SCIENTIFIC BOOKS

Artificial and Natural Flight. By Sir Hiram Maxim. New York, The Macmillan Co. $1.75 net.

Sir Hiram Maxim, the celebrated inventor and manufacturer of the machine gun which bears his name, has published in a book of 165 pages an account of the experiments which he made for and with a flying machine from 1889 to 1894, and he has supplemented this with his own observations and reflections, so as to form a valuable guide to others who may contemplate like work.

The preface and the introductory chapter bestow some hard slaps upon mathematicians who have written upon aviation; for Mr. Maxim believes that practical experiment alone is to be relied upon, and he states that all the successful flying machines of to-day are built upon the lines which he had thought out and found to be the best.

In the chapters upon Air Currents and upon Kites he describes some very interesting observations upon the rising trends of winds with which soaring birds probably perform their astonishing feats. He expresses the belief, however, that "we shall never be able to imitate the flight of the soaring birds. We can not hope to make a sensitive apparatus which will work quick enough to take advantage of the rising currents of air." It is possible that Mr. Maxim is mistaken.

Then he gives an account of his experiments upon screws, on the coefficient of air resistance of various forms, on the best shapes for aeroplanes and for condensers and then passes to hints as to the building of flying machines, which it is greatly to be hoped he will apply himself, now that the success of others has removed the odium which attached to such experiments less than fifteen years ago.

Mr. Maxim discusses briefly the Santos-Dumont, the Farman, the De la Grange and the Blériot flying machines, while he expresses doubts in the main body of the book as to the truth of the "alleged flights" of the Wright Brothers, which he takes back in the appendix. His calculations of resistances and horse power required are somewhat vague; he figures for the De la Grange machine that at an angle of incidence of 1 in 10 the screw thrust would be 100 pounds, requiring 10.66 H.P. to overcome the drift, and he allows another 10 H.P. for the atmospheric resistance due to the motor, the man and the framework of the machine, reaching the conclusion that of the 50 H.P. developed, 29 H.P. will be consumed in slip. This is probably erroneous. If the cross sectional area of the air-resisting parts be measured and proper coefficient applied it will be found that they require a good deal more than 10 H.P. to overcome the resistance at 40 miles an hour, and that the slip of the screw is much less than estimated.

Mr. Maxim has no good opinion of balloons. He devotes a chapter to them, but expresses the opinion that the day of the balloon is past, evidently not recognizing the fact that the flying machine, while capable of great speed, is limited in size and carrying capacity by its own increase of weight as the cube of its linear dimensions, eventually reaching a size beyond which it is no longer practicable, while the balloon increases in surplus lifting power faster than its own weight and promises some usefulness in spite of its inferior speed, its bulk and its fragility.

Mr. Maxim gives an account, all too brief, of his own flying machine, weighing some 8,000 pounds, with 4,000 to 6,000 square feet of sustaining surfaces, a motor of 363 H.P., this being a steam engine of his own design of unprecedented lightness, developing a thrust at the screws of 2,164 pounds. This wonderful and immense apparatus, the work of a very able engineer, was run very many times over a railway track of nine feet gauge, being restrained from rising more than two feet by guard rails of timber of thirty feet gauge. With this arrangement many tests were made and data obtained preliminary to an attempt at free flight, but on July 31, 1894, the apparatus rose with such force as to burst through the guard rails and enter upon a cruise. Steam was shut off at once and the machine, after flying perhaps 200 feet, fell and was broken. It was repaired, but various circumstances have prevented its being tested again.

There were two causes for this failure. First, the stability was deficient, as subsequently recognized, and second, Mr. Maxim did not and could not know how to handle it in the air, for lack of preliminary practise in free flight. The gradual training which all successful aviators have had to go through during the last five years is an abundant demonstration, and one of the marvels of the evolution is that so few fatal accidents have occurred to the experimenters, although there have been almost innumerable breakages of the machines.

O. CHANUTE

Our Insect Friends and Enemies. By JOHN B. SMITH, ScD., Professor of Entomology in Rutgers College and Entomologist of the New Jersey Agricultural Experiment Station. Philadelphia, J. B. Lippincott Company. 1909. Pp. 314, 1 plate. $1.50.

The many good insect books which have appeared during the past few years have not entirely filled the need for more literature of the right sort. A careful reading of this book shows it to be quite different in scope from any of its predecessors. The object is not to present a scheme of classification, a manual of insect anatomy, or a handbook of injurious species of insects, yet these phases are treated incidentally and satisfactorily.

In the foreword the author explains that his object has been to present an account of the relation of insects to other living things. In this he has been eminently successful, and it would be difficult indeed in a book of its size to give a more comprehensive and complete general survey of the whole subject. To the student and working entomologist this book is useful, but especially to the lay reader who sometimes gets an exaggerated idea of the value of parasites or remedial measures in destroying noxious species, is this volume of great value because it shows these relations in their true light and perspective.

The average individual has little knowledge about the recent discoveries relating to the transmission of human and other animal diseases by insects, especially flies, mosquitoes and fleas. In fact, his only source of information has been the newspapers, which print occasional disjointed statements regarding this very important matter. Chapter IX. makes this subject plain to anyone who will read it—and everybody ought to read it.

Chapters IV. and V., on the relation of insects to each other and their relation to animals, are particularly good and deserve to have a wide reading.

A critical person might question the statement regarding the formation of galls on page 78: "and the remarkable point is, that the gall is purely a production of the plant, and the insect has apparently nothing at all to do with it." That the irritation, stimulus or injury of the insect which causes a gall of definite and characteristic shape to form on a particular plant is little known, is true, yet it can not be considered that the insect has "apparently nothing at all to do with it," when the attack of each different species of Cynipidæ or Cecidomyidæ causes a different but entirely characteristic gall to form on the same host plant. However, this is partly explained below on the same page by Professor Smith.

A good colored plate of household insects forms the frontispiece to the volume, which is well printed on good paper, and attractively bound in tan-colored linen.

Of the 121 figures in the text about 35 are new, and were made from excellent pen drawings.

The book is remarkably free from typographical or other errors, the only one noticed being the mis-spelled specific name of the Angoumois grain moth *Gelechia cerealella* Oliv., on page 242.

This volume should find a place in every library of entomological works, and every public library should have a copy.

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NOTES ON ENTOMOLOGY

MR. G. H. VERRALL has completed another volume in the series of books on the Diptera of Great Britain.[1] This volume includes all

[1] "British Flies," Vol. V., London, 1909, 780 pp., 406 figs.