

problems of extension and rupture. The same gentleman has both discovered and applied a new and most remarkable phenomenon in friction; the fact, namely, that if we give a rotary motion to a body which is in contact with another, not only is the friction diminished in the direction of motion, but the friction in the perpendicular direction is also diminished, apparently in at least an equal degree. Hence, for instance, by rotating the leather packing of an hydraulic ram, it becomes quite free to move in its cylinder in obedience to a difference in pressure on one side or the other. Here we have, once more, science helping art, and art in return throwing light upon the path of science.

These facts, and others like them, are encouraging signs, but we must repeat that something more than signs is needed. The work must be not only begun but finished, the bonds of union must be drawn close, and that quickly, or England will find that it is too late, and that she is once more ready to do the work of the world just when the world has left her no work to do.

#### FORSTER'S "STRATA OF THE NORTH OF ENGLAND"

*A Treatise on a Section of the Strata from Newcastle to Cross Fell.* By Westgarth Forster. Third Edition, revised and corrected to the present time by the Rev. W. Nall, M.A., with Memoir. 8vo. (Newcastle-upon-Tyne, 1883.)

THE position of Forster's "Strata" among the classics of geological literature in England is so well defined that a reissue would be welcome to many readers, as although the progress both of coal and metal mining during the long interval that has elapsed since the appearance of the last edition in 1821 has done much to supplement, and in some instances modify, the author's evidence, it must ever remain as a splendid monument of geological investigation as carried on in the earlier years of the century. Unfortunately, in the present issue the editor has carried out his duties in a very thorough-going fashion; to use his own words, "Some alterations have been made in this edition of the 'Strata.' Parts I. and II. have been revised and rearranged; Part III. has been partially recast; some of the old sections have been extended, and other sections have been given; obsolete matter has been expunged, and new matter in the form of notes has been added."

If the editing had been confined to the last-mentioned additions, or rather if all the alterations had been supplied as footnotes or in the form of appendixes, such a course would have been perfectly justifiable, and the value of the text would have been enhanced; but from the course adopted of shifting the original text backwards and forwards to bring it into harmony with more modern views, and rearranging the sections even to the extent of renumbering the beds of limestone in the lead-measures, and the intercalation of new subdivisions in the limestone series not contained in the original, the work has become so strangely metamorphosed that any one taking it for what it professes to be, namely, Westgarth Forster's "Strata," will be liable to be strangely misled, unless he carefully compares it with the original text. This is much to be regretted, as the editor's work has evidently been a labour of love, and it is strange that he should have so ill-used his favourite volume.

The editor has, however, done one good service deserving grateful mention by supplying a memoir of the author, which is, however, eccentrically interpolated between the original table of contents and the text. From this we gather many interesting particulars of the life of one who may be regarded as the prototype of the Sopwiths, Bewicks, and other mining engineers in the north of England, who have become famous not only in their original districts, but in all parts of Europe and America. It is somewhat surprising to learn how in the year 1807 the material for the first edition of the "Strata" was collected by Forster, who for that purpose resigned the agency of the Allendale lead mines. The volume was issued in 1809 in the same year with William Smith's first geological map of England, and at once became exceedingly popular; and thenceforward the author was recognised as one of the leading men in his profession, and was fully engaged in many surveys until his retirement in 1833. During this active period of twenty-three years he worked in nearly all the mineral districts of England and Wales, with the exception of Cornwall and Devon, and also visited Spain and North America. The American trip was made in 1831, in pre-steamboat days, in the fine packet-ship *Napoleon*, making a fairly good voyage of thirty-two days across the Atlantic. The districts visited were Pottsville and Mauch Chunk, in the anthracite district of Pennsylvania, which had then been discovered only eight years, and the Phœnix Copper Mines in Connecticut.

The later years of his life were clouded by misfortunes due to losses in working some lead mines in Wales, and before the spring of 1829 he had spent nearly all that he possessed in abortive trials, at a period of extreme depression in the lead trade. In 1833-34 failing health led him to retire from active work, and on November 9, 1835, he died at Garrigill, in Cumberland, in his sixty-third year. In the author's words, Forster rendered valuable service to the sciences of mining and geology, and for that service, if for no other reason, his name will continue to be remembered for a long time to come.

H. B.

#### OUR BOOK SHELF

*A Manual of Chemistry.* By Henry Watts, B.A. (London: Churchill, 1883.)

THIS work is stated by the author to be intended for a student commencing the study of chemistry, and, as he states in his preface, this volume commences with a short sketch of the more important elementary bodies, the principal laws of chemical combination, and the representation of the constitution and reaction of bodies by symbolic notation. In addition to this there is a large section on chemical physics, including the mechanical properties of gases and the chief phenomena of heat, light, magnetism, &c. For an elementary work, as intended by the author, it is somewhat dense, and would be certainly apt to frighten a beginner in chemistry. The sections on physics alone, comprising Part I., occupy very nearly 150 pages, and within this narrow space we find that in the domain of light we have refraction, reflection, circular polarisation, &c., treated at considerable length. In magnetism and electricity we have a very complete and exceedingly condensed mass of information, certainly much too complete and condensed for an elementary text-book. In the purely chemical section, forming Part II., the work is extended so as to include a considerable chapter on crystals and the more recent extensions of the atomic theory, and also to the so-called rare metals,