

concluded that there is no general appreciation of its great significance. One may hardly find a history of the United States that does not give an introductory account of the early Indians; and yet it is safe to say that they are of less importance in forming an understanding of our historic progress than the work of the old glaciers is in gaining a conception of our geography. The moraines and drumlins, the kames and sand-plains, the lakes, falls, and gorges, the gravel-filled and terraced valleys that characterize the northern glaciated country, are, to be sure, relatively small topographic forms; but they are forms on which we live, and which we daily see around us. It is proper that they should be introduced to public notice; and Professor Wright's book will certainly aid in calling attention to them, particularly if his readers go further than his text, and follow up his footnotes, through which they will be led to the most important discussions on these subjects. Look, for example, at the illustration of a new river-course marked by a waterfall, or of an old river-course blockaded into a lake, both of these excellent views being copied from Chamberlin and Salisbury's invaluable essay on the driftless area of Wisconsin; or at the strongly marked morainic wall of the Kettle range in Wisconsin, taken from one of Chamberlin's reports; or at the extraordinary loops of the moraines in Minnesota and Dakota, taken from Upham's and Todd's figures; or at the drumlins reproduced from Hitchcock's report on New Hampshire; or at the map of the kames of Maine by Stone. All of these are not only valuable illustrations of highly significant topographic forms, they are also tempting suggestions towards study of the original sources on which Professor Wright has drawn freely in preparing his book. The same may be said of numerous quotations, often extended over a page or more, from the writings of those who have given us the best interpretations of glacial geology. There are extracts from Gilbert's and Pohlmann's papers on the recession of Niagara Falls; Winchell's account of the post-glacial recession of the Falls of St. Anthony; Upham's description of Lake Agassiz, now the great wheat-growing plain of Minnesota and Dakota; Claypole's suggestive although rather highly deductive account of the temporary lakes marginal to the retreating ice-sheet; Newberry's studies on pre-glacial drainage; and many more. The thoughtful reader of all this will perceive something of the long growth of the present belief in glacial geology, and of the efforts of the many workers who have so greatly contributed to its understanding. Professor Wright's own observations on the margin of the glaciated tract are of course also described.

Among the questions on which the conclusions favored by the author are most likely to find dissent with some investigators are the date and duration of the glacial period, and the ice-dam at Cincinnati, by which the Ohio was blocked into a great lake. The objections to the latter theory are not so much on account of its inherent improbability as because the effects and products of such a lake have not been as yet clearly enough seen to require a moderate sceptic to admit its existence. It is natural enough for Professor Wright to feel a paternal fondness for this idea, which he originated some years ago, and look with favor on facts that point towards it; but, before it can command general acceptance, it must be examined in the light of a broader view of the evolution of rivers and of the various changes to which they are subject. It does not seem as if this broader view has been attained, for it is said that the Ohio has been at work on its present valley from the first elevation of the continent to glacial time, that is, through all mesozoic and nearly all cenozoic time; while it must be apparent to the student of river history that the present valley of the Ohio is of by no means so great an age. The water-worn pebbles on high land in West Virginia have relatives in similar deposits in Tennessee, outside of the hypothetical Ohio lake. The terraces of western Pennsylvania are not described in such a way as to make it clear that they are of lacustrine and not of fluvial origin. The case had best stand open yet for a time till further facts are developed.

The date of the glacial period commonly alluded to, as determined by such post-glacial river-gorges as the Niagara, is rather the date of a somewhat late phase in the disappearance of the ice. How long a time elapsed from the maximum advance of the ice to the beginning of work on the gorge is not now determinate. The

unknown factors in this problem are very numerous, and they will require much labor in their definition. Prominent among these is the time-interval between the various terminal moraines and drift margins; and in this question, Wright differs from the conclusions of Chamberlin, McGee, and Gilbert, as to the division of the glacial period into two distinctly separate epochs, and regards the whole period as essentially single and continuous. Extracts are given from the writings of the above-named investigators; but the reader will do well to consult the original essays, as the discussion is rather intricate. Here, as in the case of the ice-blocked Ohio, it appears to me that Professor Wright does not sufficiently consider other arguments than those of strictly glacial geology. The evidence of topographic development, as adduced by Chamberlin and McGee, particularly needs further examination.

On these larger questions, it is to be hoped that an open mind can be maintained for some years to come. It is only by regarding them as settled that the student may be unwisely guided. The treatment of the smaller subjects, such as those of which many examples have been named above, will prove instructive to many readers.

W. M. D.

An Elementary Treatise on Mechanics. Part I. Statics. By ISAAC WARREN. London and New York, Longmans, Green, & Co. 16°. \$1.

THIS is a compact and well-arranged little volume, intended for the use of schools and students in universities. It is the first part of a work on mechanics, the second part of which will treat of dynamics, under which term the author includes kinematics and kinetics. The work follows to a great extent the same lines as those of the same author's elementary treatise on plane trigonometry, and is especially rich in exercises,—a feature which ought to recommend it to teachers. As additional exercises, a series of ten examination-papers proposed in Trinity College, Dublin, are annexed to the volume, and a note on the order of lever to which the oar belongs. This latter, though a clever thing in itself, and well adapted to develop certain faculties of the youthful mind, might well be omitted in a text-book.

Steam Engine Design. By JAY M. WHITHAM. New York, Wiley. 8°. \$6.

MECHANICAL engineers, students of engineering, and draughtsmen will find this a book well adapted to their requirements, and it will not be without value to any person interested in mechanical engineering as a profession. Its author was at one time assistant engineer in the United States Navy, and is now professor of engineering in the Arkansas Industrial University. The work treats of the application of the principles of mechanics to the design of the parts of a steam-engine of any type or for any duty, and also of auxiliary attachments and constructive details. The best and most approved engineering practice, evidently, has been drawn upon freely for the examples with which the book abounds; and the illustrations, of which there are a profusion, are, with one or two exceptions, excellent specimens of the engraver's art.

The more general elements pertaining to steam-engine practice, such as types of engines, clearance, piston speed, friction, fuel, weight of parts, and radiation of heat, are discussed in a brief introduction, after which pistons, slide-valves, and valve and reversing gears receive a chapter each. A separate chapter is devoted to the steam-chest, stuffing-box, link, eccentric, etc. A description of the principles of the compound and triple-expansion engines is condensed into one chapter, though the growing importance of this branch of the subject would seem to warrant a more extended and detailed treatment of it. After a brief chapter on indicator-diagrams of a compound engine, a chapter each is given to crank-effort diagrams, the relation of friction to the turning-power of the engine, the piston-rod and its cross-head and guides, the connecting-rod, and the crank-pin. Then comes a long and full chapter on crank-arms, crank, line and propeller shafts, bearings, and couplings; one on condensers and pumps; and one on the engine-frame, pillow-blocks, reversing-engines, walking-beams, etc. The screw-propeller and paddle-wheels, both radial and feathering, are treated of in the final chapter; and a short appendix is devoted to the strength of materials and a saturated-steam table.