

gravity, flash point, temperature of solidification, &c., of the most important of the oils now used for lubricating purposes, and a description of the apparatus commonly employed in connection with their determination.

Though the illustrations are, as a rule, clear enough, there are a few instances where it is difficult to follow the author's description of pieces of apparatus owing to the fact that symbols used in the letter-press description are not printed on the corresponding illustration.

After a brief description of the various appliances used in connection with the distribution of the oil to the working parts of machines, the author discusses the comparative value of various lubricants from the point of view both of cost and of suitability for different classes of work. Ball-bearings and roller-bearings are dealt with in two chapters, but this part of the book is by no means so complete as the earlier portions; the last chapter, which explains "forced" lubrication, might with advantage be considerably extended in any new edition. The book, however, will be found very useful for reference purposes, both by those engaged in the design and by those who have charge of machinery on a large scale; information previously scattered through various publications has been brought together into a very compact form.

The fact that Prof. Thurston's book has now reached its seventh edition is a proof of how well it has done its work in spreading among engineers a knowledge of the importance of sound investigation into the energy losses brought about by friction and the best means of lessening them. The author, whose death we had so recently to deplore, has added much fresh matter in this new edition, and brought up to date the chapters dealing with experimental investigations on friction. In the additions Prof. Thurston describes the latest researches in regard to friction in high speed electric generators and motors, and in turbines; the experimental work of Lasche is summarised very fully and clearly, and his graphical methods of recording the results of various experiments by the three coordinate system are explained, the three coordinates being pressure, velocity and temperature of lubricant. The chapters dealing with lubricants and the best methods of testing them have also been considerably revised, and amongst other additions we notice several sections treating of roller and ball bearings. The book is now probably the best reference work on friction at the disposal of engineers engaged in the design of machinery.

T. H. B.

THE FLORA OF THE SWISS ALPS.

Geschichte und Herkunft der schweizerischen Alpenflora. By M. C. Jerosch. Pp. vi+253. (Leipzig: W. Engelmann, 1903.) Price 8s. net.

THE attempt to trace the origin of a flora is so much a matter of speculative argument that it is only natural to find very divergent opinions expressed by different authorities. The object of this book is not to offer a new theory regarding the origin of the flora of

the Swiss Alps, but to bring together the views which have been put forward by leading botanists, partly for reference, partly with the object of comparing them and criticising them so far as it is possible to criticise the evidence of experts.

The primary basis upon which to formulate hypotheses is obtained by a comparison of the flora of the Swiss Alps with the floras of other regions in which many of the same plants are found. The occurrence of similar forms in the Arctic and Alpine regions is well known, and from the appearance of the species in different mountainous or Arctic regions it is possible to separate them into groups, such as the Arctic Alpine, the mid-European-Alpine group, and so on. The next step is to consider where these forms may have originated. Take, for instance, a form which appears in the Arctic regions, in the Altai Mountains, and also in the Swiss Alps. Was the original progenitor a native of any of these districts, or even elsewhere? By what path did it travel from one locality to another, and when? Some information may be gained by consulting geological records, and for this purpose the salient features of the post-Tertiary formations are submitted. A most important consideration is the effect of the Glacial period, whether the conditions were too severe or whether a portion of the present Alpine flora could have existed during the Glacial epoch; this has an important bearing on the age of the endemic species in the Alpine flora. On this, as on all hypothetical points, there is a great diversity of opinion. Christ, Heer, and Schröter are amongst those who favour a pre-Glacial origin, but Schulz, Nathorst and Clement Reid hold the view that vegetation was very much reduced at the best during the Glacial period.

Then follows the most difficult because the most speculative question, which refers to the original home of these plants. To consider again those forms which have now found suitable conditions in such scattered and diverse areas as the Arctic regions, the Alps, and the Altai Mountains, the Arctic region is postulated as the original source by Heer, Chodat and Pokorny; Hooker regards Scandinavia as the probable original home; Christ refers them back to the temperate regions of northern Asia, and considers that the Arctic regions merely represent the line of travel; and finally Briquet offers an entirely different solution, since he favours the possibility of the same species having originated in more than one locality.

These examples will give some idea of the complex and difficult problems which confront the systematist who endeavours to unravel the past history of even a highly specialised flora, and will indicate how widely diverse are the explanations which are offered by well qualified investigators. It will be inferred that the writer has had no easy task in stating briefly and impartially the various arguments. To weigh up definitely the pros and cons is impossible, but the criticisms of the author are very fair, and display considerable acumen. The scope of the book is indicated by the fact that the bibliography covers ten pages, and not the least interesting chapters are those which discuss the origin of species and the climate of the Alps.

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