

directors of vocational education, and all moneys in aid of the *training* of teachers and directors, must be matched by an equal sum on the part of the State Boards, upon which bodies will fall all the initial and annual expense of buildings, equipment, and administration. The purposes of the Act are rigidly defined. They are to fit young persons for useful employment, the teaching is to be less than college grade, and is to meet the needs of persons of more than fourteen years of age engaged in agricultural, commercial, and industrial pursuits and in home economics. The Federal Board is to inquire and to report annually to Congress as to the administration of the Act throughout the States, and as to the expenditure, and to include therein the reports of the several State Boards.

This important Act of Congress, whilst it has many commendable features, does not require compulsory attendance on the part of young people engaged in employment at continuation or part-time schools. This is regarded as vital to the efficiency of the Act in a bulletin issued by the Federal Board for Vocational Education, in which it is stated that the initiative not only for establishing such schools, but also for compelling the attendance of those for whom the instruction is provided, must be taken by the States, and that it is not probable that State schemes for part-time education will develop materially until after the passage of legislation authorising and directing the establishment of such schools, providing State funds for their equipment and support, and compelling the attendance of the young people for whom they are designed within the ordinary working hours. It is officially stated in the bulletin referred to that out of a total population, male and female, between fourteen and eighteen years of age, of 10,250,000, 5,000,000 have ceased school attendance altogether. The only State of the Union which has adopted a real measure of compulsion for pupils between fourteen and sixteen years of age having work permits is Pennsylvania, under a law enacted in 1915, and already there are 100 school districts with 36,000 pupils in attendance at part-time continuation schools; but the movement is growing, and already there appears in Bulletin 19 a draft of a suggested new State law providing for compulsory part-time education and part-time employment for children between fourteen and sixteen.

The total *day-school* enrolment of the States in 1915 was 21,958,836, of which number 91 per cent. were in the elementary schools, 7·13 per cent., or nearly 1,566,000, in high schools, academies, and secondary schools, and 1·84 per cent., or about 404,000, in higher institutions—sufficiently significant figures when compared with those of the United Kingdom. The Federal Board sets forth in a most useful and illuminating bulletin six types of continuation schools: (a) The unit-trade school, which deals solely with the needs of a single trade, and into which, having settled upon his future employment, a young

person can enter after fourteen years of age for a period of whole-time training of not less than thirty hours per week for not less than thirty-six weeks of the year, half the time to be given to practical work on a useful or productive basis, and the other half to related and non-vocational subjects; (b) the whole-time general industrial school for towns of fewer than 25,000 inhabitants on the same basis as the unit-trade school; (c) the part-time trade extension school within working hours for persons more than fourteen years of age already engaged in a trade occupation; (d) a part-time trade preparatory school for persons already in employment, but desirous of changing it; (e) a general continuation part-time school where opportunity would be given for the study of English, civics, home economics, and commercial subjects; (f) evening schools or classes for special trades and industries supplemental to day employment for persons above sixteen years of age.

The Federal Board has issued upwards of twenty important bulletins dealing with general policies and methods, agriculture and special trades and industries, different types of schools to suit differing localities and circumstances, measures for emergency training in various industries, training of vocational teachers, rehabilitation and re-education of disabled soldiers and seamen, and, finally, with buildings and the equipment necessary to give full effect to the Act. This series of publications is deserving of the closest study, as the principles and practice they embody are of general application. They should be consulted by every director of education, and be accessible in every reference library of the kingdom. The movements abroad in Germany and the United Kingdom are keenly watched by the executive of the Federal Board, and significant reference is made in the bulletins to recent legislation making compulsory complete attendance at school until fourteen years of age, extending elementary education by means of central schools, and establishing compulsory attendance at continuation part-time schools from fourteen to eighteen throughout Great Britain. A marked feature of the policy of the Federal Board is the insistence upon the avoidance of all vocational instruction in the elementary and secondary schools of the States.

THE FUTURE OF SCIENTIFIC INDUSTRIES.

THE report of the Engineering Trades (New Industries) Committee has recently been issued by H.M. Stationery Office (Cd. 9226, price 6d. net). The Committee was appointed, with the Hon. H. D. McLaren as chairman, to compile a list of articles either not made in the United Kingdom before the war, or made in insufficient quantities. A series of fifteen branch committees, consisting of producers and merchants, was arranged to give detailed consideration to groups of manufactured articles. They were required to make recommendations as to the prospect of set-

ting up new, or developing existing, industries, having regard to the financial facilities necessary for success.

