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BOOK REVIEWS:

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Design and Construction of Steam Turbines.—By H. M. Martin, London. 372 pages; cloth; 7½ x 11 in. Longmans, Green & Co. Price, $6.00 net.

Reviewed by R. W. Angus, B.A.Sc.*

This addition to a fairly long list of books on this very important subject is written especially for engineers who have had sufficient training in thermodynamics and mathematics to understand moderately difficult theory. As it contains a good deal of descriptive matter, however, and a large number of dimensioned drawings, it should prove helpful to the less skilled reader. The author states that the theory contained in the book is based on articles contributed by him to "Engineering" (London), the illustrations and descriptive matter being also largely from the same periodical.

The first chapter is brief, and is designed to give an idea of the action of a turbine, and to explain in a very elementary way the different types of wheels in use, these types being illustrated by water turbines. The chapter is too short to be of much help to anyone not having a pretty general knowledge of the subject, and the author might, with advantage, have elaborated his explanation somewhat.

The next chapter deals with the flow of steam through blades and nozzles, and proceeds at once to compute the velocity of steam from nozzles and the work done during various forms of expansion. The Mollier diagram is introduced and used as far as possible in the calculations, the author assuming that the reader understands the theory of the diagram, although this is explained in a later chapter. This important diagram deserves a place in any such treatise, and the value of the book is enhanced by explaining the use of Mollier's diagram and giving a copy of it for use.

Chapter III. describes a number of experiments made on nozzles and blades, showing somewhat the effect of the shape of the nozzle. The book then deals in the following chapter with the impulse turbine, illustrating with the turbine of Dr. Laval. The velocity triangles are drawn, and a method explained of finding the "indicated work done" on the turbine shaft by which the author means the turbine output plus the mechanical friction. This is then used to determine the efficiency of the wheel itself, and the whole is illustrated by a numerical example.

A table is given of a series of tests on impulse wheels to determine the wheel efficiency. The chapter concludes with a discussion on shock and proper velocities in the bucket.

In Chapter V. there is a discussion of the term efficiency ratio, or the ratio of the theoretical to the actual steam consumption, and the reasons for adopting multi-stage expansion, together with the resulting losses. The method of proportioning the turbine is merely suggested. In the following chapter a very interesting set of curves is given, which enable the designer to infer the results which he will obtain on a given turbine from the results of tests made on a similar turbine under different conditions, these curves enabling one to reduce any set of observations to corresponding results under a different set of conditions.

The actual design of the impulse turbine is dealt with by the author in two steps, the first dealing with the general proportioning of the parts and the determination of the probable steam consumption, etc., while the second step deals with the dimensions of the blading. The method of procedure is altogether too complicated to be discussed in this review. In general it may be stated that the limitations of the work have forced the author to assume formulas without proof, to which, however, fair exception could scarcely be taken. A chapter has been devoted to velocity compounded impulse wheels.

A number of chapters have next been devoted to reaction turbines and their design, which have been treated with a fair degree of completeness, and some difficult problems in this part of the subject are dealt with. Numerical examples have been given in certain places, and there are many useful tables and practical coefficients.

Following a chapter on the radial flow turbine, the author has given a considerable amount of theory and explanation of the thermodynamic principles involved in the turbine design, dealing also with the Mollier diagram, which has been used in earlier parts of the work.

Having treated the design from the thermodynamic standpoint, the author devotes a number of chapters to the mechanical details, there being a chapter on each of the following: Balancing, Dummy and Gland Packings, High-speed Bearings, the Strength of Rotating Discs, Geared Turbines, and the Condenser, this part occupying a fair proportion of the whole work. One could not expect the most complete treatment of these matters in a book of the size under discussion, and yet the treatment is fairly complete. For example, in the part dealing with dummy and gland packings various designs have been sketched and the method of calculating the probable leakage discussed in detail. Some dimensioned drawings have also been given.

The latter third of the book is almost entirely descriptive, and gives details of all the principal turbines, such as the A. E. G., Curtis, Rateau, Zoelly, Parsons, etc., most of the descriptions being accompanied by detail drawings

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