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ENGINEERING ARTICLES IN THE
ENCYCLOPÆDIA BRITANNICA.

Collection of Articles (loose sheets) dealing with Engineering, from the New (11th) Edition of the Encyclopædia Britannica. (Cambridge: University Press, n.d.)

THE articles dealing with engineering subjects, in that portion of the new edition of the "Encyclopædia Britannica" which ranges from *aëronautics* up to *irrigation*, have been issued separately for the purposes of review. As a whole, the articles attain a high standard of excellence, and the writers are men of acknowledged authority. Some of these articles have appeared in previous editions, and are substantially reproduced; but they have been brought up to date in most cases. Many new subjects have been dealt with in an interesting manner, and the appended bibliographical references are generally of considerable value, and will guide in their choice of authorities readers who desire to obtain fuller information. As might be expected from the necessity for extra condensation existing in encyclopædic articles, there is a lack of due proportion on the part of some authors in treating individual branches of particular subjects.

The article on *aëronautics* has special interest at the present time, and deals fully with *aërostation*—the construction and behaviour of machines which are lighter than air. *Aviation*—the branch of *aëronautics* which is devoted to flying machines heavier than air, is treated very briefly under the heading of *aëronautics*, but is also discussed under "Flight and Flying." This subdivision is arbitrary, and from the engineering side it would be more convenient had flying machines of all kinds been grouped together.

The article on "Aqueducts" contains a comparatively brief account of modern practice, but ancient works and historical facts have been dealt with in considerable detail. It is notable also that while works connected with the water supply of Manchester and Liverpool are described at length, no reference is made to the later and equally important works carried out for Birmingham. The article on "Docks" is of great interest and value, giving good information as to most works of the kind; but it is strange to find only the briefest descriptions of modern floating dry-docks, although, as is well known, their development in recent years has been remarkable. Formerly graving docks were practically supreme; they have now become relatively less important, especially in foreign ports, where floating docks are to be found which are capable of lifting the largest ships.

Under the heading of "Canals" one would have expected to find fuller reference to the facts disclosed and suggestions made in connection with the recent inquiry by a Royal Commission into the present condition and use of British canals. The actual reference occupies only about a dozen lines, and looks like an afterthought. A few of the most important canal works of modern times are dealt with

in separate articles, including the works at Panama and those incidental to the great enlargement of the Kiel-Brunsbüttel Canal, now being carried out by Germany, as a part of her naval strategy rather than with a view to any commercial benefits to her mercantile marine. In the treatment of certain subjects considerable latitude appears to have been permitted to writers, although the relative importance of these subjects hardly justifies the prominence given to them. In other cases there has been a degree of compression which is to be regretted. Editorial control of such technical matters is undoubtedly difficult, but it might in many cases have been exercised with advantage. The article on "Concrete," for example, deals with a subject of enormous and increasing importance, especially at a time when "ferro-concrete" construction—termed by the writer "steel-concrete"—is making rapid strides, yet its discussion—excellent so far as it goes—is compressed into five pages. On the other hand, the discussion of "Fire and Fire Extinction" occupies more than three times as much space. The latter subject is undoubtedly important, but from an engineering point of view it has not the relative importance which mere space measurement would suggest.

Apart from these criticisms on a few points of detail, it is a pleasure to record the opinion that on the whole the engineering articles constitute a valuable epitome of recent professional practice, and will be of great value for purposes of reference. Not a few of them are worthy of separate publication, the treatment displaying both thoroughness and ability. Some attain almost to the dignity of standard treatises on the subjects discussed, and amongst these may be mentioned the contributions of Dr. Unwin on "Bridges and Hydraulics," Mr. Dugald Clerk's article on "Gas Engines," Prof. Ewing's on "Air Engines," and Mr. Milton's on "Boilers." In many other articles modern practice is well described, and new departments of engineering are illustrated.

Special interest attaches to the articles on "Conveyors," "Elevators," and "Destructors," which deal with engineering appliances that are essential to the life and work of great centres of population. The paper dealing with "Divers and Diving apparatus" is admirable in its clearness and completeness, containing descriptions of recent improvements for working at great depths below the surface of the sea. *Dredging* is another subject which has been treated at length, and with great ability, both in relation to the construction and maintenance of channels and harbours, and its applications for purposes of scientific research. Diamond and gold mining are dealt with by high authorities in a manner which the general reader can understand. Coal and coal mining are equally well handled. A large number of shorter and less important articles are devoted to descriptions of engineering details and processes. Irrigation receives the attention it so well deserves, excellent accounts being given of the great and beneficial results obtained by British engineers in India, Egypt, and elsewhere, as well as the work done by foreign engineers in other countries.

