Theorems on stresses in envelopes by Mr. Booth.

Forces and couples on a model dirigible placed obliquely to the current by Mr. Bairstow.

Air resistances of wires and ropes, both stationary and vibrating, by Mr. Melvill Jones and Dr. Stanton.

Air pressures on the honeycombed radiator and Paulhan girder.

Methods of observing flow of water past an obstacle by Mr. Eden.

Propeller experiments by Mr. Bairstow.

Tests of balloon fabrics.

Meteorological apparatus by Mr. J. S. Dines.

The present report is characterised by greater definiteness of purpose than was noticeable in its predecessor for 1909–10. Many of the papers have a direct bearing on aërial navigation, and we do not exclude Mr. Bairstow's experiments on square plates altogether from this category, since if it is required to test the deviations from the law of proportion of pressure to square of velocity, the first tests may as well be made on square plates as on any other kind of surface. The experiments on obliquely placed model dirigibles also have an important bearing on the problems of stability and steering as applied to airships, and the necessity for such investigations is fairly evident. At the same time, the superfluity of diagrammatic details which was referred to in the review of the preceding year's report is also to some extent a conspicuous feature of the present volume, and it again appears desirable to direct attention to the fact that some of these are wholly unnecessary and only occupy space that could be with greater advantage devoted to broad and general discussions by the members of the committee on the principles of mechanical flight, considered in relation to the experiments here described. The three and one-third pages of description of Mr. Dines's theodolite would probably be just as useful without the three folded diagrams, one taken at Pyrton Hill in a clear sky, and one showing the observations by Cary at station A, and Bosch at station B, up to the point where a certain pilot balloon was lost sight of.

The article on propellers, while accompanied by six bulky folding plates, only occupies four pages of letterpress. One of these is devoted to "improvements in apparatus"—not improvements in propellers, but in the dynamometers and other instruments for testing them, while the remainder are principally devoted to determining the constants and coefficients of a Vickers and Maxim, and three Ratmanoff propellers. Certain conclusions are stated, referring in particular to the effects of cutting down the blade area, and the extent to which the principle of similarity can be applied to models. But surely there is a great deal more to be said about the general problem of propeller action, even in connection with the interpretation of the results of these experiments, and it is desirable that the investigation should be extended to other types of propeller than the two here discussed. Perhaps this will be done another year.

In making these criticisms it is necessary to guard against one serious mistake which is commonly made, and does much to retard scientific progress and development. It is frequently said of certain physical investigations that they are of no use because they do not take into account all the disturbing factors which exist in nature. As applied to aviation, we are told by some people that it is no use to investigate the efficiency of planes and propellers by laboratory experiments, as the investigations fail to take account of the atmospheric disturbances which affect the motion of an actual aëroplane. This, however, is equivalent to saying that we require to know less about the efficiency of our apparatus under the complex conditions prevailing in nature than we should if the conditions were simpler. In reality we ought to know *more*, and experiments made under ideal conditions instead of being condemned as "unnecessary," should be described as "insufficient," and should therefore be pushed on with all possible haste as a preliminary step to investigations of a more general character.

In view of the desirability of using experiments with models for all they are worth, and the success which has attended such experiments in naval architecture, it is satisfactory to find that the principle of dynamical similarity is receiving considerable attention. At the same time, one has rather an idea that the atmospheric conditions under which aëroplanes and dirigibles are navigated are rather different from those existing in the National Physical Laboratory, and the idea suggests itself that, instead of trying to produce a current of air that shall be as nearly uniform as possible, results equally interesting would be obtained if it were attempted to do the very opposite thing. When so many physical data are unknown even to within 100 per cent., it surely is rather unnecessary to trouble about whether a velocity of 1·6 or 2·1 miles an hour is set up in the air when a rotating arm is travelling through it at thirty-five miles an hour. A study of the "wash" or interference effects caused by planes or propellers on other planes or propellers following in their wake would be more useful. For example, the lift and drift of the isolated Paulhan girder determined on p. 36 may for this reason be different from the values which they would have when the girder occupied its proper place in an actual flying-machine.

