to the state legislature, drew up a bill to control the destruction, aroused public support and secured the establishment of the first game warden system in any southern state along lines at once so sane and so successful that the plan was followed for many years in other states as well.

Out of such achievements grew naturally the National Association of Audubon Societies in 1905, in which he was first its secretary and then president, but always at the front of the fight for the conservation of wild life. His tact, his resourcefulness and his persuasive power served to carry through successfully measures in many states, north and south, for game protection, despite powerful opposition. Probably the best known as also the greatest of these battles was that in New York state and later in Congress to put an end to the traffic in bird plumage sold for millinery. This carried his work beyond the limits of the United States and resulted in similar movements in many other countries and in the organization of the important International Committee for Bird Preservation in which he still retains an influential position. The origin and growth of these and numerous other valuable scientific movements are sketched by Dr. Pearson in accurate and unassuming fashion.

The quaint style of the author, the vein of quiet humor which runs through the book, the frank attack upon excesses wherever manifested and the tolerant spirit which has characterized his attitude throughout all the controversies in which he has been engaged are responsible in large measure for the remarkable success which has attended his efforts. This feature stands out clearly in his book. It is a veritable mine of information concerning men and movements in conservation. It covers well the history of the movement during the last fifty years, and the material is presented with a frankness and fairness that is unusual and that makes this record of permanent value.

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DIESEL ENGINEERING

Elements of Diesel Engineering. By ORVILLE ADAMS. Pp. xvi + 478. 250 figures, New York, Henley, 1936. $4.00.

THE book presents the elements of the subject in a clear and concise manner—from the earliest design to the most modern development. The operating principles of the various forms of Diesel construction are presented with a minimum of mathematics and irrelevant detail, consistent with a clear presentation of the subject. Topics of such major importance as fuel injection, fuel pump design, injection nozzles, combustion chamber designs, etc., are treated in such a way as to give a new man in the field an understanding of many of the fine points as well as the basic principles and the present status of development.

The many and varied problems that have been encountered in the development of the Diesel are outlined, and their solutions—or the progress that has been made toward these solutions, with particular emphasis upon the development of the high-speed Diesel—are discussed at length. Such topics as selection, installation, inspection, operation and maintenance of the automotive Diesel engine occupy a relatively large space, which is in keeping with the importance of this phase of the subject, particularly to those persons looking to this field as a means of livelihood.

One gets from studying the book a very good picture of the entire field and the great development that has been made in the Diesel engine, without getting the impression that all the problems have been solved. It is a record of the important background and present state of an industry which, although still in its infancy, has already developed to a place of great importance.

The subject-matter is particularly well selected and organized to serve as a text in a classroom or for individual use in obtaining a thorough picture of the elements of Diesel engineering.

THOS. C. POULTER

SPECIAL ARTICLES

THE ORIGIN OF THE AFTER-FEATHER[1] IN FOWL: A PROCESS OF TWINNING

IN 1932[2] we emphasized the origin of the barbs of the definitive feather from a single center situated at or near the mid-ventral line of the formative ring of cells ("collar") surrounding the base of the feather germ and enclosing the neck of the pulp. From this results the invariable seriation of barbs both as to time of origin and apico-basal order in the definitive feather. Though Hosker[3] has questioned this conclusion, farther study has served only to confirm it. We shall designate the place of origin of barbs as the *ventral locus;* it has a central position in the "ventral triangle" of our former paper. The other postulates of our pre-

[1] We use Studer's term "after-feather" (Afterfeder) for the small fluffy feather emerging from the superior umbilicus of the contour feathers of most carinate birds. The commonly accepted designation of this feather as aftershaft or hyporhachis is confusing, because the after-feather is a complete feather with its own shaft, barbs and barbules, though of course without a separate calamus of its own. (For current terminology of the feather see Asa C. Chandler, *Univ. of Calif. Publ. in Zool.,* 13: 243–446, 1916.)

[2] Frank R. Lillie and Mary Juhn, *Physiol. Zool.,* 5: 124–184, 1932.

[3] Anne Hosker, *Philos. Trans. of the Roy. Soc. of London,* Sec. B, 226: 143–188, 1936.