schools, under varied forms, have been established in most European countries, some of the best examples of them being found in Paris, Lyons, Reims, Rouen, and in other towns of France. One of the oldest of these schools is the École Martinière at Lyons. The school was founded in 1820 by a bequest from Major-General Martin, who had fought against the English under Tippoo Sahib. In this school, in which the education is gratuitous, as in nearly all the higher elementary schools of France, instruction is given in draw­ing, modelling, chemistry, mechanics and physics, in the working of wood and iron, and in German and English in addition to the subjects of an ordinary school education. Surveying is also taught to some of the pupils, and the instruction generally is of a very practical character. The students visit factories under the guidance of the masters, and on their return write out full descriptions of their visits. The school hours are from seven till eleven in the morning and from one till seven in the afternoon. The boys from this school rapidly obtain places in the commerical and industrial houses of Lyons, and many of them, after a time, succeed in obtaining high positions. A very similar school, on more modern lines, has been established at Reims, and is accommodated in a building especially adapted to the purpose. In this school instruc­tion is directed towards the staple industries of the district, namely, weaving, dyeing and engineering. There are many other similar schools in France, the object of which is to give the children of artisans and small shopkeepers a higher practical education in order to fit them to occupy the posts of foremen, overseers and superior clerks in manufacturing and commercial firms. In Germany the *real* schools, in which Latin is not taught, known as *Ohnelatein Realschulen,* have very nearly the same objects as the higher ele­mentary schools of France. The instruction in these German schools is not so practical as in the schools of France. Drawing is always well taught, and the schools generally contain good chemical laboratories, as well as collections of physical apparatus and museums. From the pupils of these schools the ranks of foremen are largely recruited. They receive no special trade instruction, but the general training is so arranged as to qualify them for higher posts in industrial works. The cost of this higher education seldom exceeds £3 per annum. In Bavaria there is found a type of school called *Industrie-Schule,* which serves very well for the training of engineers and industrial chemists, who aim at occupying inter­mediate posts, and desire to enter upon commercial work at an earlier age than students attending a university or technical college. The instruction in these *Industrieschulen* is largely practical, but is combined with some amount of literary and linguistic training. Some of the students proceed to the technical university, but the majority find posts as foremen or overseers soon after completing their school course. In most of these schools, as well as in the chief intermediate commercial schools, the exit certificate exempts a lad from two of the three years’ compulsory military service, and this regulation, to which nothing corresponds in England, is an incentive to parents to allow their children to receive higher instruc­tion, which operates very forcibly in largely increasing the number of well-educated youths in Germany.

A special feature of the education provided in the United States is what is known as the “ manual training ” school. This is a school admirably adapted for the training of foremen, although not especially intended for any particular industrial class. The manual training school is a secondary school in which a large part of the time is given to workshop exercises. The whole subject of manual training is more scientifi­cally developed in some of the states of America than in any Euro­pean country. The school is pervaded by the kindergarten spirit, and leads up, without break of continuity, to courses of instruction given in the higher technical colleges. The movement in favour of manual training in the United States is general and extends even to the private schools where youths are prepared for the university. At the same time, the purely practical teaching is invariably combined with scientific and literary instruction. In these, as in other schools, the principle is fully recognized that the primary aim of education is to make citizens and not tradesmen. It is difficult to take any one manual training school as typical of others, seeing how the curriculum varies in different states. The practical work includes exercises in carpentry, joinery, wood-turn­ing, wood-carving, forging, foundry-work, machine fitting, stone­work, and weaving and appropriate exercises for girls. The general idea underlying the scheme of instruction in these schools is that the teaching must be educative till the age of fifteen, and should then, and only then, develop into specialized and profes­sional training.

3. *Masters.—*Some of the best schools for the training of future masters, managers, engineers, manufacturers and industrial chemists are found in Germany and Switzerland, and are known as technical high schools. Schools of a similar character are found in other countries.

