arranged for the prism to be capable of easy removal for cleaning purposes or for renewal. An additional advantage of this method of construction is that a series of prisms may be employed, giving further ranges of refractive indices

FIG. 3.—Dipping Refractometer (Bellingham and Stanley, Ltd.).

up to 1·55, with an accuracy of three or four units in the fifth decimal place.

For measurements of still higher accuracy, the Pulfrich refractometer is available (Fig. 4). In ordinary use this instrument will give results four or five times as accurate as those obtained by

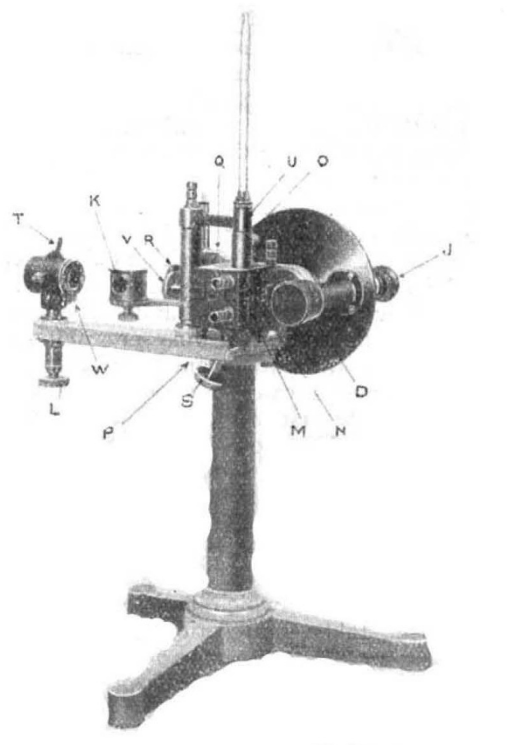

FIG. 4.—Pulfrich Refractometer (Adam Hilger, Ltd.). D, Telescope object-glass and prism dust cover; J, telescope helical focussing E.P.; K, prism for use with sodium burner; L, condenser height-adjusting milled head; M, bottom water jacket with Pulfrich prism; N, top water jacket; O, thermometer case; P, circle slow motion (position only indicated); Q, slow motion vernier (position only indicated); R, slow motion arm clamp milled head; S, clamp screw for bottom water jacket; T, light screen; U, thermometer adapter case; V, thermometer case operating milled head; W, clamp for vacuum tube holder.

means of the Abbe refractometer. Mr. J. Guild, of the National Physical Laboratory, claims that, with proper care in design and use, the Pulfrich refractometer will give results accurate to the fifth decimal place, not only in the dispersion, but also in the absolute index. In this instrument the substance to be examined is placed on top of the horizontal surface of a block of glass of known refractive index. Rays entering the substance from one side can pass out from the opposite vertical surface of the Pulfrich prism only when they enter above the horizontal boundary surface. A sharp line representing the rays which have just been able to enter the prism is observed in the telescope. The angle of emergence is measured by rotation of the telescope, which is attached to a divided circle. Messrs. Hilger have designed a new instrument in which all screw-heads are brought within reach of the observer's right hand. Direct readings on the vernier of the divided circle are accurate to one minute, and on the divided drum of the slow motion to six seconds. In accurate measurements the questions of temperature control and of the source of light employed must receive careful consideration.

THE ATLANTIC FLIGHT.

THE first attempt to cross the Atlantic by aeroplane will go down to posterity as one of the milestones in the progress of aviation, and there seems little reason to doubt that this feat will soon be accomplished. The two main factors affecting the result are the trustworthiness of the engine and the state of the weather. The best engines of to-day are capable of running for periods considerably longer than that required for the crossing, and, although it is impossible to say that a given engine will accomplish a twenty-hour run without mishap, the chance of failure due to engine breakdown is by no means exceptionally great. On the other hand, the weather is extremely difficult to forecast, and very little information is obtainable as to the conditions prevailing at a height of 10,000 ft., even though the surface conditions are fairly well known. Every possible provision will be made for the safety of the aviators in the case of a forced descent at sea, but the element of risk is naturally a very serious one, and we can but admire the men who are so ready to face it.

