

at once, to enable flight at really high altitudes to be possible.

In the present volume Mr. Ricardo covers a wide field: all important types of slow-speed engine are described. Some of the work is thus rather that of editor than author, but opportunity for the exercise, at its best, of the latter rôle is seen particularly in the sections relating to engine balancing and piston friction, where the subject is dealt with in masterly fashion and cleared of the unnecessary complication so often found in other books on this subject. Some writers have photographic vision, Mr. Ricardo's is selective and acute. We receive this volume of his book with interest, and look for the second with pleasure.

H. E. W.

Lord Moulton.

The Life of Lord Moulton. By H. Fletcher Moulton. Pp. 287+8 plates. (London: Nisbet and Co., Ltd., 1922.) 15s. net.

MR. FLETCHER MOULTON'S life of his father is an attractive volume which gives a vivid picture of the career of a man of remarkable ability. Beginning with very scanty financial resources, Lord Moulton spent some three and a half years as an assistant master after leaving school before he entered for a scholarship at Cambridge. During this time, however, he carried off three successive scholarships at the University of London, and so established a record of success which remained unbroken during his time at Cambridge.

Two consecutive chapters describe Lord Moulton's work at the Bar and on the Bench, first of the Court of Appeal and then as a Lord of Appeal and a member of the Judicial Committee of the Privy Council. The latter part of the book is given up to a description of his work during the war, and to those successful efforts which made it possible to assert that in this country, at any rate, empty shells were never kept waiting for supplies of explosives with which to fill them. For a solution of this most difficult problem of supply Lord Moulton relied mainly on the production and utilisation of a very large output of ammonium nitrate, and the principal chapter devoted to this period of Lord Moulton's life bears the appropriate title of "The Fight for Amatol." In this fight he was handicapped, not only by the inertness of this explosive, which in the early days created a well-deserved prejudice against it, but also by the difficulty of turning down inferior and sometimes fraudulent substitutes when these were advocated with the aid of influential supporters.

The most notable of these substitutes was "Halakite," a new and wonderful explosive, alleged to be capable of acting both as a propellant and as a high explosive, with

the additional advantage of containing no nitroglycerine. The first samples supplied by the inventor were found, however, to contain 20 per cent. of nitroglycerine, and samples supplied to the French Government consisted of British Mark I cordite coloured yellow with lead chromate. The twenty pages devoted to this case are probably a fair measure of the amount of time that was absolutely wasted by Lord Moulton's department when the inventor had found an editor sufficiently influential to work up a scandal but also sufficiently ignorant to be taken in by his claims. Lord Moulton himself had, however, a remarkable ability for detecting real promise in the propositions put before him, and in nearly every case where a difference of opinion arose, subsequent experience showed that Lord Moulton was right and his critics were wrong. This was notably the case in reference to amatol, which remained not merely in service throughout the war, but is generally recognised as providing one of the best fillings now available for H.E. shells for land service.

A chapter is devoted to Lord Moulton's scientific work; but although a summary is given of his experiments with Spottiswoode, the usual references by which a scientific reader would trace this work are not given. An examination of the Royal Society's Catalogue of Scientific Literature shows that these experiments are described in two papers bearing the titles "On the Sensitive State of Electrical Discharges through Rarefied Gases," Part I. (Phil. Trans., 1880, 170, 165-229), and "On the Sensitive State of Vacuum Discharges," Part II. (Phil. Trans., 1881, 171, 561-652). In the spacious days of forty years ago it was possible for a man of pre-eminent ability to secure election as a fellow of the Royal Society on what might now be regarded as a mere sample of the scientific work of which he was capable. Under these conditions Lord Moulton's election in 1880 was a natural sequel to his partnership with Spottiswoode, following upon his earlier record as Senior Wrangler and Smith's prizeman. His greatest service to science was, however, undoubtedly the wholehearted co-ordination of chemical enterprise which he brought about during the war, and then strove to perpetuate in time of peace.

Lord Moulton was educated at Kingswood School, and maintained his interest in the school to the end. During the first year after the Armistice he took part as an old boy in the annual dinner, which had been allowed to lapse during the war, and also distributed the prizes at the school where his first academic success had been won. A Moulton scholarship founded by his son will perpetuate his association with the school, and a scheme is already in progress for supplementing this by a stained-glass window in the chapel recently erected as a war memorial.