

saving effected in raising the coal. At one mine where three of Watt's engines were erected the proprietors engaged to pay 800*l.* a year for each engine as a compromise for the third part of the saving in coal.

It was with the Cornish engine that the principles governing steam engine economy were first grappled with; and with the engines used for all purposes on land, pumping engines, even at the present day, are worked with the greatest economy of fuel, examples being given where the engines are worked with an expenditure of less than 2 lbs. per I.H.P. It is interesting to note the change of pressure at which steam is worked now, reaching to 150 lbs. on the square inch, as compared with the 5 lbs. used in many of the old Boulton and Watt engines. These engines were not confined to pumping water from mines, but were applied to reclamation purposes, many of the Boulton and Watt engines, made a century ago, being still in use in the fens of Lincolnshire and Cambridgeshire. These machines were noted for their massive construction and the excellence of the workmanship, as attested by the number of years during which they have done good service.

The other fourteen chapters into which the book is divided deal with descriptions of the various types of pumping engines in use; pumps and pump valves; pit work; shaft-sinking; hydraulic transmission of power in mines; valve gears; waterworks engines; trials of pumping engines; centrifugal and low lift pumps, with descriptions of some of the scoop wheels in use in Holland; hydraulic rams and pumping mains.

*Elements of Hydrostatics.* By S. L. Loney, M.A. Pp. viii + 248 + xii. (Cambridge: University Press, 1900.)

"ELEMENTS OF HYDROSTATICS" is a subject the limits of which are sufficiently well known to require little definition. In the present instance it includes a fairly complete treatment of centres of pressure of rectilinear areas and circles by what used to be called, at Cambridge, "three-day methods"—also sections on rotating liquids and on tensions of vessels and curves of buoyancy. The book will do admirably for the ordinary run of students preparing for examinations in this subject, and the copious problems and examples should commend it to science students; but there are one or two points in which improvement is desirable. "Whole pressure" has been too long a fetish of the third-rate schoolmaster, who "thinks he is wise when he is not." But instead of banishing this misleading idea to a few lines of small print (or, better, omitting it altogether), and replacing the term "whole pressure" elsewhere by "*resultant thrust on a plane area*," Prof. Loney makes confusion worse confounded by speaking, so far as we can make out, indiscriminately of "whole pressure," "whole pressure or thrust" and "whole thrust." Again, there is no reason why we should be left in the dark as to the precise distinction between a perfect fluid and an ordinary fluid, or the reason why the principles of hydrostatics apply with sufficient approximation to the latter; these points are hinted at, but might with advantage be stated more explicitly. The usual figure of the air-condenser, with its valves hanging in an impossible position, is once more reproduced.

There are, to our knowledge, many highly successful teachers who, in their ignorance, persist in their preference for misleading methods of dealing with such notions as "whole pressure," the "parallelogram of velocities," the "binomial theorem" and the like. There are few writers better qualified to prove that scientific accuracy is not incompatible with a successful text-book than Prof. Loney, whose name alone is sufficient to ensure a large circulation for his works. Why, too, does not the Cambridge University Press rise superior to pandering to the fancy of those mathematical masters who know no better?

*Minéralogie Agricole.* By F. Houdaille. Pp. 299, avec 107 figures dans le texte. (Paris: Félix Alcan, 1900.)

THE object of this little work is to provide agriculturists and others with a knowledge of the properties, physical and chemical, of the minerals important to man, either as constituents of rocks and soils, as fertilisers or as sources of materials used in the arts. The author assumes ignorance of physics, chemistry and crystallography on the part of the reader, and as the descriptive portion of the book would be unintelligible without some knowledge of these subjects, he attempts to give the necessary smattering in an introduction of eighty-nine pages. The laws of crystallography and modern views of crystal structure are dealt with in forty pages, illustrated by a number of indifferent figures, some of which, notably the rhombohedron of Fig. 8, entirely fail to produce on the eye the effect which the author presumably intended. In the chemical section the old equivalent notation is preferred to that usually accepted at the present day; thus, sodium carbonate receives the formula  $\text{NaO}, \text{CO}_2 + 10\text{H}_2\text{O}$ ! A considerable portion of the space devoted to analysis is occupied by a picture of an elegant gentleman puffing languidly with a blow-pipe at a long candle fixed in an equally tall candlestick. The rest of the book contains a selection of facts about minerals which can be found in any treatise on descriptive mineralogy, together with some useful information as to methods of determining the permeability of soils and the percentage of calcium carbonate contained in them. We fear, however, that the work will hardly be found readable by any one who has not already had an extensive training in chemistry and mineralogy. It is therefore unlikely to be of much value to the class for whom it appears to be intended, nor can it be recommended to the serious student.

*Engine-Room Practice.* A Handbook for the Royal Navy and Mercantile Marine. By John G. Liversedge, R.N. Pp. xi. + 292. (London: Griffin and Co., Ltd., 1899.)

MR. LIVERSEDGE'S handbook will be found by all engineers to be a very useful supplement to the more technical treatises of Mr. Seaton and of Messrs. Sennet and Oram. It lays down the whole duty of a marine engineer, and more particularly of a naval engineer, from the day when he receives notice of his appointment; and it is throughout well-written, full, and admirably to the point. The running of the main engines and the care of the boilers are, of course, the chief concerns of the book; but the auxiliary machinery is also well looked after, and there are separate chapters on the electric light, the hydraulic, the refrigerating and the air-compressing plants. The chapter on adjustments and repairs seems to us of especial value, for while a successful repair at sea is often the outcome of what seems an inspiration, its success may at any time be assured by a knowledge of what has been done in similar cases.

We could wish, especially in the present season of divergent opinion on the matter, that the water-tube boiler had received somewhat greater attention. A few pages at the end of the book are specially contributed by Fleet Engineer Edwards, of H.M.S. *Powerful*, and perhaps it were unwise to do more until fuller experience has been gained; but we may expect to see the matter thoroughly taken up in later editions, for no unprejudiced observer can doubt that the water-tube boiler, in one form or another, has come to stay.

While Mr. Liversedge's book is primarily a professional handbook, it will be found, at the same time, to interest all who have any acquaintance with the engineering side of naval life, even though they may have but a superficial knowledge of the ordinary equipment of a ship's engine-room.