

The results given are very meagre, and are as follows:—The efficiencies varied between 53 per cent. and 69 per cent. The thrust fell off in flight about 33 per cent. from the value with the aeroplane anchored. The rotational speed of the engine increased in flight from 0 per cent. to 15 per cent. above the speed with the aeroplane anchored, depending on the propeller. The experiments are to be continued with the aid of a further grant, and we may therefore expect more complete results of tests with the addition of more particulars of the propellers tested than are given in the present article.

It is to be hoped that the experimenters may improve the accuracy of their apparatus, so that their results may be of real scientific value, and not merely for the purpose of differentiating between a good propeller and a bad one.

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PHOTOGRAPHY IN SURVEYING.

FOR the last half a century continued efforts have been made to utilise photography in the preparation of accurate plans of country, and thereby economise some of the time expended in the detailed measurement of every feature and object. A photographic negative provides an accurate record of the area included in it, contains much detail which measurement alone cannot give, and is always available for future reference. On the other hand, the employment of photography requires certain technical knowledge, and a good judgment in the selection of stations and views; it is best suited to regions of considerable relief, but even then patches of ground are liable to be omitted altogether from the views, and such omissions are not recognised until the work is plotted; lastly, it necessitates considerable skill in the drawing office to get the best and most complete results from the field-work. Photogrammetry has, therefore, developed most rapidly in countries where mountainous districts offer favourable conditions for its employment, and where the season available for field-work is limited. France, Italy, Germany, Austria, Switzerland, and Canada have all made use of this method in topographical surveys, despite its drawbacks. Mr. A. O. Wheeler¹ describes in general terms the methods which are employed in Canada under the direction of Dr. Deville, the Surveyor-General of Dominion Lands, and employed by Mr. Wheeler on Dr. Longstaff's recent expedition in British Columbia. But the labour involved in utilising the information collected by the camera has always hindered its wider employment in surveying, so that we welcome a new method of automatically reproducing it on a plane surface, which is described by Prof. E. Brückner.²

Some years ago Dr. C. Pulfrich, of the firm of Carl Zeiss, of Jena, produced his stereomicrometer, by which the coordinates of points represented on a pair of stereographic plates were determined, and their positions defined, so that they could be plotted on a plan. In this instrument the plates are fixed, and the movements of the index pointers are measured. A further development was the stereocomparator, in which the plates are movable, and the points to be measured are brought under fixed marks, in this case the objectives of a stereoscope. By suitable mechanical arrangements the coordinates of any point on the picture and the stereoscopic parallax are readily determined, thus providing the necessary information for plotting the point measured. Lieut. von Orel, of the Military Geographical Institute in Vienna, conceived the idea of automatically recording the data thus measured, and the necessary modifications have been made to the stereocomparator so as to enable the data to be plotted mechanically on a sheet of paper. This instrument is called the stereoautograph, and in it the movements of the plates and the stereoscope of the stereocomparator are communicated to flat rulers resting on the drawing-board, and by their aid the positions of points are plotted on the plan. Not only is the horizontal projection of the detail effected in this way, but contour lines representing the relief can also be drawn.

Plans on a scale of 1:25,000 can be accurately pro-

¹ *Geographical Journal*, June.

² *Mitt. d.k.k. geographischen Gesellschaft in Wien*, Bd. 54, No. 4.

duced in this way, and even one on the scale of 1:10,000 showed but slight differences from a precise measured survey of the same on this scale. The apparatus is said to be capable of producing a map sheet 35 cm. by 25 cm. of a mountainous region to the scale of 1:25,000 in about ten days' work, so that it promises to be of great value in reproducing the work of travellers and explorers who will take the necessary photographs. Photogrammetric methods do not apply where surveying is organised so as to utilise a *personnel* of moderate technical ability, where each individual carries out a single stage of the work only; but where skilled technical assistance is available, and each surveyor executes as complete a survey as possible of a given area, then stereophotogrammetry, simplified by Lieut. von Orel's instrument, seems to offer great possibilities, especially when conditions of work and of surface relief are also favourable.

Though primarily adapted to topographical representation, some have tried to adapt photography to large-scale (cadastral) work, and M. J. Gaultier has proposed methods for its employment. But the indoor work of the necessary precision is tedious and costly, so that in a recent paper¹ he proposes for such work an instrument which he names the "topometrographe." This is of the nature of a plane table for precise work, stoutly built and carefully levelled, on which a base-bar is clamped. This carries the pivots of two rulers set at a distance apart corresponding to the base line used. These rulers are set at any desired angle with the base-bar by means of divided circles, and their intersection locates the apex of the triangle. Very considerable accuracy is claimed for the method, which is to be based on a network of third- or fourth-order triangulation; but its effectiveness would appear to be restricted to special cases, where such elaboration in the field is compensated for by economy in the office.

BIRD-NOTES.

FROM the point of view of forest-conservation much interest attaches to Mr. F. E. L. Beal's report on the food of American woodpeckers, published as Bulletin No. 37 of the biological division of the U.S. Department of Agriculture. The report is based on the examination of the contents of a large number of stomachs of sixteen species of these birds; but since the number of specimens examined was much smaller in some cases than in others, it is quite probable that some modification of the order in which these species are tabulated according to the nature of their food may be necessary in the future. Another element of uncertainty in this respect is due to the rapidity with which the vegetable food of the cambium-eating species passes through the stomach.

As the forests of the United States, like those of other countries, have a host of insect enemies, among which wood-boring beetles are pre-eminent, any natural agency that will assist in keeping these pests in check is of the highest value. In the case of wood-boring beetles, woodpeckers occupy the first place as destroyers, and among these the two species of the three-toed genus *Picoides* are the most valuable. In the typical *P. americanus* no less than 94.06 per cent. of the food consists of animal matter; while as regards its insect-food, 71.05 per cent. consists of beetles and the remainder of ants. Most of these beetles are wood-borers, although a percentage consists of harmless species. Ants also are deleterious to trees, since they often take possession of the borings from which beetles have been extracted by woodpeckers, until they in turn are routed out by these birds. Woodpeckers are frequently charged with inflicting damage on sound trees; but the charge, except in the case of the American group of sapsuckers, is considered to be unfounded. As regards sapsuckers, which feed on cambium, these certainly do inflict damage, which in some cases may be serious although, on the other hand, they consume legions of ants.

The colouring of the Jack snipe forms, according to Mr. F. J. Stubbs in *The Zoologist* for July, an absolutely perfect protective adaptation. In some localities the only means by which the bird can be detected when squatting in its proper haunts is by looking for a couple of curved blades of faded grass of a brighter hue than any indi-

¹ *Revue Scientifique*, May 6.