for structural purposes, under direction of this society, at the Watertown arsenal. The most important action, however, was the passage of a resolution providing for the appointment of a committee of seven, to consider what changes in the organization of this society might be advisable in connection with local engineering societies, and with sections or chapters of this society.

WORK OF THE CHALLENGER EXPEDITION. — I. GENERAL AND PHYSICAL.

Two immense quarto volumes luxuriously printed, and crowded with maps, plates, and woodcuts, form vol. i. of the series of Challenger reports, and the official introduction to that series when it shall be complete. This publication, unlike the monographs of which the series is composed, is the work of many hands, and has been editorially supervised by Staff-commander Tizard, R.N., Prof. H. N. Moseley, Mr. J. Y. Buchanan, and Mr. John Murray.

Owing to the recall of Capt. Nares for duty with the last British arctic expedition, the death of Sir Wyville Thomson, and other unforeseen occurrences, modifications of the original plan became necessary. The result is not altogether satisfactory to the editors, as they explain in the preface. It may be surmised that official red tape had something to do with the retention of a system, or rather want of system, which certainly might have been much improved; though, for that, the gentlemen named would appear not to be responsible. Thus, instead of finding the contributions of the expedition to any one branch of science summarized, or systematically and continuously indicated, the text abruptly changes, without apparent reason, from (let us say) hydrography to narrative, or to some abstract of new organic forms in a particular group, which seldom seems connected in any intimate way with the locality being described or with the subsequent text. Occasionally we get a section of transcendental theorizing on abstruse questions, of a sort which, however proper in its place, seems to us out of place in a volume intended for the general reader. The editors were also hampered by the fact that many of the special reports were incomplete, or not in a state to be briefly summarized. The inconveniences of the construction of the book will be sufficiently obvious to every reader; but, having said this, little more remains in the way of adverse comment. That the work is a mine of wealth for the hydrographer, the biologist, and the geographer, goes without saying. Even the ethnologist will find himself well rewarded for his study of its pages. The illustrations, though of unequal merit, are, for the most part, of a high degree of excellence; and some of the woodcuts, especially of corals, are extremely beautiful. Much of the success in this direction is doubtless due to the efforts of the artist of the expedition, Dr. J. J. Wild. There is a notable absence of the cheap 'process' cuts so conspicuous in most of our own government publications.

It is of course impossible, within the limits of *Science*, to adequately review a work of twelve hundred quarto pages, which in itself is a summary and a synopsis. We shall endeavor to touch upon a few of its more prominent features, premising that our references must necessarily be mere samples of the harvest gathered in its pages.

The voyage of the Challenger began, for deep-sea work, off the coast of Spain; thence, *via* the Canaries, across the Atlantic to the West Indies at St. Thomas; northward in a nearly direct line to Halifax, *via* Bermuda; southward along the coast to a point off the capes of Delaware to Bermuda, and again across the ocean to Madeira; southward again along the African coast nearly to the equator; westward to St. Paul Rocks and Cape Roque; south and south-east to latitude 40° south; eastward to Tristran da Cunha, the Cape of Good Hope, Marion, the Crozets, Kerguelen, and Heard Island; south to the antarctic ice; north-east to Melbourne and New Zealand; northward to Tongatabu; and westward through the Coral Sea and through the Philippine archipelago, and to Hong Kong. Thence they retraced their way, and, passing north from Papua to Anchorite Island, made a straight wake for Japan; and then eastward across the Pacific to the meridian of 156° west; southward to the Hawaiian Islands, Tahiti, and south latitude 40°; thence eastward to Juan Fernandez and Valparaiso; south, and through Magellan Straits, to the Falklands; and across the Atlantic to the 13th westerly meridian, near which they struck northward to the Cape Verdes, and so home. This course, it will be observed, gave, in the Atlantic, practically four transverse and two axial sections, a complete though rather irregular belt about the southern hemisphere, and an immense rectangle in the Pacific. The opportunities of such a navigation may be better imagined than described; and that they were not neglected, the magnifi-

Report on the scientific results of the voyage of H. M. S. Challenger [*etc.*]. *Narrative.* 1 vol. in two parts. London, *Government*, 1885. 4°.

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°.