A few short biographies are included in the

engineering section of the "Encyclopædia," although there is no clear indication of the principle on which the subjects have been selected. The biography of Sir Benjamin Baker is hardly worthy of the man. The article is very brief, and it gives no adequate idea of the great engineering works for which Baker was responsible. This is much to be regretted. On the other hand, the notices of Bessemer and Brassey (father of Lord Brassey) contain excellent summaries of widely differing careers. The description of the "swinging saloon" devised by Bessemer for cross-Channel steamers, and of the failure of that system in practice, illustrate the dangers attaching to ventures into new regions even when they are made by capable inventors who have achieved success in other directions. Bessemer had not mastered the principles of the behaviour of ships at sea, otherwise he would not have attempted to keep a swinging saloon level as the steamer rolled by the control of an attendant who watched the indications of a spirit-level, and manipulated hydraulic machinery. Thomas Brassey was not an engineer, but was simply one of the first and greatest contractors for engineering works. He is shown to have been a man of great business and administrative capacity. The sketch of his life brings into relief his high personal qualities and illustrates the fact that he "was one of the first to aim at improving the relations between engineers and contractors, by setting himself against the corrupt practices which were then common."

W. H. W.

EXPERIMENTAL ZOOLOGY.

Experimental-Zoologie. 3: *Phylogenese.* By Dr. H. Przibram. Pp. viii+315+xxiv. plates. (Leipzig und Wien: F. Deuticke, 1910.) Price 18 marks.

THIS volume, the third instalment of the author's work on experimental zoology, is planned on the same lines as the preceding parts; it deals essentially with the nature of species and the origin and modification of specific characters. It gives a concise summary of the work which has been done in various branches of the subject, with short discussions and criticisms where the author considers them necessary. It is on the whole, however, rather an encyclopædia of the phenomena of species than a discussion, as is indicated by the fact that 70 out of 315 pages are devoted to the bibliography and index. In some cases rather more criticism would have been welcome, for the author summarises papers of very different importance with an impartiality which sometimes makes it difficult to gauge the relative value of the work.

In general, the treatment is exceedingly complete, and includes accounts of papers which might have been overlooked without giving just cause for complaint, but there are a few rather surprising omissions. For example, in dealing with heredity, the work of the biometrician school is scarcely mentioned apart from Galton's formulation of the law of ancestral inheritance; Nettleship's Bowman lecture on hereditary eye-diseases is omitted; and still more surprising is the absence of any reference to Gamble and

Keeble's work on the effects of coloured surroundings on pigment development. Poulton's work on the same subject is also treated rather inadequately.

The plates are of the semi-diagrammatic kind used in the first volume, and are excellent as illustrations of the text; they are folded so that a plate can be turned out for reference while reading, but it would make it easier to find the plate required if the numbers were visible when they are folded. As in the previous volumes, the use of the letters *a* and α is sometimes confusing; in plate vii. we notice that the numbers 4a and 4c are interchanged, and in the description of plate xxiv., Fig. 14, the use of the word "heterozygote" is misleading. We mention these small defects in the hope that an English translation will be undertaken, in which they may be remedied.

The book opens with a discussion of the criteria of species, in which the importance of physiological characters (blood tests, &c.) is emphasised, and a tabular summary is given of various classes of specific characters. The two short chapters which follow deal with the possibilities of asexual (somatic) and sexual transmission of characters. Chapter iv. consists of a very complete catalogue of experiments in hybridisation, both of crosses between distinct species and between races or varieties. This fills 100 pages, and is most valuable as a list of all the most important cases up to the year 1909. In the succeeding chapter these results are analysed. It is concluded that the first cross (F_1) may show (1) a blend, (2) a mosaic, or (3) alternative appearance of the parental characters. In the F_2 generation the first and second classes may give young all like F_1 , or Mendelian segregation may occur; the third class always gives a Mendelian result. The view that Mendelian characters are borne by chromosomes is provisionally accepted. A good account is given of dihybrid and polyhybrid cases, and of the phenomena of "latency" and sex-limited inheritance. In crosses between distinct species the characters often blend, because apparently corresponding characters in different species are not allelomorphic. The relation of Mendel's and Galton's laws to each other is described, and in a discussion of the relation of alternative to blended inheritance a suggestion is made for bringing both into one category.

Chapter vi. (63 pages) gives a summary of work in the production of characters by environment, and their inheritance. Among the work on Protozoa, Dallinger's experiments are not mentioned; and in the long section devoted to the Lepidoptera, we think that a fuller discussion might have been given of the means by which colour-production is influenced by temperature and other factors, as indicated, for example, by Gräfin von Linden's work. The theoretical conclusions to be drawn from this chapter are postponed to the end of the book. In the chapters on selection and mimicry, a good account is given of experiments and observations by various workers, and it is concluded that although natural selection can bring about the survival of the fittest, and although mimicry of a noxious species may be a protection to the mimic, yet selection can originate nothing, but only isolate "pure lines" already existing.