

regions (with two other lines in the last case) we obtain $r=1$. But, if we make holes in the plane, bounded, say, by circles the centres of which are at the 6 (or 4, or 2) points considered, the values of r for the desiccated plane will be 7 (or 5, or 3). The suggestion of Cremona's representation of the cubic surface on a plane is obvious.

The last chapter of the volume, largely algebraical, is devoted to Sylvester's representation of the equation of the surface by the cubes of five linear functions. It is shown that there are two types only, of non-singular surfaces, which cannot be thus given by five (or fewer) cubes, but that these are given by six cubes. One type, with vanishing discriminant, requires seven cubes. The author also applies Sylvester's form to obtain the five types of real surfaces, distinguishing between them by inequalities among the coefficients multiplying the five cubes.

It will be seen from this skeleton survey that the book is one for which, for long years, the reader will be grateful to the author—and to the Clarendon Press.

H. F. BAKER.

HIGH-SPEED COMPRESSION-IGNITION ENGINES

High-Speed Diesel Engines

With Special Reference to Automobile and Aircraft Types; an Elementary Textbook for Engineers, Students and Operators. By Arthur W. Judge. Fourth edition, revised and enlarged. Pp. vii+536+45 plates. (London: Chapman and Hall, Ltd., 1941.) 25s. net.

THAT a fourth edition of this book has been published only eight years after its first appearance shows that it meets a demand. The author has compiled a vast and valuable fund of information and has been very well supported in the presentation of this matter by the publishers. The greater is the regret that the author has not found it possible to reduce the number of errors and to avoid presenting, as in many instances, incorrect pictures of various aspects of his subject. To assist the student—and also the author in preparing a new edition—the following points are mentioned.

In the development of high-speed compression-ignition engines, extending over nearly twenty years, it is inevitable that many designs of combustion chamber and of injection equipment should be put forward and for various reasons afterwards dropped. In his preface, the author explains that he has retained many of these "in view of their historical interest". This would be well justified if he had indicated those designs that are obsolete and those which continue to be built; but the reader is left in complete ignorance on this distinction.

A similar vagueness surrounds many of the technical and experimental subjects treated by the author. Views of writers of scientific papers are often quoted or embodied in the text, the references and dates of the papers being usually quoted; but the value of these would be greatly enhanced, and a more accurate presentation given, if the author, after suitable analysis, had stated which of these had proved, in the light of later evidence, to be incomplete.

Some of the errors relating to combustion chambers are as follows: on p. 140, the statement appears

that the Lanova combustion chamber was produced by the inventor of the Acro combustion chamber "acting in co-operation with F. Lang". This is misleading, but is nevertheless true, since Lang was the inventor of both combustion chambers. On pp. 143 and 144, reference is made to the Omo and the Oberhansli combustion chambers, and the latter is said "to resemble the Omo". They are one and the same, the designer being the Swiss engineer, Oberhansli, while the company controlling the commercial development is the Omo A.G., of Zurich. The M.W.M. design on p. 120 is given as a modified type of Acro combustion chamber: while it is similar, it was the result of independent development. A modification was, however, actually made by the Saurer company to the Acro design, by giving a 'cross-stream' motion to the air. The author attributes this modification to a designer, "Kreuzstrom" by name.

Contrary views are often given without suitable analysis, following the method of compilation adopted by the author. For example, the picture of the initiation of combustion presented on p. 94 differs from that on pp. 99 and 100. In discussing the influence of injection advance on ignition lag, on pp. 101 and 102, the author, near the bottom of p. 101, reaches the conclusion, given in italics: "the ignition lag will therefore be greater as the injection is advanced". On p. 102, he goes on to give the results of tests by Dicksee which, with one design of combustion chamber, confirm this and, with another, contradict this conclusion. This is followed by the correct conclusion that the result also depends on the combustion chamber; but this is not given in italics by the author, and a reader taking a cursory glance at the passage would be completely misled. If, however, the author had analysed the subject and had correlated the results with Bird's work in Fig. 53, or better with Wolfer's later work at Cambridge with Bird, which is not mentioned, a correct picture would have resulted.

On pp. 179 and 181, the author refers to the excellent pioneer work of Taylor and Hawkes at Farnborough, reported in Taylor's paper in 1927, and writes, with italics: "Another interesting point observed was that as the torque was reduced, so was the specific fuel consumption". Although slow-running compression-ignition engines had revealed such characteristics near full-load, this may have been a striking result in 1927 for a high-speed unit, but the author himself, notably in Figs. 15, 33, 263 and 297, shows that this has long been recognized as the normal characteristic of compression-ignition engines. This is a typical fault of compilation.

Errors and slips in references are numerous, and the following may be mentioned: p. 69, 1926 p. 555 for 1932, p. 685; Figs. 40 and 44 are obviously from the same reference but are not acknowledged; p. 36, 1831 for 1932; p. 169, 1931-32 for 1934, while Fig. 124 is from this reference but not acknowledged. 'Junkers' is usually given as 'Junker'.

Many of these are minor matters to those who have read widely in the subject; but in a work described on the title page as an elementary text-book for engineers, students and operators, they become of vital importance. Reference to the numerous original papers is difficult for such readers, and the responsibility of the author is great. It is to be hoped, therefore, that in the fifth edition which will certainly be called for, the author will convert his work from being merely good to superlative. S. J. DAVIES.