

and its execution, we can have nothing but praise. Dr. Bolton has laid the scientific man of the whole world under a deep debt of gratitude; while those who really know the severity of the task he has so faithfully accomplished, will be forced to acknowledge that painstaking is not confined to Germany.

THE FIFTH VOLUME OF OHIO GEOLOGY.

THE fifth volume of the Ohio state geological report, crammed almost to bursting with extremely valuable information, up to more than eleven hundred pages of wretchedly thin paper, poor printing, and coarse illustrations and maps, puts us in doubt which to wonder at most, — the unenlightened niggardliness of the great wealthy pork-raising state of Ohio, or the intelligent, generous zeal of its few geologists. They, indeed, have evidently been urged on by self-sacrificing devotion to learning, and, far beyond what could have been expected from the petty means given them, have filled their measure to overflowing with knowledge that is either immediately and obviously useful, or of less direct, but wider, more manifold, and of more lasting utility.

About seven hundred pages of the report, themselves enough for a bulky tome, are the work of the able state geologist, Professor Edward Orton, done "in conjunction with the duties of his professorship at the state university;" for, of course, the state could not afford even to employ the chief of so important a survey on full time. He discusses in a hundred and twenty-eight pages the stratigraphical order of the lower coal-measures in Ohio; in forty pages, their coal-beds; in three hundred and fifty-two pages, the mines upon them, county by county; in sixty-five pages, the iron ores of the state, geologically and geographically considered; and in sixty-five pages (collaborating with Dr. G. W. Hawes), its building-stones, especially the celebrated Berea grit. He wisely avoids attempting to assign numbers to the different coal-beds, — an impracticable or impossible task, since they thicken up in so many places, or thin out and disappear, — and adopts the local names already in use in western Pennsylvania, where steeper valleys, with less drift and more frequent exposures, have earlier enabled the order and identification of the beds to be correctly made out. He maintains that the coal-beds never extended much, if at all, beyond their present northern boundary, and that the great basin gradually

contracted by general elevation, and argues that their thickest portions are confined to their borders. He has to point out that more careful surveys reduce the formerly supposed extent of the workable coals. Rarely are there more than one or two workable coal-beds at any one spot; and there is great loss of coal from tenderness, impurity, or a poor roof or floor, as well as from lack of proper care. He shows (p. 263) that a considerable disturbance occurred near the end of the lower coal-measure period in Tuscarawas county.

The state chemist, Prof. N. W. Lord, besides twenty-eight pages on the chemical work of the survey, including fifteen pages of tables of analyses, contributes an admirable chapter (a hundred and seventeen pages) on the iron manufacture of the state, noticeable for the extent to which raw bituminous coal is used, and in the hanging-rock region for the amount of charcoal-iron still made. In spite of some deficiency in rhetoric (so apt, with language, grammar, and logic generally, to be neglected by scientific men, to their own immense disadvantage in respect of easy mental work as well as to the discomfort of their readers), he certainly has the root of the matter in him; and his thorough comprehension of the subject results in sound practical advice. Good sampling gives much greater value to the analyses than any in the previous volumes have.

The state geologist's son, Mr. E. Orton, jun., gives an excellent chapter (seventy-nine pages) on the clays and all their manufactures, from common brick up to terra-cotta; and one (twenty-five pages) on the coals of Coshocton county. The former state inspector of mines, Hon. Andrew Roy, contributes a very good treatise (seventy pages) on the coal-mining of the state, including some notice of the coal-cutting machinery that is gradually coming into use. He has, too, a dozen pages on the coals of Jackson and Wellston. There are also a very good chapter (twenty-two pages) by Mr. H. Newton on coke-making; one (twenty-eight pages) by Mr. E. McMillin on the gas-coals; one by Prof. G. F. Wright (twenty-three pages) on the glacial boundary, pointing out that it separates better soils on the north from poorer ones on the south; one by Prof. A. A. Wright (twenty-seven pages) on the coals of Holmes county, with the scales of its numerous columnar sections, each carefully marked, — a convenience wanting to many sections and maps in the other coal chapters; and one (twenty-nine pages) by Mr. C. N. Brown on the Meigs-Creek coal of the upper coal-measures, very full in local details.