The Committee recognises that many engineering firms in this country are threatened with serious financial trouble from the difficulty of raising new capital, and the pressure of the munitions levy and the excess profits taxation. It finds that in some branches the industry has not kept pace with the demands of customers, and that users have been driven to purchase more up-to-date machinery in foreign markets. The principal remedies for this appear to be more specialisation and standardisation in the production of individual firms. Both tend to facilitate manufacture in quantities and so reduce cost. The Committee also emphasises the importance of scientific and industrial research, and regards with satisfaction the formation of associations in some trades for that purpose, assisted by grants from the Department of Scientific and Industrial Research.

Over much of the field surveyed, the resources for production in this country appear to be adequate. But there are cases where articles which could well be manufactured here were, before the war, obtained wholly or in great part from abroad. To take a few examples. Milk-testing appliances were obtained exclusively from Switzerland. Germany had captured most of the trade in white-metal spoons and forks. Lathe and drill chucks, gear-cutting machines, and mechanics' fine tools were, to a large extent, imported from America and Germany. Precision measuring instruments were not adequately made in this country. Electrical insulating materials were, to a great extent, if not wholly, imported from abroad, and, although progress has been made in overcoming the deficiency during the war, the opinion of the industry is that much research work is necessary, and that for success the manufacture must receive State assistance.

The market for tool-room and precision lathes has been almost entirely in the hands of foreign manufacturers, and that for the remarkable class of watchmakers' lathes, with hundreds of interchangeable fittings, is wholly in the hands of German firms.

Some branches of industry, especially the electrical industry, complain of the effect of unrestricted imports. It is pointed out that the insecurity of the home market, due to the fact that foreign products can be introduced and sold at an unreasonable price, discourages the investment of capital, and seriously hampers the development of home manufacture. Foreign makers of electrical plant, protected in their home markets by tariffs, produce on a larger scale and lower cost than the British manufacturer; in face of such conditions the industry cannot be expected to thrive. Magnetos before the war were entirely produced in Germany. During the war they have been quite successfully made here. But the exclusion of German magnetos is demanded for a period after the war except under licence and with

a duty on import. Protection or Government support is asked for in many cases. No doubt there are industries so important and so valuable as a means of training skilled workers that a claim of this kind is justified. The clock and watch manufacture seems to be such a case. But such claims must be carefully considered, in view of the fact that it is one of the objects of the Peace Conference to remove, so far as possible, all economic barriers.

It is clear from the report of the Sub-Committee dealing with scientific apparatus that the country has been backward in developing this vital industry, affecting research, education, and many other industries. The Committee recommends that for ten years scientific apparatus should not be imported except under licence, which should be granted and continued only so long as British apparatus is not available at reasonable prices. The following list gives some of the cases examined by the Sub-Committee: Balances and barometers largely obtained from Germany and sold under the names of English dealers; photographic apparatus supplied in large numbers by Germany and the United States; dividing engines supplied chiefly by Switzerland; drawing instruments derived chiefly from Germany; micrometers and measuring instruments largely supplied by the U.S.A.; physical apparatus obtained from Germany and sold under the names of English dealers; photographic lenses, which formerly came from Germany and France, might be manufactured here; also microscopes supplied largely from Germany.

It is stated that there are classes of articles imported which are made in such large quantities, and have such manufacturing and inventive resources behind them, as to make competition extremely difficult. In such cases, if the manufacture is to be developed in this country, it appears to be necessary that State assistance should be given towards overcoming the difficulty of competition. It is also recommended that Government Departments and public authorities should make it a practice to place orders for standard goods of British manufacture, and also have in view the desirability of encouraging the production of articles of new and improved types.

DR. HENRY WILDE, F.R.S.

DR. HENRY WILDE, whose death was announced in *NATURE* of April 3, was a man of remarkable individuality and a pioneer in electrical engineering. He was born in Manchester in 1833. During his apprenticeship he experimented with voltaic cells, electrical machines, electrical kites, and the electro-deposition of metals. He soon realised the great commercial possibilities of the applications of electricity, and he decided, when he was twenty-three years of age, to commence in business as a telegraph engineer and lightning-conductor expert. Several years were devoted to the invention of a magneto-electric alphabetic telegraph. Experiments with elec-