

The experience gained by the form of mounting adopted for the 60-inch mirror will be valuable when the time comes for the erection of the 100-inch mirror, and funds will no doubt soon be found when the right moment arrives.

Already the United States is the possessor of the two largest refractors and silver-on-glass reflectors. This new monster will afford her another means of greatly extending astronomical knowledge, which has made such vast strides during the last decade owing to these increased aids to observation.

AN EXPERIMENT IN INSECT-EXTERMINATION.¹

IN the year 1900 the sugar-cane planters of Hawaii were seriously alarmed by the appearance in considerable numbers in their plantations of an introduced hemipterous insect allied to the cicadas and commonly known as the cane leaf-hopper, but designated scientifically *Perkinsiella saccharicida*. Since that date the pest has increased to an enormous extent, with an estimated loss of many millions of dollars to the planters. Fortunately, the leaf-hopper has a certain number of enemies among the insects indigenous to Hawaii, since had it not been for the extent to which it was held in check by their attacks it seems probable that sugar-growing would by this time have become absolutely impossible in the islands.

These indigenous enemies were, however, utterly unable to cope in a thoroughly efficient manner with the swarms of the leaf-hopper, and it became apparent that unless some other means of diminishing its numbers were discovered the sugar industry of the Sandwich Islands would be practically ruined. Accordingly, the officials of the Entomological Division of the Planters' Association at Honolulu set to work with commendable energy and enthusiasm to endeavour to find an efficient and satisfactory remedy. It appears to have been soon decided that such a remedy would most likely be discovered in the form of insects which would prey upon the leaf-hoppers with greater vigour than any Hawaiian species; and in 1903 and the two following years expeditions were organised to North America, Australia, and Fiji with the view of discovering such insects.

In due course a number of species inimical to the cane leaf-hopper were brought to light, and the present elaborate bulletin (of which one part has been already briefly noticed in our columns) is devoted to the description and life-history of leaf-hoppers and their enemies, together with an account of the experiments which have been made in introducing and acclimatising certain of the latter into Hawaii.

The list of insects parasitic on leaf-hoppers is a very long one, and comprises representatives of several orders, although the great majority belong to the Hymenoptera. For our present purpose attention may be concentrated on the few species it has been found advisable to introduce into Hawaii. In the case of the introduction of such parasites four points are essential:—(1) Their effectiveness as destroyers of the pests; (2) the possibility of successful transportation; (3) the probability of their thriving in the new country; and (4) their rapidity of increase when introduced. The choice was soon narrowed down to certain minute Hymenoptera which feed upon the eggs of leaf-hoppers, namely, to species of *Anagrus* and *Paranagrus* in the family Myrmaridæ and to one

of *Ootetrastichus* among the Eulophidæ. The members of the two first genera complete their life-cycles in about three weeks, breed at about the same rate throughout the year, and are largely parthenogenetic. *Ootetrastichus*, on the other hand, takes fully twice as long to complete its cycle, but produces twice as many eggs, and is wholly parthenogenetic. *Caeteris paribus*, the products of the myrmarids at the end of six months will, however, be a million times more numerous than those of the other genus. On the other hand, the ootetrastid is not only more hardy, but has the advantage that each individual is bred at the expense of the whole contents of the egg-chamber of the leaf-hopper instead of destroying only a single egg.

Of the four species introduced one of *Paranagrus* is at present the most effective, but the *Ootetrastichus* is slowly but surely increasing in numbers, and is eventually expected to prove the most effective. For further details respecting these interesting and to a great extent even at present successful experiments, our readers must be referred to the Bulletin itself.

R. L.

THE FLIGHT PROBLEM.

THE real "flights," not "jumps," which Mr. Santos Dumont has been making at Paris with his new aeroplane have directed the attention of the whole aeronautical and motor world in the direction of the problem of flight. Further, tempting prizes have now been offered which will undoubtedly stir up other workers to take up the problem and so increase the chance of rapidly advancing the progress of aerial navigation.

In addition to the Archdeacon prize of 2000*l.* for a half-mile course and to the enterprising offer of the *Matin* of 4000*l.*, which was subsequently increased to 10,000*l.* by public subscription, for the first traveller who succeeds in covering the distance between Paris and London in 1908, the *Daily Mail* has now come forward with the offer, open to the world, of 10,000*l.* to the first person who shall fly by aeroplane from London to Manchester in twenty-four hours, including two stops to take in supplies of petrol.

Such large prizes will certainly go a long way towards giving a strong impetus to the manufacture of aeroplanes, and also to the motor industries to produce the lightest forms of petrol engines. In fact, a great number of people will almost immediately set about experimenting with aeroplanes in order to compete for the prizes. We read that already Mr. Santos Dumont has given an order for a lighter and more powerful engine, namely, a 100 horse-power motor which will weigh no more than 200 lbs.

Since Mr. Santos Dumont's successes were announced, several references have been made to the experiments which have been carried out by the brothers Wright in America, but very little is known about their results, since they have purposely avoided publicity; according to the views of Sir Hiram Maxim, as stated in the *Daily Mail*, they have a new motor to their aeroplane which is twice as effective as their previous one, and they hope to "fly with it 200 to 300 miles without stopping."

Up to the present time there has not been any great inducement for workers to come forward and demonstrate publicly the capabilities claimed for their machines. The rewards now offered will no doubt serve as an incentive to them, and possibly others, to enter the arena and prove in open competition the efficiency of their designs.

¹ "Leaf-hoppers and their Natural Enemies." Edited by R. C. L. Perkins. Bulletin No. 1 of the Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu, 1905-06. 10 parts. Pp. xxxii + 499; illustrated.