In Germany the *technische Hochschule* or Polytechnicum is an institution of university type in which the education has special reference to industrial purposes. In many respects the teaching coincides with that given in the universities. The chief dis­tinction consists in the arrangement of courses of instruction in the several departments, in the admission of students having a non- classical preliminary training, and in the absence of certain faculties found in the university and the addition of others. It is not correct to say that the technical high school is a professional school as distin­guished from the university; for the faculties of law, medicine and theology give to the university as distinctly a professional character as the faculty of engineering gives to the technical high school. Nor can it be said that the scientific studies at the universities are less practical than at the technical high school. For, whilst work­shops for instruction in the use of tools are found in very few of the German high schools, the laboratories for the practical study of chemistry and physics are as well equipped at some of the German universities as at the technical high schools. At the same time, engineers of every description, architects and builders, besides a great number of manufacturing chemists, find in the technical high school the scientific and special training which the future lawyer or physician, and in many cases the industrial chemist, seeks in the university.

In some of the large cities—in Berlin, Vienna and Munich, for instance—the two institutions co-exist; and in certain cases, in which a very special training is required to fit a youth for his career, the German student, after spending three or four years at a technical high school, passes on to another institution, such as a dyeing school, in which his studies are further specialized with a view to his future work.

Taking the technical high school of Munich as a type of other similar institutions, we find that it consists of seven depart­ments:—(1) the general; (2) the civil engineering; (3) the building; (4) the mechanical engineering; (5) the industrial chemical; (6) the agricultural, and (7) electrical technology. In other institutions there are architectural, pharmaceutical and mining schools. The programme of the Munich school gives a list of about 200 different courses of instruction distributed over the several departments. A separate professor is engaged to lecture on that particular subject with which he is specially conversant, and the number of such pro­fessors attached to a technical high school is very large. In the engineering department there are several distinct courses of lectures under the direction of professors who are experts in their special subject. The largest of all these institutions is that of Berlin, which was completed in 1884 at a cost of about £450,000. It is situated in what was a suburb of Berlin, and is generally known as the Charlottenburg Institution. It includes departments for the highest specialized instruction in nearly all branches of technology. Other schools in Germany are less complete, but most of them have one or more departments which are specially organized with a view to the highest grade of technical instruction. Both in the univer­sities and in the technical high schools facilities for scientific re­search arc provided, and the students are encouraged to undertake original investigations. The technical high schools are now placed on the same educational platform as the universities and have the power to confer the degree of Doctor of Engineering on students fulfilling the required conditions.

In France, the institutions in which the highest technical instruc­tion is given are concentrated in the capital. There are a large number of provincial colleges such as the École Centrale at Lyons, the École des Mineurs at St Étienne and the Institut du Nord at Lille, where the education is some­what more practical, but where the mathematical and scientific teaching is not carried to so high a point. Several of the French provincial colleges in which the higher forms of technical instruction are well developed became in 1898, under the law of 1896, separate universities. The École Centrale of Paris, in which the majority of French engineers who are not employed in the government service are trained, is a rare instance of an institu­tion for higher technical instruction which is self-supporting and independent of government aid. Other special institutions in Paris, some of which are associated with the university of Paris, are the École des. Mines, the École des Ponts et Chaussées, and the Collège de France, an old foundation in which facilities are afforded for the highest scientific research.

In Switzerland the federal polytechnic of Zurich is in many ways similar to the schools of Germany and Austria. Italy has three superior technical institutes—one at Milan, one at Turin and one at Naples, in which technical education is given on the same lines as in German polytechnic schools. Holland has an excellent institution at Delft, which was opened in 1864. In each of the state universities of Belgium there is a faculty of applied science, and degrees are granted on a course of training in science and technology; and in Russia the imperial technical school at Moscow is a high-class engineering school in which the theoretical studies are supplemented, to a greater extent than in the German schools, by workshop practice. It will be seen, therefore, that in nearly all European countries, instruction in engineering in all its branches and in chemical technology has become a recognized part of a university course, and that the faculty of applied science has been so enlarged as to provide technical education of the highest grade.

Some of the best schools for the higher technical instruction—for the training of masters and of those who are to occupy the position