those practically engaged in the raising of water. The first chapter relates to the early forms of water elevators, such as the balanced pole with a bucket hung from one end and counterpoise at the other, known as the *piccottah* in Bengal and the *shadouf* in Egypt, flash wheels, scoop wheels, chain pumps, and the archimedean and other water screws; and the efficiencies of the wheels, chain pumps, and screws, are calculated. The three following chapters are devoted to the elementary action, the theory, and the various types of reciprocating pumps, the last subject extending over a hundred pages, or one-third of the book. Reciprocating pumps may be divided into two classes, namely, those having hollow valved pistons, or bucket pumps, and those having solid pistons, or plunger pumps; and they comprise both lift pumps and force pumps, generally combining suction as well, and embrace the most common forms of machines for raising water, and also fire-engine and water-pressure pumps. The fifth chapter describes different forms of rotary pumps, of which the centrifugal pump is the most familiar example, and furnishes calculations with regard to the form, velocity, and efficiency of these types of pumps. In the sixth and final chapter, the principles of the hydraulic ram, ejectors and injectors, spiral pumps, compressed-air pumps, the pulsometer, and syphons are explained with the aid of diagrams. The excellent woodcuts, indeed, 197 in number, dispersed throughout the text, elucidate the descriptions very efficiently. A table of contents at the head of each chapter would have been valuable for guidance, especially when a single chapter occupies one-third of the book, and also a list of the woodcuts, and headings to the principal illustrations; whilst an index of barely more than a page, does not afford adequate opportunities of reference. The translation has been so well performed, that the only reminders of the foreign origin of the book are the metric measures, after which have been added their English equivalents in brackets; but in a book drawn up expressly for English readers, the calculations, as well as the results, should have been converted into English measures, to which the most prominent place should have been assigned, even if it was considered advisable to retain the foreign measures. Pumping machinery has so long formed a speciality of several English manufacturers, that English authors should have rendered it unnecessary to resort to Germany for an exposition of the mechanics of pumping machinery. Germans, however, have been long renowned for the thoroughness of their scientific investigations, and Mr. Dahlstrom, of Lehigh University, has performed a valuable service in putting this book within the reach of American and British engineers and students.

Geography of Africa. By Edward Heawood, M.A. Pp. viii + 262. (London: Macmillan and Co., Ltd., 1896.)

THE publication of this little text-book in Macmillan's Geographical Series will be welcomed by all who are interested in geographical education, or who desire a handy and trustworthy compendium on Africa. Books made up mainly of tables of chief towns, lengths of rivers, and other statistical information, are, we hope and believe, on the decline, and rightly so; for they represent the worst methods of teaching geography. Throughout Mr. Heawood's volume, the principles kept in view are: "In the first place, the rule laid down by Dr. Mill in the 'General Geography' of this series, of proceeding from the general to the particular, has been adhered to; and in the second, a clear understanding of the broad physical features of each region described has been