The practical utility of geological surveys is incidentally illustrated at several points in the volume, where it is shown that money, up to more than a million dollars in a single case, might have been saved by a good preliminary examination of the circumstances.

The world (if Ohio does not) must needs feel very grateful to Professor Orton and his assistants, some of them not contributors to the volume, for their largely gratuitous and very successful labors, and, congratulating him and them on having accomplished so much with such limited time and means, must hope that he may soon find himself able to publish at least one more volume on the several other economical subjects of high importance necessarily neglected this time.

THE WINDMILL AS A PRIME MOVER.

THIS treatise is intended to present the theory and the practice of construction and use of windmills, the history of this form of prime mover, its progress and development, and the economy attained in its application to the production of available power. It is a careful and conscientious study of the machines in use, of the theory of the transformation of the available energy of wind for purposes of application, and of the commercial aspect of the case.

Here will be found an account of the extent to which windmills are used, and of the comparative value of these forms of motor and the steam-engine, the theory of wind-pressure, and the effect of air in motion upon the sails. The history of the construction and use of windmills is given with a description of the best known. The whole is a very complete treatise, and will probably take its proper place as the standard, the only real treatise upon this subject. It supplies a want, and will probably be extensively read.

The arrangement of the book seems to us excellent, the treatment good, the work, so far as we have been able to check it, accurate, and the conclusions correct. Chapters ii. and ix. on the construction of the formulas for effect, and on the commercial economy of the mill, are the most strikingly valuable parts of the book; and the former will interest the student of the theory of prime movers as greatly as the latter will interest the proposed user of the machine, and the practising engineer. The text is well written, the book-making excellent,

The windmill as a prime mover. By ALFRED R. WOLFF, M.E., New York. Wiley, 1885. 8°.

and the whole book is an illustration of a kind of work which is always welcomed by the profession to which its author has presented it.

NOTES AND NEWS.

A LARGE stone slab has just been placed in the wall of the entrance hall of the newly completed portion of the Museum of comparative zoölogy, which was built by Dr. Alexander Agassiz at his own expense, and presented to Harvard college. The simple inscription reads as follows:—

LVDOVICI ▼
AGASSIZ ▼
PATRI ▼ FILIUS ▼
ALEXANDER ▼
MD ▼ CCC ▼ LXXX ▼

— On the last day of August, according to *Nature*, Professor Michel Eugene Chevreul entered upon his 100th year. Apart from the fact, that, among men whose lives have been devoted to active scientific research, no one has before attained such an age, Chevreul stands conspicuous for the vast amount of work he has done, and for the great practical effect his work has had on the industries of the world. When Dumas, in 1852, addressed him on the occasion of handing to him the prize of 12,000 francs accorded to him by the Société d'encouragement pour l'industrie nationale, he said, "Le prix consacre l'opinion de l'Europe sur des travaux servent de modèle à tous les chimistes; c'est par centaines des millions qu'il faudrait nombrer les produits qu'on doit à vos découvertes." More recently, in 1873, when the award of the Albert medal was made by the English society of arts, the terms in which the council expressed the grounds of the award were, "For his chemical researches, especially in reference to saponification, dyeing, agriculture, and natural history, which for more than half a century have exercised a wide influence on the industrial arts of the world." His scientific work, apart from its commercial outcome, was recognized by the Royal society of London as far back as 1826, when he was elected a foreign associate. In 1857 the Copley medal was awarded to him. Other countries have also paid him honor, while the distinctions of his native land have showered upon him. Born in Angers in 1786, where his father was a physician of note, he was but seventeen when he went to Paris to be 'manipulateur' in the laboratory of the celebrated Vanquelin. At the age of twenty he published his first chemical paper, and in the next half-dozen years he had published more than a score on different subjects. Then began that series of papers (commencing in 1813), "*Recherches chim-*