Education of Engineers.[1]

THE report on the education and training of electrical engineers is a really important and instructive pronouncement. The industry is a comparatively new one, and the committee has been able to formulate recommendations in advance of the prejudices and customs of older branches of engineering. An attempt is made to lay down a uniform system for manual and technical workers of various grades, and it is pointed out that industry should be represented on all committees concerned with primary, higher, and technical education and with after-care and juvenile employment. The committee recognises four classes of apprentices, namely:

(1) *Trade Apprentices,* who enter works between fourteen and sixteen and are to be trained to become skilled workmen. They should be selected at an interview and given a trial period. The committee suggests that they should be placed under the supervision of a trained officer responsible for their selection, who should keep records of their progress.

(2) *Engineering Apprentices,* who enter works between the ages of sixteen and eighteen, chiefly from the higher secondary schools. These should be trained by practical experience and technical education, up to the age of twenty-one, for junior staff positions. Before entering works they should have attained a standard equivalent to that of a university matriculation examination. They should be selected after an interview and examination of school records, and appointed for a probationary period. Their practical training should be directed not so much to making them skilled workmen as to giving them a knowledge of various manufacturing processes and of design, testing, and workshop organisation. Their technical education should be continued during apprenticeship by part-time courses.

(3) *Student Apprentices,* preferably graduates in engineering, who enter the works between the ages of nineteen and twenty-two, and should be definitely trained for senior positions on the staff. The committee has reached the conclusion that the need for attracting men of ability makes it imperative, not only to abolish the premium system, but also to give during apprenticeship a maintenance allowance. Student apprentices should, if possible, have graduated in honours in engineering, and be taken systematically through a group of related departments.

(4) *Research Apprentices.*—Research is now an essential factor in industrial progress, and it is necessary to make definite provision for the training of research workers. University graduates who have shown special aptitude for scientific investigation should be selected, preferably from those who enter as student apprentices. In the last year of apprenticeship they should devote attention to investigations arising in practice, and then return to the university for a year of post-graduate work or obtain equivalent experience in a works laboratory.

The report concludes with a discussion of the need for more scholarships from primary to junior technical and secondary schools, and from these to the technological faculties of the universities; also for post-graduate research.

The report of the Institution of Naval Architects is briefer and less systematic. So far as it goes, it is on the same lines as the electrical report. It states that an apprenticeship, or at least a clear understanding binding on both sides between employer and lads entering works, is desirable. It suggests selection on results of school work and the need for a supervisor of lads learning their business. An appendix contains information obtained from the principal shipbuilding firms as to the opportunities afforded by them to lads entering the works, and especially as to the inducements held out to them to improve their educational equipment. An interesting part of the report is an account of the admirable system of training established by the Admiralty in H.M. Dockyards.

W. C. U.

1 "Education and Training for the Electrical and Allied Industries." Being a Report of a Committee of the British Electrical and Allied Manufacturers' Association. 64 pp. (London: Edward Arnold.)

Institution of Naval Architects. Report of the Committee on the Education and Training of Apprentices in Shipyards and Marine Engineering Works.

Tropical Control of Australian Rainfall.

IT would appear probable that the Australian continent, extending well within the tropical belt, of approximately symmetrical shape, and free from disturbance by large land masses, especially to the east and west, is the very best place to study the mechanism of tropical rain control. Certainly such a control, if proved and reduced to a system, should very greatly assist the forecasting of the all-important Australian rainfall. Bulletin No. 15 of the Commonwealth Bureau of Meteorology is devoted to a study of this subject by Mr. E. T. Quayle, Supervising Meteorologist of the Melbourne Bureau.

It must be admitted that the period dealt with, largely confined to the six years 1911–16, seems to demand very strong evidence to justify a general conclusion. This objection is partly met by an addendum dealing to some extent with longer periods—up to twenty-four years in one instance—but one would be inclined to wait for confirmation of the great improvement in rain-forecasting claimed by Mr. Quayle. His chosen "argument" is the minimum temperature in the tropical regions of Australia. If this is high, it may be attributed to cloudiness, extra humidity, or north-east wind, and of these three the second is suggested as the most important. In any case, the idea is that this high minimum, which is usually persistent for a few weeks at a time, causes such a flow of air to the southern parts of the continent that the approaching cyclonic "lows" are compelled to part with rain.

The stations on which Mr. Quayle lays most stress for his prediction are Darwin and Mein, the latter being on the north-east coast of Queensland. The influence does not travel directly southward, but Mein corresponds more closely with the Darling district of New South Wales and North Victoria; while Darwin corresponds with South Australia and, to a much less extent, with Western Australia. Inasmuch as the Darwin temperatures are inclined to follow those of Mein after about three days, the inference is that a longer forecast can be made from the Mein figures, or possibly from figures further eastwards in New Guinea.

Mr. Quayle gives figures to show that the average daily rainfall over the southern inland areas during the months April to October (the wheat-growing period) is more than twice as great during periods of high minimum at Darwin as during periods of low minimum. He considers that the slowness of the changes at Darwin justifies forecasts twenty days ahead. He discredits barometer readings as quite untrustworthy for this purpose. The behaviour of the lines of influence is not the same in dry years, but is nearly north to south in wet years. The exceptional years 1914 and 1916 happen to be included in the short period under consideration, and these certainly