

whiteness is due to zinc oxide put in by the manufacturer.

Some inaccurate information is given about the composition and constitution of the common commercial synthetic rubbers. How can, for example, "the basic recurring group" (p. 34) of a simple copolymer containing 25 per cent of one monomer contain one molecule of each monomer? The suggestion is made (p. 177) that the superiority of Neoprene *G* over Neoprene *E* is due to its production by emulsion technique, but the fact is overlooked that Neoprene *E* was also eventually made by the same technique. Thiokol *F* is not derived from dichlorethyl formal (p. 216). The section about Hycars is confused and the uninformed reader might assume that importance is attached to Hycar *OR* for tyres. The section on Chemigums is equally indefinite and would lead the reader to believe that these rubbers had no similarity with Buna *S* or *N*. There are also several errors in the simple technology of the rubbers; for example, the statement is made on p. 206 that butyl rubber is difficult to work on a cold mill but becomes soft and smooth and amenable between 80–100 degrees (no scale of temperature given), whereas anybody who has ever handled this product knows that it runs smoothly on a cold mill but 'breaks' up on a hot one. On p. 59 the statement is made that a solution of chlorinated rubber is invariably employed for bonding synthetic elastic materials to metal. This is far from the truth, since with the sulphur-curing synthetic elastic materials the brass-plating technique is almost invariably employed.

In defence of the author it must be said that he has attempted to write about the subject at the most difficult time in its history, when products and ideas are changing and few technologists in Great Britain have had the opportunity of actually handling the new synthetic rubbers.

The general lay-out is good and it is a great pity that the book has been spoilt by so many mistakes.

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## THE HIGH-SPEED COMPRESSION-IGNITION ENGINE

### The High-Speed Compression-Ignition Engine

By C. B. Dicksee. Pp. xii+331. (London, Glasgow and Bombay: Blackie and Son, Ltd., 1940.) 16s. net.

THIS is the work of an engineer who has been intimately connected with the application of high-speed compression ignition engines to public passenger vehicles over the whole fourteen years of this development. He has been responsible for the power units of the majority of London's oil-engined buses and nobody will question the high technical standard these have reached. Improvements are so gradual that they usually pass unnoticed by the public, but a comparison of the state of the atmosphere in a traffic block on a hot summer's day in, say, 1939, with that in 1929, indicates the progress in combustion efficiency, lubrication, etc.

In his book, the author, with this wide experience to support him, has wisely written from his own point of view. He has, of course, found it necessary to call on the work of others, but the reasoning throughout is original and most of the experimental data are the results of his own researches. Pro-

ceeding from a brief but adequate treatment of the available basic knowledge of the properties of gases and of the processes of combustion, he discusses the various problems of practical design in a very able manner, endeavouring always to interpret practical results in terms of fundamental knowledge. His work thus preserves a better balance between theory and practice than is often found in books on this subject.

Following his first three chapters, which deal, respectively, with the laws of gases, ideal cycles and combustion, he discusses the losses and limitations of the practical engine. In this chapter, among other good points, he gives suitable prominence to the 'practical ideal' curve of efficiency of Tizard and Pye, which marks a great step forward from the air standard cycle to which many writers continue to devote so much attention. This is followed by a useful chapter on volumetric efficiency and the air charge.

The next two chapters, dealing, respectively, with the processes of combustion and the air movement in the combustion chamber are the author's best. The discussion of the interaction of the variables which determine the course of the ignition lag and subsequent combustion is masterly, the section dealing with the function of air movement being exceptionally good. A minor point is that the later Cambridge experiments carried out by Wolfer, under Bird's direction, are not considered, the author referring, on pp. 111 and 198, only to Bird's early work on ignition lag.

The author, in the next chapter of twenty-three pages, discusses types of combustion chamber. This discussion, while always sound in its reasoning and of great interest, suffers from incompleteness: for example, the Junkers design is omitted, in spite of the practical success achieved in aircraft and over the whole range of oil engine practice, while the General Motors engine would also merit consideration. But lack of space may have been the reason for this. The author unfortunately prefers the term "pre-combustion chamber" to "designs with ante-chambers".

This chapter is followed by one dealing with the somewhat difficult subject of fuel injection. Here the author reveals a defect of his good qualities, since, in his desire to correlate his own observations with fundamental principles, he neglects to use other experimental evidence available in British publications. In dealing with processes in the piping, therefore, he is at his best when dealing with engine results of a direct kind, in which the practical value of his evidence is high.

The book concludes with a valuable chapter having the title, "Some Practical Results". The discussion of the measurement of mechanical losses is interesting, but in most engines the third method, namely, of extrapolating the curve of fuel per hour on brake mean pressure, leads to values that are too high. The author, however, correctly says "that there is no method which will give a really accurate measurement of the indicated horse power". Under the heading, "Future Developments", and, indeed, throughout the book, no real reference is made to two-stroke engines. While the author obviously does not wish to deal with such engines, a mention of this limitation might have appeared in the preface. But none of the minor criticisms offered affect the fact that this work is of quite exceptionally high standard and value.

S. J. DAVIES.