cent work before us, with its companion volumes, is satisfactory testimony.

As is natural, the introductory chapters have something of an historical nature, apart from the narrative of the voyage itself; and the progress of deep-sea research is summarized, though without pretensions to monographic completeness. The remarkable results obtained by Sir John Ross, and his foreshadowing of many modern methods, are deservedly praised; and there is no doubt he was half a century beyond his contemporaries and many of his successors. The vessel, her fittings, and the methods of observation adopted, the instrumental devices provided for the regular work, and those suggested by experience, are described and figured in detail. It is known that the work of the Challenger was done with hempen lines, — the method in common use at the time she went to sea, — though wire was adopted shortly afterward. Bearing this in mind, it is easy to note a touch of official conservatism in the statement (p. 71), that "for purposes of deep-sea investigation, however, which includes actual sounding as only one of its items, good hemp sounding-line is still indispensable." The errors inevitable to the use of hemp, in all water not absolutely motionless from top to bottom, are sufficient to decide in favor of its rejection. These errors in the case of the Challenger sounding-work off the coast of the United States, where tested by the U. S. navy, are believed in some instances to reach more than two hundred fathoms, and are always liable to be as great when hemp is used. This is no reflection upon their work, which was unquestionably as good as their outfit permitted; but it forms an irrefragable argument against the use of rope, when a more accurate method is available.

Without attempting to go into detail for particular localities, it is worth while to trace the general physical features of the sea-bed, as developed by the Challenger work, and enlarged and confirmed by other expeditions, as represented by the charts accompanying this volume. These would have been still better, had the localities of supplementary information been indicated; for the hypothetical part, necessarily large, would thus have been much diminished for the casual inspector. It is pretty well determined, however, that the Atlantic is divided by submarine ridges into three different basins. These ridges, and the deeps they separate, are of singular conformation. From the southern part of Africa a ridge extends southwesterly to mid-ocean. From this a ridge extends a short distance westward, and another nearly due north to the equator. Sheering off from the African coast, with which it nevertheless preserves a curious parallelism, it extends north-westward, throwing off a spur toward French Guiana, which closes the northern rim of the south-western Atlantic basin. The central deep of this basin is supposed to lie about seven hundred miles off the mountainous coast-region of Brazil, from Cape Roque to the Rio Doce. From the last-mentioned portion of the ridge, it extends northward and eastward, widening as it goes, rising above the sea at the Azores, and finally joining the great arctic plateau, nearly in mid-ocean, at about the latitude of Paris. The north-western basin has its greatest deep north from, but close to, the Windward Islands. Here the coast-survey has since found the deepest water known in the North Atlantic. The eastern basin, of irregular and elongated form, has two deeps, — one westward from the Cape Verde Islands, the other north-eastward from St. Helena. There is a smaller depression just south from Cape Palmas.

In the southern ocean the antarctic plateau extends nearly to Africa, in latitude 40° south, and reaches New Zealand and Patagonia by narrow isthmuses. The vast area of the Pacific is less known and less markedly divided. Its greatest deep lies along the Kurile Islands, is very narrow, and is doubtless the deepest depression existing in any ocean. Apart from the Polynesian area, its most conspicuous elevation extends sickle-shaped from the coast of South America in latitude 40° south, to the meridian of 120° west. Otherwise the eastern portion of the Pacific presents an astonishing uniformity.

JAGNAUX'S TRAITÉ DE MINÉRALOGIE.