There are two possible alternatives. One is (following the usual custom) to disparage such researches as those last-named; the other is to ask for something more. The latter alternative certainly appears from every point of view to be the better.

The collection of abstracts of papers on aëronautics, compiled from various English and foreign journals, extends from p. 92 to p. 124, and is an exceedingly valuable feature of this, as it was of last year's report. The preparation of such abstracts involves an expenditure of time and thought, on the part of the abstractors, which, as a rule, receives but scanty recognition. The idea suggests itself whether some working arrangement could be arrived at between the Government Committee and the Aëronautical Society to enable the abstracts to be reprinted in the Journal of the latter, and thus circulated among its members at regular intervals. Perhaps this question may be deferred until the Aëronautical Society has had time to settle down after the arduous work of reorganisation on which its council has recently been engaged.

SIGHT TESTS IN THE MERCANTILE MARINE.

THE Board of Trade has published the annual return of the sight tests used in the mercantile marine for the year ending December 31, 1910 (Parliamentary Paper, Cd. 5876), a return which includes the examinations in both form and colour vision. In the course of the year 7502 candidates were examined, including fishermen who sought to obtain certificates as skipper or second hand of fishing boats, and of this total 109 (1·46 per cent.) failed in form vision, and one of them, who was re-examined, failed again. One hundred and forty-one failed in colour vision, but of these 69 were re-examined on appeal, and 29 of them passed, leaving 112 (1·56 per cent.) as ultimate failures.

The colour examination, since November, 1909, has been conducted with five skeins of wool, a purple and

a yellow, in addition to the green, pink, and red originally used by Holmgren; and a coloured plate gives the colours which were selected as matches by the rejected candidates, and are distinguished by letters of reference in a schedule showing the performances of all the candidates who were ultimately rejected, and are therein described as completely or incompletely red or green blind. This information, however, is withheld in the very cases in which it is most required, that is, in the cases of candidates who, having originally been rejected, were passed on appeal. With regard to these, we are only told that they "failed in the colour vision tests," and, in another column, that they "appealed and passed." It would be highly interesting to know both on what grounds they were originally rejected and on what grounds they were ultimately passed, because these are the very cases in which the sufficiency of the methods of examination employed may possibly be called in question at some future time. The matter is perhaps of less importance, as we read in the report that "the whole question of sight tests is now being carefully considered by a Departmental Committee appointed for the purpose," and it is therefore possible that changes both of procedure and of record may be suggested.

Of the 112 men rejected for defective colour vision, 42 were completely and 21 incompletely green blind, and 32 were completely and 17 incompletely red blind, no instances of the rarer varieties of failure being recorded. The rejections are somewhat in excess of those of many previous years, and the explanation seems to be that the fishermen seeking certificates, as mentioned above, have only been required to pass the same sight tests as candidates for certificates as masters or mates in the mercantile marine since November, 1909, and that they have increased the proportion of defectives. As compared with the amount of defective colour-sense in the population generally, the proportion of rejections does not seem large, and it is highly probable that many colour-blind persons are prevented, by a knowledge of their condition, from attempting to enter the sea service.

WIND IN THE ADRIATIC AND IN HOLLAND.[1]

THERE has been in recent years a re-awakened interest in the problem of the periodic variations of the wind, but there remains much to be done to complete that thorough harmonic analysis of the motion of the air which Kelvin emphasised as one of the most important lines of meteorological research so long ago as 1876. Hitherto attention has been devoted mainly to a consideration of the semi-diurnal variation, and the results have shown conclusively that the regular semi-diurnal wave of pressure can, as indeed it must, be connected through the hydrodynamical equations with a similar regular variation of the wind-vector. In the discussion of the record for individual places, the question of the local variations from the general law and their explanation rightly find a place, but they ought not to be allowed to exclude the consideration of other possible periods.