Mr. Hawker, on his Sopwith machine, is carrying a collapsible boat, attached to the upper side of the fuselage, containing signalling devices and provisions for two days. Even with such a precaution the risk would be very great in a rough sea, and the chance of attracting the attention of ships would be small. It is understood that Mr. Hawker will not be able to send, but only to receive, wireless messages. This is unfortunate, for in the event of a forced descent the machine would take about ten minutes to glide from a height of 10,000 ft., and there would be ample time to get into communication with any vessels in the vicinity. It is intended to drop the undercarriage of the Sopwith machine soon after starting, a gain of several miles per hour being thus rendered possible owing to the decreased head-resistance of the machine. A daylight landing is a necessity under these conditions, and a slight crash is inevitable.

The time of crossing is estimated at approximately twenty hours, and some interesting figures relating to this point given in a report of the Meteorological Section of the Air Ministry were referred to in last week's NATURE. These figures are based on the average of the weather reports available, and show that under the best conditions the time of crossing for a machine with a speed of 100 miles per hour, flying from west to east, is only 14½ hours in the month of April, and under the worst conditions 23 hours. The corresponding times for an east-to-west crossing are 21 and 36 hours. The advisability of a start from the American side is thus plainly demonstrated.

Although Mr. Hawker, with his Sopwith machine, was the first to be prepared for the start, it seems likely that prevailing bad weather will give other competitors time to get ready, and that the Atlantic attempt will be of the nature of a race. It is to be hoped that the desire to be first across will not lead any competitor to start before the weather conditions are reasonably favourable, as the risks are sufficiently great under the best conditions, and the loss of such experienced pilots as those engaged in the present attempt would be most regrettable. Meanwhile, every endeavour will doubtless be made to choose the best moment for the start, and we will hope that before many days are past a new and great triumph will be added to the annals of aeronautical science.

THE FOOD REQUIREMENTS OF MAN.

THE Food (War) Committee of the Royal Society has recently issued a report[1] on the food requirements of man and their variations according to age, sex, size, and occupation, which summarises existing knowledge in a manner intelligible to the ordinary citizen. The customary units of measurement are carefully defined, and it is suggested that the energy requirements of those engaged in various occupations should be estimated in terms of the amount of energy necessarily set free in the body to ensure equilibrium under the given conditions.

A provisional classification is into sedentary work, where the excess expended during eight hours' work over that transformed during eight hours' sleep is not more than 400 Calories; light work, the excess being 400–700 Calories; moderate work, 700–1100 Calories; heavy work, 1100–2000 Calories. The method is illustrated upon the data of Becker and Hämäläinen, the food requirements of males being found to vary from 2750 Calories for a tailor to 5500 for a woodcutter. In the following section the influence of external temperature is discussed, regret being expressed that the statistics of consumption during different months of the year are so inadequate that valid inferences cannot be drawn from them.

The energy requirements of women are dealt with on the same lines as those of men, the provisional figures ranging from 1783 Calories for a seamstress to 3281 for a laundress (net energy values), the food requirements of the average working woman being placed at 2650 Calories per diem.

In the following section the scanty data concerning the needs of children and adolescents are epitomised, and the report ends with a cautious description of the qualities of the proximate principles and their respective *rôles* in a dietary. The final sentence runs as follows: "The above report shows how very inadequate is our present knowledge of the science of nutrition, and demonstrates the necessity of renewed investigations of almost every point discussed in it."

We do not know whether this sentence, expressing the considered opinion of a committee fully representative of all departments of science concerned with the subject of animal nutrition, will be taken to heart by the Government and people of this country, but the measure of attention it receives will be a measure of the real acceptance by the nation of the gospel of science. Further progress in the science of nutrition chiefly depends upon the accumulation of accurate details. We already know, for instance, that the food requirements of a labouring man vary enormously with the nature of his avocation, and we also know how these requirements can be experimentally determined; we know that in the hand-working classes the proportion of the total income expended upon food often approximates to 50 per cent. This is the extent of our knowledge. Excepting the armed forces, there is not a single class of the community, not one occupational group, the average energetic needs of which have been measured upon a scale which entitles the measurements to be taken into serious consideration as data for estimating the income necessary to ensure the preservation of a fit standard of life or the general food requirements of the nation. To secure this knowledge—but one item in the long catalogue of defects—organised research extending over years is necessary, research neither particularly attractive in itself, nor calculated to yield spectacular results which can be made interesting to the readers of the daily Press. The contribution of each individual worker must be small; the ultimate value of the sum of results would be immense.

It remains to be seen whether we have the faith in science and the patience which will be necessary to replace the scattered fragments, which are all we now have, by a well-compacted body of exact information.

[1] Report on the Food Requirements of Man and their Variations according to Age, Sex, Size, and Occupation. Pp. 19. (London: Harrison and Sons, 1919.) Price 1s. 6d.