IT would not seem to be an unreasonable demand, that a volume of nine hundred pages, and bearing the date of 1885, should contain enough fresh and valuable matter to make its study thoroughly profitable to those specially interested in the subject of which it treats; but this will hardly be found to be true with this new Mineralogy of Jagnaux. The reader who expects to find the value of this large volume in proportion to its size will be much disappointed. The task which the author has set for himself — that is, the preparation of a work which shall give scientific descriptions of all important mineral species, and at the same time develop all the applications of

Traité de minéralogie appliquée aux arts, à l'industrie, au commerce et à l'agriculture, etc. Par RAOUL JAGNAUX. Paris, *Doin*, 1885. 883 p., 468 figs. 8°.

mineralogy to the various arts — is not an easy one. The two branches of the subject are too distinct to be easily fused together. The methods of crystallography and the process of making bricks are not very closely related. About one-half of the volume is devoted to the preliminary discussion of the general characters of minerals, physical and chemical, and to the description of species. This portion of the work is not only in no sense an original contribution, but it is not even a satisfactorily competent presentation of the present condition of the science. The author is evidently a faithful student of Haüy and Dufrénoy, but hardly seems to be aware of any thing that has been done, even in his own country, in the last twenty-five or thirty years. The chapters on crystallography and the optical characters of minerals, the classification and description of species, are all consistent in being what Dufrénoy would have given us in 1856. Even in minor points, modern innovations have been resisted: silica still appears in all the formulas as SiO_3, water as HO; and so on.

The portion of the work which is devoted to the practical side of the subject contains, however, much that is interesting and valuable, if not always original. In the preparation of it the author states that he has visited personally many manufactories and technical works, as well as consulted numerous standard books upon the subject. Some of the topics discussed in greatest detail are the coal industry, the manufacture of glass, of powder, of bricks, of porcelain, the treatment of various ores, and so on. The descriptions here are minute rather than profound, many trivial points receiving more attention than they deserve. The frequent long quotations from other authors, too, give the whole treatment rather a patchwork character. The reader looks in vain in this part of the work, as in the other, for evidence that the author is thoroughly acquainted with the progress that recent years have brought, especially outside of his own country. However, it must be allowed that a large amount of interesting matter has been brought together, particularly in regard to some of the leading French industries; and for this the book should have all the credit that it deserves. That the author had only a French audience in mind, is shown by the fact that the bibliography at the close of the volume contains (with the exception of two translations) only titles of French works; but while no fault need necessarily be found with this, we can but regret that he has not made more use of such admirable works as those of Des Cloizeaux and Mallard, which are mentioned in his list.

GEOLOGY OF THE VIRGINIAS.

IN publishing this compilation of Professor Rogers's contributions to the geology of the Virginias, Mrs. Rogers has conferred a substantial benefit upon the science; for Professor Rogers's investigations still remain the most important and the only systematic or comprehensive attempt to elucidate the geology of these great states, which are not excelled in structural complexity, or the interest of the problems which they present, by any district in eastern North America. But his reports were printed from forty to fifty years ago; and copies of them are now so extremely rare, that many geologists of the present generation have probably not seen them, and are not aware of the vast amount of careful and enduring work which they represent. Hence this reprint is in many respects as fresh and timely as the original publications, with the great advantage of combining in one convenient volume all of the annual reports and the widely scattered separate papers, and thus forming a handbook of Virginian geology which will be indispensable to the student of the Appalachian system, and constitute a necessary starting-point for all future investigations in the Old Dominion.

The geological survey of Virginia was instituted in 1835, and Professor Rogers's annual reports to the legislature for the first seven years make up the principal part of this volume. These reports were very properly designed for popular instruction, and are models of clearness and simplicity of style, without evident sacrifice of scientific accuracy and detail; while the general absence, in both terminology and theory, of indications that they were written nearly half a century ago, is a matter of constant surprise.

The difficulties attending geological explorations in Virginia were much greater at that time than now; but Professor Rogers's energy and industry had brought the survey of the largest area ever at that time subjected to systematic geological examination within one year of completion, according to his original plan, when it was abruptly terminated by the failure of the legislature to continue the appropriation. No provision was made for the final report, which was to embody in a digest-

A reprint of geological reports and other papers on the geology of the Virginias. By the late WILLIAM B. ROGERS, LL.D., etc. New York, *Appleton*, 1884.