In the first chapter before us, Dr. Mazelle, Director of the Observatory at Trieste, analyses five years' records from the Beckley anemograph erected in 1902 on a lighthouse in the Adriatic, the Klipper Porer, which lies a mile and a half W.S.W. of Cape Promontore, the most southerly point of Istria. The results have been very fully discussed, and the records are arranged and tabulated in many different ways to exhibit the different features inherent in them. A table giving the frequency of the wind for sixteen directions for the four seasons of the year shows that at all times the E.N.E. wind is most frequent, and that all easterly winds have their maximum frequency in winter and spring, while westerly winds are more frequent in summer and autumn. Another table, giving the diurnal variation of the frequency of the wind for the eight principal directions, shows that N.E. winds are most frequent about 3 a.m., and W. winds about 3 p.m., a result which may arise from land and sea breezes.

Diagrams are drawn to show the diurnal variation of the wind-vector for the four seasons and for the whole year. In general the vector rotates in a clockwise direction in the course of the day, but in winter the curve is looped and the rotation is counter-clockwise from 3 p.m. to 3 a.m. The variation is greatest during summer, and is greater in spring than in autumn. It would have been an advantage if the results had been analysed for the four principal directions, instead of for N.E., S.E., N.W., S.W., in order to permit of direct comparison with results from other places and with theory.

A considerable part of the paper is devoted to a discussion of strong winds or gales, especially gales from the N.E. quadrant, Bora, and from the S.E. quadrant, Scirocco. Dr. Mazelle takes a stormy day to be one on which the mean velocity of the wind is at least 50 kilometres per hour. There were 149 such days in the five years, or, roughly, one day in twelve. January had 33 such days, or rather more than one in five. June, on the other hand, had only one such day in the whole period. A curious and suggestive peculiarity is the secondary maximum in October, which had 18 stormy days, compared with 11 in September and November. The diurnal variation on a stormy day is about the same in summer as in winter, the maximum occurring at or slightly before noon in both seasons. For days of stormy Bora and Scirocco the definition is extended to include days on which the maximum velocity exceeded 50 kilometres per hour. There were 233 days of stormy Bora and 71 of Scirocco during the five years, a result which does not altogether support Horace's description of Scirocco or Notus as "arbiter Hadriae," "that tumultuous ruler of the restless Adriatic." Bora is most frequent in winter, the worst month being January, with an average of eight days; Scirocco is most frequent in autumn, with a maximum monthly average of 2·6 days in October. In every month the average number of days of Bora is greater than that of Scirocco.

Perhaps the best idea of the character of Bora and Scirocco is given by tables showing the length of the periods during which the mean velocity exceeded 50 kilometres per hour, and of periods during which the velocity never fell below 50 kilometres per hour. It is seen from these that on one occasion of Bora the wind blew uninterruptedly with a velocity exceeding 50 kilometres per hour for 144 hours, and that on the same occasion the mean velocity did not fall below 50 kilometres per hour for 7 days. The corresponding maximum periods of duration for Scirocco are 36 hours and 3 days. The absolute maximum velocity recorded during the five years was 128 kilometres per hour for Bora, 102 for Scirocco, 98 for S.W. gales, and 80 for N.W. gales. Unfortunately, the factor of reduction is not stated, so that it is not possible to compare these values with records for this country.

The second paper is a discussion contributed by

[1] "Die tägliche Periode der Windrichtung und Windstärke nach den anemometrischen Aufzeichnungen auf der Klippe Porer." By E. Mazelle. Besonders Abgedruckt aus dem lxxxvii. Bande der Denkschriften der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften. Pp. 65. (Wien: Alfred Hölder, 1911.)

"On the Diurnal Variation of the Wind and the Atmospheric Pressure and their Relation to the Variation of the Gradient." By Dr. J. P. van der Stok. Pp. 14. Koninklijke Akademie van Wetenschappen te Amsterdam. Reprinted from Proceedings of the Meeting of May 27, 1911.